Specifications and Tolerances (S&T) Committee Interim Report

Mr. Kenneth Ramsburg, Committee Chair
Maryland

300 INTRODUCTION

The S&T Committee (hereinafter referred to as the "Committee") submits this Committee Interim Report for consideration by National Conference on Weights and Measures (NCWM). This report contains the items discussed and actions proposed by the Committee during its Interim Meeting in Charleston, South Carolina, January 27-30, 2013. The report will address the following items in Table A during the Annual Meeting. Table A identifies the agenda items by reference key, title of item, and page number and addresses the appendices by appendix designations and page number. The acronyms for organizations and technical terms used throughout the report are identified in Table B. The headings and subjects apply to NIST Handbook 44 *Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices, 2013 Edition*. The first three digits of an item's reference key are assigned from the Subject Series List. The status of each item contained in the report is designated as one of the following: **(D) Developing Item:** the Committee determined the item has merit; however, the item was returned to the submitter or other designated party for further development before any action can be taken at the national level; **(I) Informational Item:** the item is under consideration by the Committee but not proposed for Voting; **(V) Voting Item:** the Committee is making recommendations requiring a vote by the active members of NCWM; **(W) Withdrawn Item:** the item has been removed from consideration by the Committee.

Some Voting Items are considered individually, others may be grouped in a consent calendar. Consent calendar items are Voting Items that the Committee has assembled as a single Voting Item during their deliberation after the Open Hearings on the assumption that the items are without opposition and will not require discussion. The Voting Items that have been grouped into consent calendar items will be listed on the addendum sheets. Prior to adoption of the consent calendar, the Committee will entertain any requests from the floor to remove specific items from the consent calendar to be discussed and voted upon individually.

Committees may change the status designation of agenda items (Developing, Informational, Voting, and Withdrawn) up until the time that the report is adopted, except that items which are marked Developing, Informational or Withdrawn cannot be changed to Voting Status. Any change from the Committee Interim Report (as contained in this publication) or from what appears on the addendum sheets will be explained to the attendees prior to a motion and will be acted upon by the active members of NCWM prior to calling for the vote.

An "Item Under Consideration" is a statement of proposal and not necessarily a recommendation of the Committee. Suggested revisions are shown in **bold face print** by **~~striking out~~** information to be deleted and **<u>underlining</u>** information to be added. Requirements that are proposed to be nonretroactive are printed in ***bold faced italics***. Additional letters, presentations, and data may have been part of the Committee's consideration. Please refer to [ADD LINK TO 2013 Interim Report] to review these documents.

All sessions are open to registered attendees of the conference. If the Committee must discuss any issue that involves proprietary information or other confidential material; that portion of the session dealing with the special issue may be closed provided that (1) the Chairman or, in his absence, the Chairman-Elect approves; (2) the Executive Director is notified; and (3) an announcement of the closed meeting is posted on or near the door to the meeting session and at the registration desk. If at all possible, the posting will be done at least a day prior to the planned closed session.

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

Subject Series List

Table A
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Appendices

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
AAR	Association of American Railroad	LNG	Liquefied Natural Gas
AES	Advanced Encryption Standard	MMA	Meter Manufacturers Association
API	American Petroleum Institute	MPMS	Manual of Petroleum Measurement Standards
AREMA	American Railway Engineering and Maintenance-of-Way Association	NCWM	National Conference on Weights and Measures
AWWA	American Water Works Association	NEWMA	Northeastern Weights and Measures Association
BCS	Belt-Conveyor Scale	NIST	National Institute of Standards and Technology
CC	Certificate of Conformance	NTEP	National Type Evaluation Program
CNG	Compressed Natural Gas	OIML	International Organization of Legal Metrology
CWMA	Central Weights and Measures Association	OWM	Office of Weights and Measures
DGE	Diesel Gallon Equivalent	PUC	Public Utilities Commission
DLE	Diesel Liter Equivalent		
DOT	Department of Transportation	RMFD	Retail Motor Fuel Dispenser
FALS	Fuels and Lubricants Subcommittee		
FHWA	Federal Highway Administration	S&T	Specifications and Tolerances
GGE	Gasoline Gallon Equivalent	SD	Secure Digital
GIPSA	Grain Inspection Packers and Stockyard Administration	SI	International System of Units
GLE	Gasoline Liter Equivalent	SMA	Scale Manufactures Association
GMM	Grain Moisture Meter	SWMA	Southern Weights and Measures Association
GPS	Global Positioning System	TC	Technical Committee
IATR	International Association of Transportation Regulators	USNWG	U.S. National Work Group
IEC	International Electrotechnical Commission	WIM	Weigh-in-Motion
LMD	Liquid Measuring Devices	WWMA	Western Weights and Measures Association

Details of All Items
(In order by Reference Key)

320 SCALES

320-1 V S.6.4. Railway Track Scales and Appendix D – Definitions

Source:
Systems Associates, Inc., (2012)

Purpose:
Align NIST Handbook 44 with the most recent version of the AAR Scale Handbook.

Item Under Consideration:
1) Amend NIST Scales Code paragraph S.6.4. Railway Track Scales. as follows:

S.6.4. Railway Track Scales. – A railway track scale shall be marked with the maximum capacity of each section of the load-receiving element of the scale. Such marking shall be accurately and conspicuously presented on, or adjacent to, the identification or nomenclature plate that is attached to the indicating element of the scale. ~~***The nominal capacity of a scale with more than two sections shall not exceed twice its rated section capacity. The nominal capacity of a two section scale shall not exceed its rated section capacity.****~~

The nominal capacity marking shall satisfy the following.

(a) For scales manufactured from January 1, 2002 through December 31, 2013:

(1) The nominal capacity of a scale with more than two sections shall not exceed twice its rated section capacity.

(2) The nominal capacity of a two section scale shall not exceed its rated section capacity.

(b) For scales manufactured on or after January 1, 2014, t**he nominal scale capacity shall not exceed the lesser of:**

(1) The sum of the Weigh Module Capacities as shown in Table S.6.4.M. or Table S.6.4, or;

(2) Rated Sectional Capacity (RSC) multiplied by the Number of Sections (Ns) minus the Number of Dead Spaces (Nd) minus 0.5. As a formula this is stated as RSC x (Ns - Nd - 0.5); or

(3) 290 300 kg (640,000 lb).

~~***[*Nonretroactive as of January 1, 2002]***~~

(Amended 1988, 2001, ~~**and**~~ 2002**, and 2013**)

Table S.6.4.M. Railway Track Scale – Weigh Module Capacity	
Weigh Module Length (m)	**Weigh Module Capacity (kg)**
< 1.5	**36 300**
1.5 to < 3.0	**72 600**
3.0 to < 4.5	**108 900**
4.5 to < 7.0	**145 100**
7.0 to < 9.0	**168 700**
9.0 to < 10.5	**192 300**
10.5 to < 12.0	**234 100**
12.0 to < 17.0	**257 600**
Note: The capacity of a particular module is based on its length and determined from corresponding capacity values specified in Table S.6.4.M.	

(Table Added 2013)

Table S.6.4. Railway Track Scale – Weigh Module Capacity	
Weigh Module Length (ft)	**Weigh Module Capacity (lb)**
<5	**80 000**
5 to < 10	**160 000**
10 to < 15	**240 000**
15 to < 23	**320 000**
23 to < 29	**372 000**
29 to < 35	**424 000**
35 to < 40	**516 000**
40 to < 56	**568 000**
Note: The capacity of a particular module is based on its length and determined from corresponding capacity values specified in Table S.6.4.	

(Table Added 2013)

2) Add the following definition for the term "weigh module" to NIST Handbook 44, Appendix D:

weigh module - The portion of a load-receiving element supported by two sections. The length of a module is the distance to which load can be applied. [2.20]

Background / Discussion:
The nominal capacity of a railway track scale has historically been based on the capacity of the pivots or load cells supporting the various sections of the scale. Since pivots were generally the weakest element, this was logical. With the introduction of load cell technology, the capacity of a section could far outreach the capacity of the weighbridge. Weighbridge design, based on the requirements in the AAR Scale Handbook, must be capable of supporting 80,000 pound axles on 5 foot centers. With the introduction of combined short span weigh modules over multiple sections, the use of the section capacity to determine scale capacity provides both the opportunity for overloaded structures and/or the requirement to overdesign the section. Basing nominal scale capacity on both the section capacity and the structural capacity is the best solution. Additionally, a 640,000 lb limit assures these scales can be calibrated with 12.5 % of capacity using the conventional 80,000 lb test weight equipment.

The changes to the nominal capacity specification were developed by Committee 34 - Scales, of the American Railway Engineering and Maintenance-of-Way Association (AREMA) and approved, by unanimous vote, for inclusion in the AAR Scale Handbook.

The original proposal to amend paragraph S.6.4. Railway Track Scales recommended: 1) striking out the two nonretroactive sentences in the paragraph, which linked nominal capacity to the number of sections of a railway

track scale, and 2) adding new criteria for establishing a scale's nominal capacity based on the lessor of three considerations as follows:

1) the sum of the weigh module capacities;

2) a scale's rated sectional capacity multiplied by the number of sections of the scale minus the number of dead spaces minus 0.5; or

3) 640,000 lb.

The original proposal also recommended adding a new definition for "weigh module" and a new Table S.6.4. to NIST Handbook 44. The new table provided various capacity ratings of weigh modules based on weigh module length for use in determining the value of the first of the three considerations shown above.

Eliminating the two nonretroactive sentences in the paragraph as proposed would have had the effect of making the entire paragraph retroactive.

During the 2012 Interim Meeting, the Committee agreed to add "the nominal capacity listed on the CC" to the list of proposed nominal capacity considerations to address concerns about the potential impact the proposal might have on existing equipment, especially equipment manufactured between the dates January 1, 2002 (the effective date of enforcement of the nonretroactive portion of the current paragraph proposed for deletion) and the date the proposed changes to the paragraph would take effect.

The Committee also agreed to add a note beneath Table S.6.4. to make clear that the module capacities are to be based on the length of the module and corresponding capacities specified in the proposed table. A final change agreed to by the Committee during the 2012 Interim Meeting was to amend the definition of "weigh module" originally proposed by deleting the words "single or articulated" as a descriptor in the definition.

The Committee designated the item Informational to allow time for additional input relative to these concerns and further analysis and comments on the amended proposal.

At the 2012 NCWM Annual Meeting, Mr. Darrell Flocken (Mettler-Toledo, Inc.), speaking on behalf of SMA, supported the proposal as amended by the S&T Committee during the 2012 Interim Meeting.

NIST OWM noted that the option of "the nominal capacity listed on the CC" was added by the Committee during the 2012 NCWM Interim Meeting after it was made known there existed at least one CC (and possibly more) for railway track scales with nominal capacities greater than the lessor of the values corresponding to the other options. This created potential conflicts between the requirement as originally proposed and the information on some existing CCs.

As a result of further analysis of this item, OWM suggested, as an alternative to adding "the nominal capacity listed on the CC" as one of the proposed nominal capacity consideration options, dividing the Item Under Consideration into two retroactive parts and assigning different enforcement dates to those parts. OWM noted that information on a CC is sometimes changed and if this were to occur, it could have an impact on the application of the requirement. OWM also suggested modifications to make the units consistent by either using both units "lb" and "ton" for every value [e.g., 640,000 lb (320 ton)] or using only a single unit. It was noted that the railroad industry has traditionally rated section capacity in "tons" and nominal capacity in "lb" units. Additionally, OWM would likely include equivalent SI values in NIST Handbook 44, if this item were adopted.

Mr. Steve Beitzel (Systems Associates, Inc. (SAI)), commented that as original submitter of the proposal, he supported the changes proposed by OWM, including the proposed change to a retroactive status and the proposed change of the values in the table from tons to pounds. He stated that he also agreed with OWM's suggestion to delete "the nominal capacity listed on the CC" as one of the proposed nominal capacity considerations and suggested that the definition for "weigh module" be further modified to delete the phrase "of the weighing element" at the end of the first sentence.

Mr. Rafael Jimenez (AAR) stated that the AAR supports the changes outlined by Mr. Beitzel, including those offered by NIST OWM.

The Committee agreed with NIST OWM's concern that if an NTEP CC corresponding to existing equipment were changed, that equipment may not be able to comply with proposed option of "the nominal capacity listed on the CC." For this reason, the Committee agreed to eliminate that option from the proposal and divide the Item Under Consideration into two parts, as suggested by OWM, assigning each part a different enforcement date. The Committee also agreed to modify the proposed definition of "weigh module" by deleting the words "of the weighing element" from the proposed definition. In consideration of the number of changes agreed upon, the Committee agreed to delete the proposal under "Item Under Consideration" in NCWM Publication 16 and replace it with the following:

1) Amend NIST Handbook 44, Scales Code paragraph S.6.4. Railway Track Scales as follows:

S.6.4. Railway Track Scales. – A railway track scale shall be marked with the maximum capacity of each section of the load-receiving element of the scale. Such marking shall be accurately and conspicuously presented on, or adjacent to, the identification or nomenclature plate that is attached to the indicating element of the scale. ~~***The nominal capacity of a scale with more than two sections shall not exceed twice its rated section capacity. The nominal capacity of a two section scale shall not exceed its rated section capacity.****~~

The nominal capacity marking shall satisfy the following.

(a) For scales manufactured from January 1, 2002 through December 31, 20XX:

(1) **The nominal capacity of a scale with more than two sections shall not exceed twice its rated section capacity.**

(2) **The nominal capacity of a two section scale shall not exceed its rated section capacity.**

(b) For scales manufactured on or after January 1, 20XX, the nominal scale capacity shall not exceed the lesser of:

(1) **The sum of the Weigh Module Capacities as shown in Table S.6.4, or;**

(2) **Rated Sectional Capacity (RSC) multiplied by the quantity of the Number of Sections (Ns) minus the Number of Dead Spaces (Nd) minus 0.5. As a formula this is stated as RSC x (Ns - Nd - 0.5); or**

(3) **640,000 lb.**

~~***[*Nonretroactive as of January 1, 2002]***~~

(Amended 1988, 2001, ~~**and**~~ 2002**, and 20XX**)

Table S.6.4.M. Railway Track Scale – Weigh Module Capacity	
Weigh Module Length (m)	**Weigh Module Capacity (kg)**
< 1.5	**36 300**
1.5 to < 3.0	**72 600**
3.0 to < 4.5	**108 900**
4.5 to < 7.0	**145 100**
7.0 to < 9.0	**168 700**
9.0 to < 10.5	**192 300**
10.5 to < 12.0	**234 100**
12.0 to < 17.0	**257 600**
Note: The capacity of a particular module is based on its length and determined from corresponding capacity values specified in Table S.6.4.M.	

(Table Added 20XX)

Table S.6.4. Railway Track Scale – Weigh Module Capacity	
Weigh Module Length (ft)	**Weigh Module Capacity (lb)**
<5	**80 000**
5 to < 10	**160 000**
10 to < 15	**240 000**
15 to < 23	**320 000**
23 to < 29	**372 000**
29 to < 35	**424 000**
35 to < 40	**516 000**
40 to < 56	**568 000**
Note: The capacity of a particular module is based on its length and determined from corresponding capacity values specified in Table S.6.4.	

(Table Added 20XX)

2) Add the following definition for the term "weigh module" to NIST Handbook 44, Appendix D:

weigh module - The portion of a load-receiving element supported by two sections. The length of a module is the distance to which load can be applied. [2.20]

During the fall 2012 Regional Association Meetings, the CWMA and SWMA supported the item and recommended it be designated a Voting item. The WWMA and NEWMA recommended it be an Information Item. Mr. Flocken, speaking on behalf of the SMA at both the WWMA and SWMA fall 2012 Regional Association Meetings, stated that the SMA supported the concept of the more recent changes that took place during the course of the 2012 NCWM Annual Meeting and would review the item at its November 2012 meeting.

During the 2013 NCWM Interim Meeting Open Hearings, Mr. Flocken, speaking on behalf of the SMA, supported the item.

NIST OWM recommended three additional changes to the proposal as follows:

1. Add a reference to Table S.6.4.M in proposed new subparagraph S.6.4.(b) (1);

2. Delete the words "the quantity of" from proposed new subparagraph S.6.4.(b) (2) so that it reads as follows:

Rated Sectional Capacity (RSC) multiplied by ~~the quantity of~~ the Number of Sections (Ns) minus the Number of Dead Spaces (Nd) minus 0.5. As a formula this is stated as RSC x (Ns - Nd - 0.5); and

3. Add the metric equivalent of 640 000 lb to proposed new subparagraph S.6.4.(b)(3).

Mr. Jimenez, speaking on behalf of the AAR, commented that the U.S. Railroads supported the item with the changes recommended by OWM. Mr. Beitzel (SAI) commented that he, too, supported the item with the changes suggested by OWM.

Based on the comments received during the Open Hearings, the Committee agreed to amend the proposal to include OWM's three suggested changes to read as shown in the Item Under Consideration and designated the item as a Voting item.

Additional letters, presentations, and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

320-2 W Table 4 – Minimum Test Weights and Test Loads

Source:
Fairbanks Scales, Inc. (2013)

Purpose:
Provide clarification regarding the minimum amount of test weights and test loads required for official tests of floor scales having nominal capacities of 3001 lb and greater.

Item Under Consideration:
Amend Scales Code Table 4. Minimum Test Weights and Test Loads as follows:

Table 4.
Minimum Test Weights and Test Loads[1]

Devices in Metric Units			Devices in U.S. Customary Units		
Device Capacity (kg)	**Minimums (in terms of device capacity)**		**Device Capacity (lb)**	**Minimums (in terms of device capacity)**	
	Test Weights (greater of)	**Test Loads[2]**		**Test Weights (greater of)**	**Test Loads[2]**
0 to 150 kg	100 %		0 to 300 lb	100 %	
151 to 1 500 kg	25 % or 150 kg	75 %	301 to 3 000 lb	25 % or 300 lb	75 %
1 501 to 20 000 kg	**~~12.5 % or 500 kg~~ 25 % or 1 250 kg**	50 %	3001 to 40 000 lb	**~~12.5 % or 1 000 lb~~ 25 % or 2 500 lb**	50 %

20 001 kg+	12.5 % or 5 000 kg	25 %[3]	40 001 lb+	12.5 % or 10 000 lb	25 %[3]

Background Discussion:
Table 4 Minimum Test Weights and Test Loads specifies the greater of 25 % of device capacity or 300 lb, as the minimum amount of test weight required for testing scales ranging in capacity from 301 to 3000 lb. The 25 % specified in Table 4 corresponds with the amount required by the shift test procedures described in subparagraph N.1.3.7.(b), which allows, as an option, the shift test to be performed using a one-quarter nominal capacity test load centered as nearly as possible, successively, over each corner of the load-receiving element.

There is inconsistency in minimum test weight requirements between Table 4 and paragraph N.1.3.7. for scales of other capacities. Consider a 10 000 lb capacity floor scale as an example. Table 4 requires a minimum of only 12.5 % of scale capacity in test weights, which equates to 1250 lb. Subparagraph N.1.3.7. (b) requires 25 % of nominal capacity in test load, or in this example 2500 lb, to perform the shift test. The differences in these two requirements could become an issue in states that enforce NIST Handbook 44. There should be consistency in the minimum test weights required and the weights required to perform a shift test.

One could argue that the shift test can be performed using substitutions along with test weights. However, N.1.3.7.(b) can be interpreted as specifically defining "test loads" as "test weights" for the purpose of that paragraph.

At the fall 2012 NEWMA Meeting, it was reported that some believe this item would be a safety concern [because of the increased amount of test weight that would be needed to test such scales if this proposal were accepted]. NEWMA suggested retaining the 12.5 % currently specified in Table 4 and stated that more information would be needed to support the item. NEWMA forwarded the item to NCWM, recommending it as a Developing Item.

During the 2013 Interim Meeting Open Hearings, the S&T Committee heard comments from Mr. Lou Straub (Fairbanks Scales) recommending that the item be withdrawn because the changes proposed to Table 4 shown in Item Under Consideration, if accepted, would not solve the problem identified by the submitter as reported on NCWM Form 15. Using a 10 000 lb capacity floor scale as an example to illustrate his point, Mr. Straub explained that Table 4 requires a minimum of 1250 lb in test weight and that subparagraph N.1.3.7.(b) specifies that either a one-third or one-quarter nominal capacity test load be used to conduct the shift test, depending upon the position of the test load on the platform. One-quarter nominal capacity, the lesser of the two fractions specified in subparagraph N.1.3.7.(b) equates to 2500 lb on a 10 000 lb capacity. Thus, it appeared to the Fairbanks technician, who submitted this proposal, that there was a conflict in the amount of test weight required by Table 4 and subparagraph N.1.3.7.(b), to perform an official test.

Mr. Straub further explained to the Committee that, whereas a one-third nominal capacity test load is explicitly defined as "test weight" in subparagraph N.1.3.7.(b), a one-quarter nominal capacity test load, which is also referenced in the same subparagraph is not. In reviewing past NCWM Conference Reports relating to paragraph N.1.3.7. he concluded that the one-quarter nominal capacity test load referenced in subparagraph (b) was purposely not defined because it was intended for that test load to be comprised of either all test weight or a combination of test weight and substituted material. By not defining the one-quarter nominal capacity shift test load as test weight, one could conduct a shift test on a 10 000 lb capacity scale using a combination of 1250 lb of test weight, (i.e., the minimum amount of test weight specified in Table 4 for a 10 000 capacity scale) and a single substitution test load. That is, a substitution test load used in combination with the test weight could create a shift test load equal to 2500 lb (one-quarter nominal capacity). This being the case, there is no conflict concerning the amount of test weight required by the two NIST Handbook 44 requirements.

Mr. Straub also indicated that another factor contributing to his recommendation to withdraw this item is the fact that paragraph N.1.3.7. does not, in any way, preclude someone from conducting the shift test using a one-quarter nominal capacity test load comprised entirely of test weight. In conclusion, he suggested that the Committee may want to consider adding a footnote to subparagraph N.1.3.7.(b) to make clear that the one-quarter nominal capacity test load can be comprised of either test weight entirely or a combination of test weight and substitution test loads.

The Committee also heard comments from Mr. Darrell Flocken (Mettler-Toledo, Inc.), speaking on behalf of the SMA. Mr. Flocken indicated that the SMA was opposed to the item as written because they do not believe the agenda item aligns with the recommendation as written in the original NCWM Form 15.

NIST OWM noted that it is only reasonable to expect that the amount of test weight specified in NIST Handbook 44 for a shift test be not greater than the minimum amount of test weight required to certify a scale. Rather than proposing to increase the amount of test weight required to perform an official test on all scales having capacities between 3001 and 40 000 lb, OWM suggested that the submitter might consider amending the Item Under Consideration, so that it's impact would be limited to only those scales having been identified in the proposal as being of concern, that is, those having capacities between 3001 and 10 000 lb. Jurisdictions might also find this to be a more reasonable approach. With regard to the possibility of paragraph N.1.3.7. being misinterpreted, OWM noted that the paragraph is very clear in defining one-third nominal capacity test load as "test weight."

In consideration of Fairbanks Scales' recommendation to withdraw the item and SMA's opposition to the item, the Committee agreed to withdraw it. The Committee also agreed that it was not necessary to add a footnote to paragraph N.1.3.7.(b) to clarify that a one-quarter capacity test load could be comprised of either test weight entirely or a combination of test weight and substitution test loads because there is already a footnote in Table 4 defining the term "test load."

Additional letters, presentations, and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

320-3 W T.N.3., Table 6. Maintenance Tolerances

Source:
Michigan Department of Agriculture (2013)

Purpose:
Provide additional guidance concerning the proper application of NIST Handbook 44, Scales Code, Table 6 tolerances.

Item Under Consideration:
Amend Scales Code Table 6. Maintenance Tolerances as follows:

Table 6.
Maintenance Tolerances
(All values in this table are in scale divisions)

	Tolerance in Scale Divisions			
	1d	**2d**	**3d**	**5d**
Class	**Test Load in Divisions**			
I	0 - 50 000	50 001 - 200 000	200 001 +	
II	0 - 5 000	5 001 - 20 000	20 001 +	
III	0 - 500	501 - 2 000	2 001 - 4 000	4 001 +
IIII	0 - 50	51 - 200	201 - 400	401 +
III L	0 - 500	501 - 1 000	(Add 1d for each additional 500 d or fraction thereof)	

Note:
In order to determine the number of divisions for any test load; divide the value of the mass standard being applied by the minimum division indicated by the scale.

Example: If the scale has a minimum division of 0.1g and a 1500g mass standard is applied, the test load is equal to 15 000 divisions.

Result: On a Class II scale with a test load between 5001 and 20 000 divisions indicates the tolerance is +/- 2 divisions or +/- 0.2g.

Background / Discussion:
2012 CWMA Interim Meeting: Table 6 is located in NIST Handbook 44; however, the instructions for use are located in NIST Handbook 133. This amendment would aid service companies who may be unaware of NIST Handbook 133; or those technicians who may have been told what the tolerances are but not trained on how to determine those numbers. Based on suggestions from regulatory officials, the submitter's original proposal was modified to add "d" to the column headings and to rewrite the new guidance as a note and include an example. CWMA supported the item as amended and forwarded it to NCWM, recommending it as a Voting Item.

At the 2013 NCWM Interim Meeting, Mr. Darrell Flocken (Mettler-Toledo, Inc.), speaking on behalf of the SMA supported the item, but recommended:

1. That the term "mass standard" be changed to "test weight(s)" in both the "Note" and the "Example" sentences.

2. That the two sentences, the first of which follows the word "Example" and the second of which follows the word "Result" in the Item Under Consideration be combined as an example to read:

   Example: ~~If the scale has~~ A Class II scale with a minimum division of 0.1g and a 1500g ~~mass standard~~ test weight(s) ~~is~~ applied, the test load is equal to 15 000 divisions, resulting in a tolerance ~~is~~ of +/- 0.2g.

   ~~Result: On a Class II scale with a test load between 5001 and 20 000 divisions indicates the tolerance is +/- 2 divisions or +/- 0.2g.~~

NIST OWM commented that it would be inappropriate to include the letter "d" after each tolerance multiple as shown in Table 6 of the Item Under Consideration because in cases where the value of $d \neq e$ (such as on some Class I and II scales, dynamic monorails, etc.) a factor of the value of "e," rather than "d," is used to determine the applicable tolerances. Likewise, in the proposed note and associated example, it would be technically incorrect, in some cases, to refer to the division as "minimum" because the minimum division indicated by the scale would be the value of "d" and "d" would not necessarily be used to determine the number of divisions for any test load. In cases where the value of $d \neq e$, the number of divisions for any test load would be determined by dividing the test load value by the verification division (e). For these reasons, it is OWM's opinion that the proposed changes would tend to confuse rather than aid those not very familiar with how the values in Table 6 are to be applied.

Ms. Kristen Macy (California) commented that she agreed with OWM's comments and that the changes proposed in the Item Under Consideration would only apply in cases where the value of "d" and "e" are equal.

NIST OWM developed the following alternative changes to Table 6 and provided them to the Committee for consideration should the Committee decide that additional clarification of the values in Table 6 were needed:

Table 6.
Maintenance Tolerances
(All values in this table are in scale divisions)

	Tolerance in Scale Divisions (d or e)*			
	1	**2**	**3**	**5**
Class	**Test Load in Scale Divisions (d or e)***			
I	0 - 50 000	50 001 - 200 000	200 001 +	
II	0 - 5 000	5 001 - 20 000	20 001 +	
III	0 - 500	501 - 2 000	2 001 - 4 000	4 001 +
IIII	0 - 50	51 - 200	201 - 400	401 +
III L	0 - 500	501 - 1 000	(Add 1 d for each additional 500 d or fraction thereof)	

***In cases where d ≠ e, for example, some Class I and II scales, dynamic monorail scales, etc., the value of "e" is used to determine tolerance and test load. In all other cases the value of "d" is to be used.**

OWM noted that a somewhat different approach to amending Table 6 in an effort to improve understanding would be to develop and present a separate table in NIST Handbook 44 for each scale accuracy class. An example draft table for Class I scales was developed by OWM and also provided to the Committee to show how these could be used as an alternative to amending Table 6.

The following additional comments and recommendations relating to the Item Under Consideration were also provided by OWM:

- If a note is needed to explain how to calculate the number of scale divisions in the test load, OWM suggests expressing the example as a formula and offers the following for consideration:

$$\textit{Test Load in Scale Divisions} = \frac{\textit{Test Load in Units of Mass}}{\textit{Value of Scale Division } (d \text{ or } e) \textit{ in Units of Mass}}$$

- With regard to the proposed example, the Committee might wish to consider suggesting that the example be included in a field manual, EPO, or other guidance document, rather than in NIST Handbook 44.

- Should the Committee decide to modify Table 6 by adding additional clarifications concerning which value ("d" or "e") applies, it might also consider amending various other paragraphs in NIST Handbook 44 where both (d) or (e) could apply, yet, neither is specified, or only one of the two is specified within the paragraph (e.g., paragraphs S.2.1.3.1, S.2.1.3.2., N.1.2.1., T.N.1.2., T.N.7.2., etc.).

In considering this item, the Committee agreed with the comments received from NIST OWM and the State of California that it would be inappropriate to include the letter "d" after each tolerance multiple without also including some explanation of how the values in the table would apply in cases where the value of "d" and "e" are different on a scale. The NIST Technical Advisor pointed out to the Committee that in the U.S., the term "scale division" is often used interchangeably to reference both scale division (d) and verification scale division (e) and that, unless the term is further defined, it is unknown which value is being referenced. Adding the letter "d" after each tolerance multiple as proposed in the Item Under Consideration would provide additional clarification by defining the tolerance values as scale division (d) opposed to verification scale division (e). Such clarification would be inappropriate because the tolerances in Table 6 must also be applied to scales having a value of "d" that is different than "e" and in such cases, tolerances must be determined in values of "e."

The Committee considered how the table might be amended or the information in the table presented to provide a better understanding of how tolerances are to be determined given that the table applies to not only scales where the

value of "d" and "e" are the same, but also to scales where the values are different. The Committee considered OWM's alternative changes to the table and whether or not a separate table in NIST Handbook 44 for each scale accuracy class would make it any easier for those less experienced to understand how to determine and apply tolerances. The Committee concluded that there is no simple means of making the information in the table easier to understand or presenting it in a way that would improve understanding for inexperienced inspectors or service personnel who have not received training. The Committee agreed that regardless of how the table was changed or the information in the table presented, training would still be needed to teach how the values in the table are to be applied. With training comes the understanding that "d" and "e" are not always equal for all classes of scales and how to use those values to determine the tolerance and test loads specified in Table 6. Additionally, the definition in Appendix D for "verification scale division" and paragraph S.1.2.2. Verification Scale Interval clarifies how "d" and "e" are to be applied. In considering OWM's alternative approach of developing and presenting a table for each scale accuracy class, the Committee preferred that scale tolerances for all scale accuracy classes remain in a single condensed table. The Committee also agreed that examples to make clear how tolerances are to be applied are better included in training material rather than NIST Handbook 44. For these reasons, the Committee agreed to Withdraw this item.

The Committee understands and appreciates the concerns raised by the submitter of this item, but doesn't believe the changes proposed to NIST Handbook 44 would be beneficial, and therefore agreed to withdraw this item.

Additional letters, presentations, and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

320-4 V Appendix C – Units of Mass (ton)

Source:
Rice Lake Weighing Systems, Inc. (2012)

Purpose:
Establish uniform abbreviations for "short ton."

Item Under Consideration:
1. Amend the Units of Mass Table that appears on pages C-19 and C-20 of NIST Handbook 44 Appendix C to recognize "tn" as an acceptable abbreviation for "net" or "short" ton, and add a footnote to make clear that abbreviations for "net" or "short" ton other than "tn" are considered appropriate for use with older equipment. The following changes are proposed:

Units of Mass	
1 assay ton[17] (AT)	29.167 grams
1 carat (c)	200 milligrams (exactly) 3.086 grains
1 dram apothecaries (dr ap or ʒ)	60 grains (exactly) 3.888 grams
1 dram avoirdupois (dr avdp)	$27^{11}/32$ (= 27.344) grains 1.772 grams
1 gamma (γ)	1 microgram (exactly)
1 grain	64.798 91 milligrams (exactly)
1 gram (g)	15.432 grains 0.035 ounce, avoirdupois
1 hundredweight, gross or long[18] (gross cwt)	112 pounds (exactly) 50.802 kilograms
1 hundredweight, gross or short (cwt or net cwt)	100 pounds (exactly) 45.359 kilograms
1 kilogram (kg)	2.205 pounds
1 milligram (mg)	0.015 grain
1 ounce, avoirdupois (oz avdp)	437.5 grains (exactly) 0.911 troy or apothecaries ounce 28.350 grams
1 ounce, troy or apothecaries (oz t or oz ap or ℥)	480 grains (exactly) 1.097 avoirdupois ounces 31.103 grams
1 pennyweight (dwt)	1.555 grams
1 point	0.01 carat 2 milligrams
1 pound, avoirdupois (lb avdp)	7000 grains (exactly) 1.215 troy or apothecaries pounds 453.592 37 grams (exactly)
1 micropound (μlb) [the Greek letter mu in combination with the letters lb]	0.000 001 pound (exactly)
1 pound, troy or apothecaries (lb t or lb ap)	5760 grains (exactly) 0.823 avoirdupois pound 373.242 grams
1 scruple (s ap or ℈)	20 grains (exactly) 1.296 grams
1 ton, gross or long[19]	2240 pounds (exactly) 1.12 net tons (exactly) 1.016 metric tons
1 ton, metric (t)	2204.623 pounds 0.984 gross ton 1.102 net tons
1 ton, net or short **(tn)**[x]	2000 pounds (exactly) 0.893 gross ton 0.907 metric ton

[17] Used in assaying. The assay ton…[18] The gross or long ton and hundredweight are used commercially in the United States to only a very limited extent, usually in restricted industrial fields. The units are the same as the British "ton" and "hundredweight."
[19] The gross or long ton…

[x]As of January 1, 2014, "tn" is the required abbreviation for short ton. Devices manufactured between January 1, 2008 and December 31, 2013 may use an abbreviation other than "tn" to specify short ton.

Assign the appropriate footnote sequence number to "x" in the table and footnote shown above and renumber subsequent footnotes in Appendix C.

2. Amend the abbreviation "t" for 1 ton (20 hundredweights) beneath the Avoirdupois Units of Mass heading on page C-6 of NIST Handbook 44 Appendix C to "tn" and add the same footnote as is proposed for addition in Item Under Consideration 1. above to again make clear that abbreviations for "net" or "short" ton other than "tn" are considered appropriate for use with older equipment. The following changes are proposed:

Avoirdupois Units of Mass[6]

[The "grain" is the same in avoirdupois, troy, and apothecaries units of mass.]

1 µlb	= 0.000 001 pound (lb)
$27^{11}/_{32}$ grains (gr)	= 1 dram (dr)
16 drams	= 1 ounce (oz)
	= 437½ grains
16 ounces	= 1 pound (lb)
	= 256 drams
	= 7000 grains
100 pounds	= 1 hundredweight (cwt)[7]
20 hundredweights	= 1 ton ~~(t)~~ **(tn)[x]**
	= 2000 pounds[7]

In "gross" or "long" measure, the following values are recognized:

112 pounds (lb)	= 1 gross or long hundredweight (cwt)[7]
20 gross or long hundredweights	= 1 gross or long ton
	= 2240 pounds[7]

[6] When necessary to distinguish…

[7] When the terms "hundredweight" and…

[x] As of January 1, 2014, "tn" is the required abbreviation for short ton. Devices manufactured between January 1, 2008 and December 31, 2013 may use an abbreviation other than "tn" to specify short ton.

Assign the appropriate footnote sequence number to "x" in the table and footnote shown above and renumber subsequent footnotes in Appendix C.

Background / Discussion:

The submitter of this item discovered a difference between U.S. and Canadian abbreviation requirements that may impact manufacturers that sell products in both countries and NTEP type evaluations under the US/Canada mutual recognition program. Most units of mass have an abbreviation for SI and U.S. customary units (e.g., kg, lb, g, oz, etc.). However, the same abbreviation, the lower case "t," is used to represent both the metric ton and the short ton (2000 lb). If an indicator is set up to display both SI and U.S. customary units, the operator or customer cannot know what units are being displayed if "t" is the only abbreviation that is acceptable for metric ton. Because of the limited space available on today's indicators, the words "short ton" or "long ton" are not always an option.

In the Canadian Lab Manual, Part 2, Section Appendix-2A in the table for abbreviations and symbols accepted in Canada, metric ton is abbreviated by "t" and short ton is abbreviated by "tn." In NCWM Publication 14, Appendix C in a table titled "Acceptable Abbreviation/Symbols" there is an abbreviation of "TN" for short ton and "LT" for long ton. In keeping with the Canadian abbreviation, the Committee considered a request that NIST Handbook 44 be amended to use the lower case "tn" and "lt" as the abbreviations for short and long ton respectively.

The following is a short list of some of the more significant points raised and comments heard during the fall 2011 CWMA, WWMA, and SWMA Regional meetings regarding the proposal:

- The intent of the proposal is to align U.S. and Canadian requirements. The abbreviation "tn" is an acceptable Canadian abbreviation for "short ton."

- Representatives from two scale manufacturers expressed concerns of the impact that the proposed abbreviation changes would have on the substitution or replacement of existing terms on longstanding industry practices.

- NIST Handbook 44 Appendix C uses the lower case "t" for both the U.S. Customary short ton (2000 lb) on page C-6 and the metric ton (2204.623 lb) on page C-19. Additionally, NIST Special Publication 811 *Guide for the International Systems* doesn't use any abbreviation for U.S. Customary tons and uses the lower case (t) for the metric ton.

- The Weighing Sector considered this item and agreed to move it forward because of differences between the U.S. and Canadian requirements. Canada doesn't accept upper case "TN." The Weighing Sector also agreed to modify NCWM Publication 14 to designate the abbreviation for short ton as "tn." The same change is being proposed for NCWM Publication 14 scales checklists.

- The Committee believes the proposal lacks specific direction on whether to add or replace the existing abbreviations in NIST Handbook 44 Appendix C. Additionally, there was no proposed solution or suggested abbreviation for indicators with both U.S. Customary and Metric tons used in the submitter's example.

During the 2012 NCWM Interim Meeting, the original submitter, Mr. Paul Lewis (Rice Lake Weighing Systems, Inc.) requested that the proposal in the Interim Agenda be modified to remove the reference to "long ton" and its associated proposed abbreviation "lt." Mr. Lewis indicated that the intent of the proposal is to align U.S. and Canadian requirements and noted that the abbreviation "tn" is an acceptable Canadian abbreviation for "short ton."

The SMA supported the abbreviation "tn" for "short ton," but not the abbreviation "lt" for "long ton" and suggested making the item Informational to allow for more discussion.

NIST OWM stated that they agreed with the points raised during the 2011 WWMA Annual Meeting regarding the need for continued development of the item.

Mr. Bill Ripka (Thermo Fisher Scientific) indicated that several different references for ton (short) have been used with belt-conveyor scale systems over the years. For example, both lower case "t" and upper case "T" have been used to abbreviate "short ton." He stated that although he was not opposed to the item, more work is needed to ensure that references are consistent throughout all of NIST Handbook 44.

The Committee considered the comments received during the Open Hearings and agreed to remove the reference to "long ton" in the Units of Mass table on page C-19 of NIST Handbook 44 Appendix C as was requested by the submitter of the proposal. The Committee asked the NIST Technical Advisors to undertake a review of the references in NIST Handbook 44, the Canadian requirements, and NCWM Publication 14, and identify any additional changes that might be needed to ensure consistency. Additionally, the Committee requested input from the community on the impact that this item might have on existing scales in the marketplace. The Committee agreed that additional work was needed on this item and consequently designated the item Informational.

During their spring 2012 Annual Meetings, NEWMA supported the item as amended at the 2012 NCWM Interim Meeting. The CWMA recommended changing the abbreviation "t," which refers to "short ton," to "tn" to avoid conflict with the recommended proposal and recommended that the item remain Informational.

At the 2012 NCWM Annual Meeting, the Committee acknowledged that the reference to "lt" is no longer under consideration. The SMA iterated comments made at the CWMA meeting and supported changing the item to "Informational."

NIST OWM noted that the 2011 Publication 14 Belt-Conveyor Scale Systems type evaluation criteria provides a table on page BCS-4 that indicates the U.S. short ton may be identified as "ton" or upper case "T;" the metric ton as lower case "t;" and the U.S. long ton as upper case "LT." The abbreviation "T" for U.S. short ton in Pub 14 conflicts with the acceptable abbreviation for the U.S. short ton specified in Appendix C of NIST Handbook 44, which is "t." A search of the word "ton" in Appendix C of NIST Handbook 44 revealed that nowhere is upper case "T" used, although lower case "t" appears as an acceptable abbreviation for both the U.S. short (or net) ton (page C-6) and the metric ton (page C-19). OWM expressed a concern that officials applying paragraph G-S.5.6.1. might be inclined to reject upper case "T" as an acceptable abbreviation for the U.S. short (or net) ton even though Publication 14 indicates that the upper case "T" is acceptable. Officials might also find it confusing if lower case "tn" were made an acceptable abbreviation for the U.S. short or net ton, given that the table on page BCS-4 of Publication 14 specifies lower case "t" as the acceptable abbreviation for the metric ton.

OWM noted that even if everyone were to agree on different acceptable abbreviations for the U.S. short or net ton, the U.S. long ton, and the metric ton, it would be unlikely that this would completely resolve all the confusion relating to the value of the ton in commercial transactions. The spelled-out version of the word "ton" is often used instead of its abbreviation to identify values displayed or recorded by a commercial device. Thus, when the word "ton" is used by itself with no further qualification of an appropriate clarifying preface such as "metric," "short," "net," or "long," it's unclear as to which ton is being quoted for all terms.

OWM suggested that the Committee consider changing the abbreviation "t" (which refers to "1 ton (short)," beneath the heading "Avoirdupois Units of Mass" on page C-6 of the 2012 version of NIST Handbook 44) to "tn" to avoid conflict with the recommended proposal. OWM also noted that the abbreviation "lt" had erroneously been left in the table.

The Committee acknowledged that the "lt" abbreviation for "1 ton, gross or long" in the "Units of Mass" table on page S&T 20 of 2012 Publication 16 was erroneously left in the table from the original proposal and agreed that it should be removed. Associated with this change, the Committee also recommended deleting the reference to "Long Ton" in the "Purpose" of the proposal so that it reads as currently shown in Item Under Consideration. The Committee reiterated its request for input from the community on the impact that this item might have on existing scales in the marketplace and asked for input regarding what additional changes might be needed to the proposal prior to moving it forward.

Comments received during the Open Hearings of the fall 2012 Regional Weights and Measures Associations were predominantly in support of the item. At the fall 2012 CWMA Interim Meeting, industry requested that the Committee support a change to "short ton" to align with Measurement Canada. The WWMA acknowledged potential conflict with the abbreviation of "tn" for "net" or "short ton" in NCWM Publication 14 BCS-4, yet reported there was no opposition to the item and it appeared that concerns raised in the Background / Discussion had been resolved. Mr. Darrell Flocken (Mettler-Toledo, Inc.), speaking on behalf of the SMA during the WWMA and SWMA, indicated the SMA supported the item. Three of the regional weights and measures associations recommended the item be Voting and NEWMA recommended it remain Informational.

During the 2013 NCWM Interim Meeting Open Hearings, NIST OWM commented that conflicts in the abbreviation for "short" or "net" ton in NIST Handbook 44 and NCWM Publication 14 are of continued concern. OWM identified a number of concerns as follows:

- NIST Handbook 44 (Appendix C) recognizes the lower case "t" as an acceptable abbreviation for both the U.S. short ton and the metric ton. NIST Handbook 44 does not recognize upper case "T" as an acceptable abbreviation for the U.S. short ton or metric ton, nor does it recognize upper case "LT" as an acceptable abbreviation for the U.S. long ton.

- A table included on page BCS-4 of the 2012 NTEP Publication 14 Belt Conveyor Scales (BCSs) Checklists and Test Procedures indicates the U.S. short ton may be identified as "ton" or upper case "T;" the metric ton as lower case "t;" and the U.S. long ton as upper case "LT." The following abbreviations appear in the 2012 version of Pub 14 BCSs type evaluation criteria:

Unit	Abbreviation
pounds	lb or LB
U.S. short ton	ton or T
U.S. long ton	LT
Metric ton	t
kilograms	kg

The word "ton" is not an abbreviation, although it is included in the Publication 14 table as such.

- Because upper case "T" and upper case "LT" are recognized by NTEP as acceptable abbreviations for U.S. short ton and U.S. long ton, respectively, it can only be assumed that there are BCSs currently in commercial service that have been issued an NTEP CC that use these abbreviations.

- By virtue of the fact that paragraph G-S.5.6.1. specifies the locations of where appropriate abbreviations for equipment manufactured as of January 1, 2008 may be found; if a particular defining symbol observed during inspection is not included in those locations, it infers that that particular symbol is inappropriate, disallowed, and would necessitate official rejection. Thus, if an official were to observe the abbreviation "T" or "LT" during an inspection of a BCS that was manufactured as of January 1, 2008, regardless of which "ton" was intended to be identified, they should reject for failure to comply with the provisions of G-S.5.6.1. even though an active CC may be linked to the device.

- If the proposed change is adopted and "tn" was to become an acceptable abbreviation for U.S. "short ton," Publication 14 BCSs would be revised to reflect the change. How will officials apply the revised abbreviation to existing equipment that designate short tons using upper case "T" or other abbreviations? Wouldn't accepting the additional abbreviation "tn" for the U.S. short ton only add to an already existing, and somewhat confusing problem?

- A more reasonable approach it would seem, is to first fix the current problem, perhaps by agreeing on one or maybe two, acceptable abbreviations for each type of ton and then specifying what those agreed upon abbreviations are in both NIST Handbook 44 and NCWM Publication 14. Additionally, it might be agreed that when the word ton is not abbreviated, it must be further qualified by a preface clarifying which ton is being referenced. As OWM has noted before, even if everyone were to agree on different acceptable abbreviations for the U.S. short or net ton, the U.S. long ton, and the metric ton, it would be unlikely that this would completely resolve all the confusion relating to the value of the ton in commercial transactions. The spelled-out version of the word "ton" is often used instead of its abbreviation to identify values displayed or recorded by a commercial device. Thus, unless the word "ton" is further qualified using an appropriate clarifying preface such as "metric," "short," "net," or "long," it's unclear as to which ton is being referenced when the word "ton" by itself is used to identify the unit of measure.

As a final comment, OWM recommended that should the Committee decide to move forward with the proposal, that the Committee consider changing the abbreviation "t" (which refers to 1 ton (short), beneath the heading "Avoirdupois Units of Mass" on page C-6 of the 2012 version of NIST Handbook 44) to "tn" to avoid conflict with the recommended proposal.

The submitter of the proposal, Mr. Lewis, commented that the intent of the proposal is to harmonize the short ton abbreviation with Measurement Canada.

Mr. Flocken, speaking on behalf of the SMA, indicated that the SMA supported the item.

During its deliberations, the Committee considered how to address concerns regarding how officials are to treat equipment with an existing CC that uses an abbreviation for short ton that differs from the "tn" abbreviation

proposed, should this item be adopted. Paragraph G-S.5.6.1. specifies the locations of where appropriate abbreviations for equipment manufactured as of January 1, 2008 may be found and NIST OWM commented during the Open Hearings that if a particular defining symbol observed during inspection is not included in those locations, it infers that that particular symbol is inappropriate, disallowed, and would necessitate official rejection. If "tn" is made the acceptable abbreviation for "short ton" and is added to Appendix C of NIST Handbook 44 as proposed, how are officials to apply paragraph G-S.5.6.1. to existing equipment that uses an abbreviation other than "tn" that was manufactured on or after January 1, 2008, i.e., the enforcement date of G-S.5.6.1.(a)?

The Committee acknowledged that the change proposed, if adopted, would affect some existing equipment that use an abbreviation for short ton that might currently be considered acceptable, but with this change, would cause that abbreviation to be unacceptable. In consideration of this point, the Committee is interested in hearing input from those anticipating that this change will be detrimental to their equipment.

The Committee agreed to designate the item Voting and, in an effort to address the concerns raised by OWM regarding the treatment of existing equipment, to add a new footnote to Appendix C in the Units of Mass Table immediately following the abbreviation "tn," as shown in the Item Under Consideration.

The Committee also agreed with OWM's suggestion to change the abbreviation "t," which refers to "1 ton (short)," beneath the heading "Avoirdupois Units of Mass" on page C-6 of the 2013 version of NIST Handbook 44 to "tn" and add the same new footnote immediately following the amended abbreviation as shown in the Item Under Consideration.

Additional letters, presentations, and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

321 BELT-CONVEYOR SCALE SYSTEMS

321-1 V UR.1.2. Conveyor Installation

Source:
USNWG Belt-Conveyor Scales (2013)

Purpose:
Remove the current restrictions on minimum and maximum belt lengths.

Item Under Consideration:
Delete subparagraph UR.1.2.(h) of UR.1.2. Conveyor Installation and reletter subsequent subparagraphs as follows:

UR.1.2. Conveyor Installation.

(a) **Installation - General.** – A belt-conveyor scale shall be so installed that neither its performance nor operation will be adversely affected by any characteristic of the installation, including but not limited to, the foundation, supports, covers, or any other equipment.
(Amended 2002)

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.

(g) **Tripper and Movable Pulleys.** – There shall be no tripper or movable head pulleys in the conveyor.

~~*(h) Conveyor Length. – The conveyor shall be no longer than 300 m (1000 ft) nor shorter than 12 m (40 ft) from head to tail pulley.*~~
~~*[Nonretroactive as of January 1, 1986]*~~

(~~i~~h) Conveyor Orientation. – The conveyor may be horizontal or inclined, but, if inclined, the angle shall be such that slippage of material along the belt does not occur.

(~~j~~i) Conveyor Stringers. – Conveyor stringers at the scale and for not less than 6 m (20 ft) before and beyond the scale shall be continuous or securely joined and of sufficient size and so supported as to eliminate relative deflection between the scale and adjacent idlers when under load. The conveyor stringers should be so designed that the deflection between any two adjacent idlers within the weigh area does not exceed 0.6 mm (0.025 in) under load.

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.
.

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

(Amended 1998 and 2008)

Background / Discussion:
Belt-conveyor scale manufacturers participating in the USNWG on BCS have reported increased demand for shorter commercial application conveyor systems. The minimum conveyor length specified in sub-paragraph UR.1.2. (h) and other requirements in the Belt-Conveyor Scales Systems Code that set minimum spacing requirements between components on a belt-conveyor scale system will not currently permit shorter systems. The USNWG on BCS, during their February 2012 meeting, concluded that the limit of 40 feet for a conveyor is unrealistic due to the spacing required between components and that this requirement is too prescriptive. In addition, the USNWG agreed that limiting the conveyor length to 1000 feet would be self-regulating to some extent, in that calibration and testing that incorporates the use of whole/full revolutions of the belt would be excessively time consuming. The USNWG also agreed that the performance of the weighing device should be evaluated without regard to conveyor length and that, if there are designs of devices that support acceptable performance using conveyors outside the limits of this requirement, the requirement should be stricken. As an initial step towards removing language in the Belt-Conveyor Scale Systems Code that is prohibitive of shorter belt conveyor system weigh-belts, the USNWG recommends that subparagraph UR.1.2.(h) be deleted. The USNWG plans to continue to develop further proposals to amend additional requirements within the BCS Code to recognize shorter belt-conveyor scale systems.

The elimination of UR.1.2.(h) will further align U.S. standards with the international requirement OIML R50 Continuous totalizing automatic weighing instruments (belt weighers) in that OIML R50 does not contain minimum or maximum requirements relating to conveyor length.

During the fall 2012 Regional Weights and Measures Association meetings, all of the Regional Associations supported the proposal as written and recommended it be forwarded to the NCWM for vote. Mr. Bill Ripka (Thermo-Fisher Scientific), speaking on behalf of Thermo-Fisher Scientific and the USNWG on Belt-Conveyor Scales at the WWMA meeting, supported the proposal to eliminate UR.1.2.(h). He stated that the minimum (40 ft) restricts placement of the scale and isn't consistent with other codes in NIST Handbook 44. He indicated that the USNWG on BCS is working on a proposal to allow smaller feeders. He has found that excessive belt scale lengths are self-regulating due to the difficulty in testing them. Additionally, weights and measures jurisdictions are easily granting exceptions to the limits currently in NIST Handbook 44, so there is no need for these restrictions.

During the 2013 NCWM Interim Meeting Open Hearings, Mr. Ripka, speaking on behalf of Thermo-Fisher Scientific and as Chairman of the USNWG on BCS, reiterated the comments he provided during the fall 2012 WWMA Annual Meeting.

NIST OWM stated that calibration and testing of belt-conveyor scale systems with excessively long conveyors could be problematic primarily due to the time needed to complete full revolutions of the conveyor belt. Belt-conveyor

scale systems using excessively short conveyor belts may also present challenges in designing those systems to account for difficulties including the location and placement of conveyor components and maintaining proper belt tension during operation. OWM does not believe that it is appropriate for NIST Handbook 44 Belt-Conveyor Scale Systems Code to include a requirement that prescribes limitations on the maximum and minimum length of conveyors associated with belt-conveyor scales if it can be demonstrated that conveyors of a length outside these limits are capable of complying with all applicable performance requirements.

OWM does not anticipate any negative effect with the removal of requirement UR.1.2. (h) Conveyor Length as proposed and acknowledged the point that the elimination of this sub-paragraph serves to further harmonize NIST Handbook 44 Belt-Conveyor Scale Systems Code with OIML Recommendation R50.

The Committee agreed with the justification provided by USNWG on BCS and the comments received during the Open Hearings in support of this item and agreed to designate this item Voting.

Additional letters, presentations, and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

321-2 V Appendix D – Definitions: Belt Revolution, Belt Load, Integrator, Loading Point, and Master Weight Totalizer

Source:
U.S. National Work Group on Belt-Conveyor Scales (USNWG BCS) (2013)

Purpose:
Provide clarity of meaning for the use of terms in the Belt-Conveyor Scales Code to avoid confusion or misuse.

Item Under Consideration:
Add three new definitions and amend two existing definitions in Appendix D – Definitions associated with the Belt-Conveyor Scale Systems Code as follows:

> **belt revolution. - The amount of conveyor belt movement or travel that is equivalent to the total length of the conveyor belt. Also referred to as "belt circuit." [2.21]**
>
> **belt load. - The weight of the material carried by the conveyor belt, expressed in terms of weight units per unit of length - i.e., pounds per foot, kilograms per meter. Also called Belt Loading.[2.21]**
>
> **integrator. - A device used with a belt-conveyor scale which combines conveyor belt load (e.g., lb/ft) and belt travel (e.g., feet) to produce a total weight of material passing over the belt-conveyor scale. An integrator may be a separate, detached mechanism or may be a component within a totalizing device. (Also see "master weight totalizer")[2.21]**
>
> **loading point. – ~~The~~ A** location **~~at which material to be conveyed is applied to the conveyor~~ on a conveyor where the material is received by the belt. The location of a hopper, chute, or the discharge of a pre-feed device used to supply material to a conveyor.**[2.21]
>
> **master weight totalizer. - ~~A~~n primary** indicating element used with a belt-conveyor scale **which incorporates the function of an integrator** to indicate the **totalized** weight of material **~~that was~~** passed over the scale**. ~~The master weight totalizer is a primary indicating element of the belt-conveyor scale.~~ (Also see "integrator")**[2.21]

NIST Technical Advisor's Note: During their February 2013 meeting, the USNWG BCS agreed to further modify the definition of "loading point" to better clarify the location of the loading point on a conveyor. The USNWG

forwarded the following proposed definition to the S&T Committee to replace that shown above in Item Under Consideration:

> **loading point. - ~~The~~ A** location **~~at which material to be conveyed is applied to the conveyor~~ on a conveyor where the material is received by the belt. The location of the discharge from a hopper, chute or ~~the discharge of a~~ pre-feed device used to supply material to a conveyor. [5.54]**

Background / Discussion:
Certain terms and phrases are used in NIST Handbook 44 and in discussions related to belt-conveyor scale systems that have specific meanings within that context. The terms "belt revolution," "belt load," and "integrator" appear in various paragraphs throughout the Belt-Conveyor Scale Systems Code and yet, are not currently defined in NIST Handbook 44. The terms "master weight totalizer" and "loading point" are currently defined in Appendix D. "Master weight totalizer" is frequently used interchangeably with the term "integrator." The proposed amendment to this definition is intended to distinguish between these two terms while recognizing the interrelated functions of: (1) the integration of belt travel and belt loading and (2) the totalization and display of weight passing over the weighing device. The changes proposed to the definition of "loading point" are intended to improve understanding.

During the fall 2012 Regional Weights and Measures Association Meetings, each of the regions supported the proposal and recommended it be forwarded to NCWM as a Voting item. Based upon meeting reports received from the various regions, there were few comments made during the meetings regarding the item, with most regions acknowledging their support of the item based on its development and recommendation by the USNWG on BCS. Mr. Bill Ripka (Thermo Fischer Scientific) commented during the WWMA meeting that he supported the addition of the new definitions of "belt revolution," "belt load," and "integrator" and the proposed changes to "loading point" and "master weight totalizer." Mr. Ripka said that he believed it made sense to have a description in NIST Handbook 44 of what these terms mean.

At the 2013 NCWM Interim Meeting Open Hearings, Mr. Ripka, speaking on behalf of the USNWG on BCS, commented that the USNWG had reviewed and agreed on the definitions of the terms in the proposal and believed they were necessary to include in NIST Handbook 44. The USNWG believes that these definitions will improve understanding of these terms and provide more consistent application of requirements in the NIST Handbook 44 Belt-Conveyor Scale Systems Code where these terms are used.

NIST OWM noted that the definition of "loading point" already existed in Appendix D of NIST Handbook 44 and should not be presented as a new definition, but instead, as an amended definition in the Item-Under-Consideration. OWM provided the Committee an amended version of the definition appearing in Appendix D of NIST Handbook 44 for consideration, which is the same definition included in the original proposal, except that it includes revisions shown in **bold face print** by **~~striking out~~** information to be deleted and **underlining** information to be added to the current definition in NIST Handbook 44.

OWM acknowledged the merits of this proposal to provide three new definitions for terms that are used specifically in association with belt-conveyor scale systems as well as the proposed amendments of the existing definitions for "master weight totalizer" and "loading point." These definitions clarify the meaning of these terms and will assist in the interpretation of the NIST Handbook 44 Belt-Conveyor Scale Systems Code.

The Committee agreed with comments received during the Open Hearings in support of the proposed definitions. The Committee agreed that the proposed definition of "loading point" should be presented as a modification to the existing definition in NIST Handbook 44 and modified the proposal accordingly as shown in the Item Under Consideration.

Based on the support for these changes, the Committee agreed to designate this item Voting.

Additional letters, presentations, and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

330 LIQUID MEASURING DEVICES

330-1 W S.1.6.4.2 (a) Product Identity and UR.3.2. Unit Price and Product Identity

Source:
Missouri Department of Agriculture (2013)

Purpose:
Reduce the potential for misfueling consumer vehicles.

Item Under Consideration:
The Committee considered the following proposal to amend paragraphs S.1.6.4.2. and UR.3.2. However, as described in the "Background/Discussion" section, the Committee decided to Withdraw this item from its agenda.

S.1.6.4.2. Product Identity.

(a) A device shall be able to conspicuously display on each side the identity of the product being dispensed.

(b) A device designed to dispense more than one grade, brand, blend, or mixture of product also shall be able to display on each side the identity of the grade, brand, blend, or mixture being dispensed.

(c) The term "Gasoline", "E15Gasoline", "E85", or "Flex-Fuel" shall be conspicuously displayed on the dispenser nozzle(s). This subsection applies only to spark-ignition engine fuel dispensers.
(Amended 20XX)

UR.3.2. Unit Price and Product Identity.

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

(1) except for dispensers used exclusively for fleet sales, other price contract sales, and truck refueling (e.g., truck stop dispensers used only to refuel trucks), all of the unit prices at which the product is offered for sale; and

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

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

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

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

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

(c) The term "Gasoline", "E15Gasoline", "E85", or "Flex-Fuel" shall be conspicuously displayed on the dispenser nozzle(s). This subsection applies only to spark-ignition engine fuel dispensers.

(Amended 1972, 1983, 1987, 1989, 1992, ~~and~~ 1993**, and 20XX**)

Background / Discussion:

The level of confusion for consumers fueling vehicles continues to grow with the introduction of new fuels in the marketplace. The proposed changes are intended to ensure proper delivery of the selected product and to reduce the potential of misfueling vehicles. Missouri and other states have received complaints from consumers who have fueled their vehicles with inappropriate products. At this time, practically all gasoline dispensers nationwide do not comply with section UR.3.2 or S.1.6.4.2 (a) as they do not display the product identity (i.e., gasoline).

At its 2012 Interim Meeting, the CWMA proposed that the item be designated as an Informational item. The CWMA did not support the proposed change to paragraph S.1.6.4.2., but did support the change to UR.3.2. The CWMA recommended review of the item by the NCWM FALS.

At the 2012 WWMA Annual Meeting, Mr. Mahesh Albuquerque (Colorado) opposed this item because it is burdensome and adequate labeling requirements already exist. He noted that consumers need to take ownership and read the labeling to avoid mis-fueling. Mr. Gordon Johnson (Gilbarco) opposed this item because it doesn't effectively solve the problem. He believes this should not be a specification, but rather a user requirement because 90 % of his company's dispensers are sold without hoses and nozzles. He questioned how this requirement would even be implemented. Mr. Ron Hassmeyer (Alameda County, California) opposed the item and stated that labeling in S.1.6.4.2 Product Identity is adequate to require a product description. He also questioned how this item would apply to a multi-product dispenser. Mr. Hassmeyer believed this would be an undue burden to the device owner. Mr. Doug Deiman (Alaska) recommended this item be withdrawn, noting that it is too much of a burden on gas pump owners. Ms. Kristin Macey (California) opposed this item and recommended withdrawal. The WWMA recognized the lack of support for this proposal and agreed that the product identity section adequately addresses this issue. Additionally, the WWMA did not understand the submitter's comment that practically all gasoline dispensers nationwide do not comply with paragraphs UR.3.2 or S.1.6.4.2 (a). The WWMA did not forward the item to NCWM.

At NEWMA's 2012 Interim Meeting, members questioned whether this item should be a weights and measures responsibility. NEWMA believes that this item should be addressed by FALS.

At the 2012 SWMA Annual Meeting, Mr. Matt Curran (Florida) provided comments on behalf of Mr. Ron Hayes (Missouri). Mr. Hayes noted that the intent of the proposal was not to increase labeling requirements, but to provide an additional point at which a consumer would be informed of the product identity. He had more interest in establishing a user requirement than a specification. Mr. Curran noted that there are stations in Florida that dispense E85 where the attendant specifically asks the consumer whether or not the vehicle can accommodate the fuel. Mr. Steve Benjamin (North Carolina) questioned how the requirement would be applied on a dispenser with a single hose used to dispense multiple products. He noted that the proposal seems to be just another variation on the proposed color-coding requirement considered in the past. Mr. Ed Coleman (Tennessee) supported the proposal, pointing out that more labeling on the dispenser may result in having too much information on the dispenser that no one reads. However, on nozzles, he believes that the labeling would have more visibility. Mr. Johnson opposed the item. Mr. Tim Chesser (Arkansas) opposed the item, noting concern about the impact of requiring new labeling on all existing nozzles. Mr. Bill Studzinski (General Motors) expressed appreciation for the effort to further clarify product identity, but opposed the proposal, noting that there is already a requirement for marking product identity in Handbook 44. He echoed concerns about how the requirement would apply to single hose dispensers with multiple products. The majority of comments received by the SWMA were in opposition to the proposal. The SWMA appreciated the desire to improve consumer understanding but believed the proposal would not fully address

misfueling incidents. Noting that there were too many questions about how the language would be applied, particularly with single-hose, multi product dispensers. SWMA did not forward the item to NCWM.

At the 2013 NCWM Interim Meeting, Mr. John Albert (Missouri) gave a presentation which illustrated the types of complaints that Missouri routinely receives. He indicated that this problem has been in existence for a long time, noting that customers associate the color "green" with diesel dispensers and frequently mistake dispensers with green gasoline nozzles for diesel dispensers. Mr. Albert reported that they have received thousands of complaints on this subject and they find that customers frequently make fueling mistakes because their attention is distracted by things such as discount information, station traffic, and other signage on the dispenser, not to mention personal distractions. He noted that octane stickers are not sufficient by themselves to alert distracted customers that the dispenser is dispensing gasoline and not diesel. Mr. Tim Columbus (Steptoe and Johnson), speaking on behalf of the National Association of Convenience Store Operators, expressed concern about the proposal, noting that this affects only a small percentage of customers and many of the customers who mis-fuel their vehicles admit they are not paying attention. He also commented that octane stickers on gasoline dispensers are adequate to alert consumers that the product is gasoline. Mr. Gordon Johnson (Gilbarco) reiterated comments made at the 2012 WWMA Annual Meeting, noting that about 95% of Gilbarco's customers do not purchase hoses and nozzles with new dispensers, preferring to put their own on the equipment upon installation. Gilbarco believes that, if the Committee decides to move forward with the proposal, it should be addressed through the addition of a user requirement.

Mr. Hayes, speaking as Chairman of FALS, noted that FALS provided the Committee with alternative language. The alternative proposal eliminates the proposed addition of S.1.6.4.2.(c) and replaces the proposed UR.3.2.(c) with the following:

> **(c) The term "Gasoline", "E15", "E15 & Gasoline" for multiple product dispenser with single nozzle, "E85", or "Flex-Fuel" shall be conspicuously displayed on the dispenser nozzle(s). This subsection applies only to spark-ignition engine fuel dispensers. This section satisfies subsection UR.3.2.(b)(1) requirement.**

During its work session, the Committee clarified with Mr. Albert that Missouri believes that the current language in UR.3.2.b.(1) provides means to require clear identification of the product identity; however, the proposed changes would promote uniformity in the use of terminology, not only for diesel dispensers, but also other fuels and, hopefully, reduce incidents of mis-fueling. Mr. Albert noted that Missouri is not able to enforce the use of specific colors to identify products without changes to NIST Handbooks 44 and 130.

After reviewing the original and alternate proposals and considering the comments received during the Open Hearings, the Committee expressed concerns about the extent of support for the proposal. The Committee is concerned about the potential burden on stations to modify current equipment, particularly when there are questions about whether or not the proposed changes would significantly reduce mis-fueling incidents. Provided a dispenser is clearly labeled with the product identity as required by UR.3.2., the Committee believes that the customer must accept some responsibility to follow instructions and signage during the transaction. While the Committee appreciates the concerns that have been raised by Missouri, the Committee agreed that the proposed marking requirements would not resolve all mis-fueling problems and the Committee does not believe there is a consensus to support the proposal. Consequently, the Committee decided to withdraw the item.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

330-2 V Table T.2. Accuracy Classes and Tolerances for Liquid Measuring Devices

Source:
NIST Office of Weights and Measures (2013)

Purpose:

Resolve inconsistencies in the temperature ranges defined for Heated Products among NIST Handbook 44 Liquid-Measuring Devices, Vehicle-Tank Meters, and Mass Flow Meters Codes.

Item Under Consideration:
Amend Table T.2. follows:

Table T.2. Accuracy Classes and Tolerances for Liquid Measuring Devices Covered in NIST Handbook 44, Section 3.30

Accuracy Class	Application	Acceptance Tolerance	Maintenance Tolerance	Special Test Tolerance[1]
0.3	- Petroleum products delivered from large capacity (flow rates greater than 115 L/min or 30 gpm)** devices, including motor-fuel devices - Heated products (other than asphalt) at ~~**or**~~ **temperatures** greater than 50 °C **(122 °F)** - Asphalt **at temperatures** at or below ~~**a temperature of**~~ 50 °C **(122 °F)** - All other liquids not shown in the table where the typical delivery is over 200 L (50 gal)	0.2 %	0.3 %	0.5 %
0.3A	- Asphalt at temperatures greater than 50 °C **(122 °F)**	0.3 %	0.3 %	0.5 %
0.5*	- Petroleum products delivered from small capacity (at 4 L/min (1 gpm) through 115 L/min or 30 gpm)** motor-fuel devices - Agri-chemical liquids - All other applications not shown in the table where the typical delivery is ≤ 200 L (50 gal)	0.3 %	0.5 %	0.5 %
1.1	- Petroleum products and other normal liquids from devices with flow rates** less than 1 gpm. - Devices designed to deliver less than 1 gal	0.75 %	1.0 %	1.25 %

* For test drafts ≤ 40 L or 10 gal, the tolerances specified for Accuracy Class 0.5 in the table above do not apply. For these test drafts, the following applies:

(a) Maintenance tolerances on normal and special tests shall be 20 mL plus 4 mL per indicated liter or 1 in^3 plus 1 in^3 per indicated gallon.

(b) Acceptance tolerances on normal and special tests shall be one-half the maintenance tolerance values.

[1] Special test tolerances are not applicable to retail motor fuel dispensers.

** Flow rate refers to designed or marked maximum flow rate.

(Added 2002) (Amended 2006 **and 2013**)

Background / Discussion:
This item was initiated as a result of discussions at an NTEP measuring labs meeting and forwarded to the Measuring Sector for review in 2011. In reviewing criteria for heated products during discussions at the 2011 annual NTEP Laboratory Meeting, the Measuring Laboratories noted inconsistencies in the way that heated products are referenced in the LMD, VTM, and MFM Codes.

The differentiation between "heated" and "non-heated" products first appeared in NIST Handbook 44 in 2000 as a result of a proposal adopted by the NCWM in 1999 to expand the tolerances applicable to meters use to measure asphalt above 50 °C (see S&T Committee Items 330-6 and 337-4 in the 1999 NCWM S&T Committee Final Report

for details). This reference was refined by the Committee in 2001 when changes were adopted to clarify the application of tolerances to asphalt at 50 °C in the LMD and MFM Codes. When the LMD and VTM Codes were modified in 2003 and 2004 to adopt an accuracy class table to mirror the MFM Code, inconsistencies first appeared in the way that heated products were referenced among the codes.

This proposal, and similar proposals elsewhere in the Committee's agenda, suggest changes to correct these inconsistencies. A summary of the proposals is listed below.

Section: 3.30 Liquid-Measuring Devices; Table T.2. (S&T Item 330-2)
Section: 3.31 Vehicle-Tank Meters; Table 1. (S&T Item 331-1)
Section: 3.37 Mass Flow Meters; Table T.2. (S&T Item 337-3)

The proposed changes in these items take into account corresponding references to heated products in NCWM Publication 14, including the "Product Families Table" in Technical Policy C and past discussions at meetings of the NTEP Measuring Sector. Revisions are also proposed to ensure appropriate references to both Fahrenheit and Celsius temperatures.

NIST OWM also notes that there may be a need to address hot water meters (for which the American Water Works Association (AWWA) defines a boundary temperature of 90 °F) in NIST Handbook 44.

At their Fall 2012 meetings, NEWMA and SWMA supported moving this item forward as a Voting item. The SWMA also recommended that this item be consolidated with correlating items in the VTM and MFM during the voting process to help ensure consistency among these codes.

At the 2013 NCWM Interim Meeting, the Committee received comments in writing from NIST OWM reiterating the origin of the proposal and noting that the goal of the proposed changes is to improve consistency in references to heated products among the codes. OWM noted that this item is largely housekeeping and is intended (along with S&T Agenda Items 331-1 and 337-3) to clarify the application of tolerances to different types of heated products and to ensure consistency across several metering codes. The Mass Flow Meters (MFM) Code does not include any specified temperature threshold that would define "heated products" as is provided in both the LMD and VTM Codes. Since MFMs could be used in the same applications as other meter types covered by the LMD and VTM Codes, it would be logical for the temperature threshold to be the same. Additionally, the current formatting of references to temperature thresholds is inconsistent among LMD, VTM, and MFM Codes. The Committee also heard comments from Mr. Michael Keilty (Endress and Hauser), who agreed with NIST OWM's comments and further suggested that discussion be taken simultaneously on this item and Items 331-1 and 337-3 for expediency.

Hearing no opposition to the proposed changes, the Committee agreed to move this item forward for a vote.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

330-3 V N.4.2.4. Wholesale Devices

Source:
Flint Hills Resources (2013)

Purpose:
To better align wholesale meter testing with current testing procedures, measuring practices and technology changes while maintaining the integrity of the special test.

Item Under Consideration:
Amend paragraph N.4.2.4. as follows:

N.4.2.4. Wholesale Devices. - "Special" tests shall be made to develop the operating characteristics of a measuring system and any special associated or attached elements and accessories.

N.4.2.4.1. Special Test, Type Evaluation. - "Special" tests shall **be made during type evaluation** ~~**include a test**~~ at the slower of the following rates:

(a) 20 % of the marked maximum discharge rate; or

(b) The minimum discharge rate marked on the device.

Add a new paragraph N.4.2.4.2. as follows:

N.4.2.4.2. Special Test, Field Evaluation. - "Special" tests shall be made during field tests at or near the minimum discharge flow rate developed under the conditions of installation, but not less than the minimum discharge rate marked on the device.

Background / Discussion:
This proposal is intended to clarify that conducting a slow flow test to the marked minimum discharge rate is required for type evaluation and testing to the minimum discharge flow rate developed under the conditions of installation for routine field inspections is appropriate. It would:

1) Remove the rigidity of the current language and provide for flexibility and efficiency while maintaining the requirement to test at different flow rates to determine the accuracy of a measuring system;

2) Differentiate between testing for type evaluation and field verification;

3) Reflect changes in field testing procedures, technology and industry practices; and

4) Improve meter performance by establishing a meter factor for the slowest preset flow rate.

The current language is very rigid and does not take field installation conditions into consideration. It may not be possible or practicable to achieve the marked minimum discharge rate during field tests without changes to upstream equipment (valves, pumps, etc.), changing the flow computer programmed presets, or changing the idling of other fueling bays during testing.

The Code does not allow for any deviation from the **"**shall**"** test at the marked minimum discharge rate. Current loading rack systems generally do not have a discharge nozzle or other physical means downstream of the meter to control or restrict the flow rate. Today most rely on pumps and valves upstream of the meter and preprogrammed flow rates for specific products with an assigned meter factor for each flow rate and product. The proposed change would still allow for testing at the marked minimum discharge rate when there is a discharge nozzle or other physical means in use downstream of the meter to restrict flow, but would recognize the need to vary from the marked minimum discharge rate for systems not so equipped.

The submitter notes that it is more productive to verify that the system is operating properly when used in its intended manner and set-up rather than alter the system for test-purposes and then return it to its "as-used condition." Adjusting the system to flow at the marked minimum discharge rate by making changes to the system when that flow rate is not used introduces variables into the system not normally seen and adds little to no value.

Even if the system can achieve the marked minimum discharge rate (for example, through the use of a discharge nozzle), it is not always practical or possible to hit it exactly when testing. The variables involved with proving while multiple bays are operating at a loading rack can make achieving the target flow rate difficult. It is not really necessary to test exactly at the marked minimum flow rate to develop the operating characteristics of a meter. However, Handbook 44 offers no room for deviation. Today, a wholesale meter tested near the marked minimum discharge rate, but not at it exactly is not being tested in accordance with the requirements of NIST Handbook 44. This problem may never be an issue, but it might (the history regarding the change to NIST Handbook 44

Introduction section illustrates why the language in the handbook must match the application of it in the field). Amending the current language as proposed will remove this risk, however, slight.

In the LMD Code, retail motor-fuel devices with a marked minimum flow rate are tested "at or near the marked minimum flow rate," but are not required to be tested at exactly the marked minimum. If this is acceptable for a retail motor-fuel dispenser then it should be acceptable for a wholesale meter. The proposal would make testing more uniform and consistent among different, but similar device types.

The purpose of this proposal is not to do away with a special test, but to make the test more reasonable. The proposal would allow the integrity of the test process to be maintained while providing both industry technicians and weights and measures officials the flexibility to test the meter in a manner that is more reflective of actual field testing and device use. It is designed to test meters not at the *design* flow rate, but at the flow rate at which they are actually used. It does not preclude a weights and measures inspector from testing at the marked minimum flow rate; it just removes the mandate to conduct it at that flow rate

The submitter points out the following supporting arguments:

- The marked minimum and maximum discharge rates are design parameters, not operational parameters.
- The Mass Flow Meters Code does not require testing at the marked minimum discharge rate. It requires, at a minimum, that one test be conducted at the minimum flow rate of the installation.
- The principle of testing as used and not to the design parameters is present in other codes and testing. It exists for scales since scales are not required to be tested to their design parameters; they are only tested as set up and used. A scale may be rated at a capacity range of 100,000 – 200,000 pounds and a scale division of 20 or 50 pounds, but it will only be tested based on its conditions of installation regardless of how it could be used.
- NIST Handbook 44 does not require that a measuring system be tested at the marked maximum discharge rate because it recognizes the measuring system may not be able to achieve the marked maximum discharge rate due to the conditions of installation.
- There is no regulation requiring a meter to be able to discharge at its marked minimum discharge flow rate; the marked minimum discharge flow rate is a design parameter not a use requirement.
- Not all tests in the test notes section are required to be conducted in the field as is noted in Handbook 44 Introduction Section S. Using the Handbook, which states: "Since some sections are designed to be applied to tests performed under laboratory conditions, it would be impractical or unrealistic to apply them to field tests. Not all tests described in the "Notes" section of the handbook are required to be performed in the field as an official test." Based on this section, it could be argued that a "special" test is not even required; however, the submitter believes that the special test has value and is not seeking to eliminate the test entirely.

The proposal doesn't specify the exact flow rate, but requires a test at the minimum flow rate based on the system and the establishment of a meter factor at that flow rate. The added flexibility and establishment of a meter factor during the test is important for both industry technicians and weights and measures officials.

The proposed change is similar to the recommended tests described in API Manual of Petroleum Measurement Standards (MPMS) Chapter 6.2 Loading Rack Metering Systems - "When using electronic presets with multiple flow rate configurations, the establishment of multiple meter factors may be required. This is particularly true when low flow start-up and shutdown sequences are employed to prevent system shock and static electricity generation (see API RP 2003)."

A potential argument in opposition to the proposal is that, even if the system is not being used at the marked minimum discharge rate at the time of test, it could be used later; thus, it is important to not only test as found, but as it could be used. While there is some merit to this argument, it is not consistently applied since many systems are tested as found, not as they *could be* used. There is also no incentive for a fuel terminal to not test their system as used. Further, the current practice is to set a calibration factor for all flow rates, so it is unlikely that the system would be changed after testing without additional testing and establishment of a calibration factor.

Based on comments received at its 2012 Interim Meeting, the CWMA amended the original proposal to reflect language that was applicable to field practices and current with technology. The language was also amended to

maintain special tests as a requirement during type evaluation, but optional for other examinations. CWMA supported the item as amended and forwarded the item to NCWM, recommending it as a Voting Item. The proposal submitted by the CWMA is as follows:

N.4.2.4. Wholesale Devices. - "Special" tests shall be made **during type evaluation** to develop the operating characteristics of a measuring system and any special associated or attached elements and accessories. "Special" tests shall include a test at the slower of the following rates:

(a) 20 % of the marked maximum discharge rate; or

(b) The minimum discharge rate marked on the device.

N.4.2.5. Wholesale Devices; Other Tests. – Other tests may be made during field tests at or near the minimum discharge flow rate developed under the conditions of installation for all wholesale devices.

(a) For devices equipped with electronic preset flow rates, tests may be conducted at any electronic preset flow rate used, including the slowest flow rate, when multiple flow rate configurations are used to deliver product.

(b) "Normal" applicable tolerances shall apply to tests conducted.

U.R.3.6.4 Wholesale Devices; Electronic Preset Flow Rates - A meter factor shall be established for all electronic preset flow rates used to deliver product.

At the 2013 NCWM Interim Meeting, the Committee heard comments from Mr. Ross Andersen (retired NY) who suggested that, if the concern is that there is not enough flexibility in the reference to "20% of the marked maximum," the focus should be placed on modifying this reference rather than making other proposed changes. He provided alternative language for the Committee to consider. The Committee also received written and verbal comments from NIST OWM noting that the proposed language would not consider any test conducted at lower flow rates to be 'normal" tests and, therefore, such tests would be required to meet "normal" test tolerances.

OWM commented that it is important to verify the performance of a meter over the range of flow rates for which it is designed to operate. The "normal" test (as described in N.4.1. Normal Tests.) combined with a "slow flow" test (as described in N.4.2.4. Wholesale Devices.) allows an inspector or serviceperson to verify the performance of a meter over the range in which it is typically used under the conditions of its installation. For positive displacement meters with single point calibration, the results of both tests can be used to determine whether or not a particular meter is providing accurate measurement over the complete range of operating speeds associated with its installation and whether the meter is in good operating condition. Product discharge rates are affected by installation particulars, (e.g., the diameter of the piping, pump speed, etc.,) and these can be changed after installation, thus affecting meter performance. For these reasons, OWM recommends the slow flow test remain a required part of an official test as was originally intended by the original submitter of this item. As a general rule, OWM recommends that test procedures considered part of an official examination of a commercial weighing or measuring device not be made elective because, as such, they create the potential for inconsistent enforcement of legal requirements amongst weights and measures jurisdictions.

The proposed new paragraph N.4.2.5. Wholesale Devices; Other Tests. allows for a test at the minimum discharge rate marked on the device but would have the effect of eliminating the application of the "Special Test" tolerance, which currently applies to the results of a test conducted at flow rates below a certain point. Since the test would no longer be considered a "Special Test," basic tolerances (i.e., 0.3 % maintenance and 0.2% acceptance) would apply and these tolerances are more stringent than the current "Special Test" tolerance of 0.5 % specified in Handbook 44. OWM is concerned about the impact this change may have on existing in-service wholesale equipment that might currently be able to comply with the "Special Test" tolerance, but may not be able to comply if that tolerance were tightened. For example, in instances where the minimum discharge flow rate developed under the conditions of installation (i.e., the test condition specified in proposed new paragraph N.4.2.5.Wholesale Devices; Other Tests.) for a wholesale device already in service, is equivalent to the lesser of the two rates specified in N.4.2.4., the flow

rate for the test, whether applying proposed paragraph N.4.2.5. or existing paragraph N.4.2.4., would be the same, yet a more stringent tolerance would apply under proposed paragraph N.4.2.5.

An additional concern is that if the parameters of the test were changed from those currently specified in (a) and (b) of paragraph N.4.2.4. to the proposed "at or near the minimum discharge flow rate developed under the conditions of installation" the change would provide device owners the latitude of being able to try and extend the service life of a meter by compensating for badly worn or otherwise defective parts simply by increasing the minimum flow rate of product through it. Although such action would constitute a violation of G-UR.4.3. Use of Adjustments, it might be very difficult for officials to recognize and enforce.

For these reasons, OWM proposed alternate language (which combines elements of the original proposal and the CWMA alternative) as a means to provide more flexibility in conducting special tests, while retaining the original intent of the special test as a tool for verifying the condition of the meter.

OWM also commented that additional work is needed to develop minimum testing requirements for equipment with multi-point calibration capability to ensure consistency in inspection and testing of these systems.

Mr. Henry Oppermann, Weights and Measures Consulting, echoed OWM's concerns regarding the need to conduct special tests as a means to assess the condition of the meter. He acknowledged that the current language in Handbook 44 may not provide the same flexibility that is provided for other meter types (for which tests can be "at or near" the marked minimum); however, he expressed concern about backing off of a proper test for what appears to be primarily convenience. Mr. Constantine Cotsoradis (Flint Hills Resources) pointed out that, with many current systems, there frequently is not a way to restrict the flow rate. Mr. Richard Suiter, Richard Suiter Consulting, further commented that the location where flow is restricted (e.g., before vs. after the meter) during special tests can also affect the results of testing, and this should be considered in constructing the final language (and associated test procedures) for any proposed change.

Mr. Dmitri Karimov (LC), speaking on behalf of the MMA, noted that the proposal has the effect of (1) providing some flexibility in establishing a flow rate near the marked minimum flow rate rather than at the minimum; (2) changing the tolerances that would apply to tests conducted at slower flow rates; and (3) specifying the establishment of meter factors for preset flow rates. Of these three facets, MMA only supports the first. He noted that some registers may use different types of calibration factors and addressing these variations in a single paragraph would be difficult. He further noted that, if changes are made to the test conditions in the LMD Code, similar changes should be made to other measuring codes as needed to ensure consistency.

Ms. Julie Quinn (MN) noted that MN believes that it is necessary to conduct testing at every flow rate where the device is configured; however, the factors at these various points do not need to be different.

The Committee acknowledged the comments in support of maintaining the requirement for conducting special tests during routine field inspections, but modifying paragraph N.4.2.4. to provide for some flexibility in the rate at which a special test is conducted. In recognition of limitations which may prevent some systems from being tested exactly at the marked minimum flow rate, the Committee agreed that modification to the language to be more consistent with other measuring devices is appropriate. Based on the support heard for the language proposed by OWM with respect to N.4.2.4.1. Special Test, Type Evaluation and N.4.2.4.2.Special Tests, Field Evaluation, the Committee agreed to recommend this alternative language as shown in the Item Under Consideration above for a vote.

In reviewing the remaining portion of the proposed changes, the Committee noted the considerable debate regarding the inclusion of the User Requirement regarding the establishment of meter factors for preset flow rates. Based on this opposition, the Committee considered splitting this proposal into two items: one item to address the proposed changes to the Notes and a second item to address the proposed changes to the User Requirements. However, there was very limited support for the proposed changes to the User Requirement. Thus, the Committee decided to eliminate the proposed paragraph U.R.3.6.4 Wholesale Devices; Electronic Preset Flow Rates from the Item Under Consideration.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

330-4 I UR.3.3. Computing Device.

Source:
NCWM Task Group on Retail Motor Fuel Dispenser Price Posting and Computing Capability (2013)

Purpose:
Refine the criteria in the LMD Code related to price posting and computing capability of RMFDs for post-delivery discounted transactions to more clearly reflect the recommendations of the NCWM Task Group on RMFD Price Posting and Computing Capability for the indication of the highest unit price.

Item under Consideration:
Amend paragraph UR.3.3.(c) as follows to: (1) add the underlined text; and (2) modify the alignment of the statement regarding electronic receipts following paragraph UR.3.3.(c)(2) such that it aligns with parts (a), (b), and (c):

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

(Added 1989) (Amended 1992)

The following exceptions apply:

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

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

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

(Added 1993)

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

(Added 1993)

(c) A dispenser used in an application where a price per unit discount is offered following the delivery is exempt from this requirement, provided the following conditions are satisfied:

(1) the unit price posted on the dispenser and the unit price at which the dispenser is set to compute **prior to the application of any discount** shall be the highest unit price for any transaction;

(2) all purchases of fuel are accompanied by a printed **or electronic** receipt **upon purchaser demand** recorded by the system for the transaction containing:

a. the product identity by name, symbol, abbreviation, or code number;

b. transaction information as shown on the dispenser at the end of the delivery and prior to any post-delivery discount including the:

1. total volume of the delivery;

2. unit price; and

3. total computed price of the fuel sale prior to post-delivery discounts being applied.

c. an itemization of the post-delivery discounts to the unit price; and

d. the final total price of the fuel sale.

For systems equipped with the capability to issue an electronic receipt, the customer may be given the option to receive the receipt electronically (e.g., via cell phone, computer, etc.)
(Added 2012)

(Added 1998) (Amended 1992, 1993, and 2012)

Background / Discussion:
At the 2013 NCWM Interim Meeting, the NCWM Task Group (TG) on RMFD Price Posting and Computing Capability met to review examples of receipts and scenarios for compliance with language adopted into NIST Handbook 44 in 2012 to address systems that are used to offer post-delivery discount pricing in retail motor-fuel dispensing applications. During that review, the TG noted that the language in paragraph UR.3.3. (c)(1) could be incorrectly interpreted to prohibit the application of both pre- and post-delivery discounts in a single transaction; the Task Group develop proposed changes to the paragraph to address this concern. The current language in (c)(1) states that, in order to qualify for the exemptions offered for post-delivery discounts, the unit price posted on the dispenser and the unit price at which the dispenser is set to compute shall be the highest unit price for any transaction. In instances where a customer elects to receive a discount prior to the delivery (i.e., a "pre-delivery" discount), this might create an unintended conflict. For example, if a customer elects to pay in cash at the start of the transaction, the dispenser might display and compute at a lower, cash unit price. Since UR.3.3.(c)(1) stipulates posting and computing at the highest unit price, some might interpret this to mean that this dispenser may not also participate in post-delivery discount pricing or be entitled to the exemptions in U.R.3.3.(c). The original intent of the changes proposed by the Task Group and adopted by the NCWM was not to restrict systems from participating in both pre- and post-delivery discounting. Consequently, the TG proposes changes as outlined in UR.3.3.(c)(1) in the Item Under Consideration above.

The TG also developed proposed changes to UR.3.3.(c)(2) as shows in the Item Under Consideration to acknowledge that: (1) the system must be able to provide a receipt to the customer, but the customer can be given an option of receiving the receipt or not; and (2) an electronic receipt is an acceptable alternative to a hard copy receipt if the purchaser agrees to an electronic receipt in lieu of or in addition to a hard copy. The Task Group believes that, should a customer prefer not to receive a receipt or prefer to receive it electronically, this should be permissible.

Lastly, the TG recommended changing the vertical alignment of the statement following UR.3.3.(c)(2) regarding the option of an electronic receipt so that it clearly applies to UR.3.3.(a), (b), and (c) rather than just part (c). As presently shown in NIST Handbook 44, this statement would apply only to UR.3.3.(c). The text shown in the Item Under Consideration above aligns that statement such that it would apply to UR.3.3.(a), (b), and (c).

The Committee agreed to add this item to its agenda to address these changes proposed by the TG. The Committee believes the proposed changes have merit and believe they simply clarify the original intent of the language developed by the TG and adopted by the NCWM. However, because the proposed changes were not available for publication and review in NCWM Publication 15, the Committee agreed that the item should be designated as an Information item to allow adequate opportunity for the review and comment by all stakeholders potentially affected by the proposed changes. The Committee also believes this will provide an opportunity for input on the specific language to ensure that it clearly and adequately addresses the concerns identified by the Task Group.

Note that the Committee agreed to retain Item 360-3 as a Developing Item while the TG continues work to develop guidelines and examples on how the changes made to the LMD Code in 2012 will apply to receipts for post-delivery discounted transactions. See Item 360-3 for additional background information on this work.

Additional letters, presentations, and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

331 VEHICLE-TANK METERS

331-1 V Table 1. Accuracy Classes and Tolerances for Vehicle-Tank Meters

Source:
NIST, Office of Weights and Measures (2013)

Purpose:
Resolve inconsistencies in the temperature ranges defined for Heated Products among NIST Handbook 44 Liquid-Measuring Devices, Vehicle Tank-Meters, and Mass Flow Meters Codes.

Item Under Consideration:
Amend Table 1 as follows:

Table 1.
Accuracy Classes and Tolerances for Vehicle-Tank Meters

Accuracy Class	Application		Acceptance Tolerance	Maintenance Tolerance	Special Test Tolerance
0.3	- Petroleum products delivered from large capacity (flow rates over 115 L/min or 30 gpm)** devices, including motor-fuel devices - Heated products (other than asphalt) at ~~or~~ **temperatures** greater than 50 °C **(122 °F)** - Asphalt **at temperatures** at or below ~~a temperature of~~ 50 °C **(122 °F)** - All other liquids not shown in the table where the typical delivery is greater than 200 L (50 gal)		0.15 %	0.3 %	0.45 %
0.3A	- Asphalt at temperatures greater than 50 °C **(122 °F)**		0.3 %	0.3 %	0.5 %
0.5*	- Petroleum products delivered from small capacity (at 4 L/min (1 gpm) through 115 L/min or 30 gpm)** motor-fuel devices - Agri-chemical liquids - All other applications not shown in the table where the typical delivery is ≤ 200 L (50 gal)		0.3 %	0.5 %	0.5 %
1.1	- Petroleum products and other normal liquids from devices with flow rates** less than 4 L/min (1 gpm) and - Devices designed to deliver less than 4 L (1 gal)		0.75 %	1.0 %	1.25 %
1.5	- Water	Overregistration	1.5 %	1.5 %	1.5 %
		Underregistration	1.5 %	1.5 %	5.0 %
* For 5 gal and 10 gal test drafts, the tolerances specified for Accuracy Class 0.5 in the table above do not apply. For					

Table 1. Accuracy Classes and Tolerances for Vehicle-Tank Meters				
Accuracy Class	**Application**	**Acceptance Tolerance**	**Maintenance Tolerance**	**Special Test Tolerance**
these test drafts, the maintenance tolerances on normal and special tests for 5 gal and 10 gal test drafts are 6 in^3 and 11 in^3, respectively. Acceptance tolerances on normal and special tests are 3 in^3 and 5.5 in^3. ** Flow rate refers to designed or marked maximum flow rate.				

(Added 2002**, Amended 2013**)

Background / Discussion:
This item was initiated as a result of discussions at an NTEP measuring labs meeting and forwarded to the Measuring Sector for review in 2011. In reviewing criteria for heated products during discussions at the 2011 annual NTEP Laboratory Meeting, the Measuring Laboratories noted inconsistencies in the way that heated products are referenced in the LMD, VTM, and MFM Codes.

The differentiation between "heated" and "non-heated" products first appeared in NIST Handbook 44 in 2000 as a result of a proposal adopted by the NCWM in 1999 to expand the tolerances applicable to meters used to measure asphalt above 50 °C (see S&T Committee Items 330-6 and 337-4 in the 1999 NCWM S&T Committee Final Report for details). This reference was refined by the Committee in 2001 when changes were adopted to clarify the application of tolerances to asphalt at 50 °C in the LMD and MFM Codes. When the LMD and VTM Codes were modified in 2003 and 2004 to adopt an accuracy class table to mirror the MFM Code, inconsistencies first appeared in the way that heated products were referenced among the codes.

This proposal, and similar proposals elsewhere in the Committee's agenda, suggest changes to correct these inconsistencies. A summary of the proposals is listed below.

Section: 3.30 Liquid-Measuring Devices; Table T.2. (S&T Item 330-2)
Section: 3.31 Vehicle-Tank Meters; Table 1. (S&T Item 331-1)
Section: 3.37 Mass Flow Meters; Table T.2. (S&T Item 337-3)

The proposed changes in these items take into account corresponding references to heated products in NCWM Publication 14, including the "Product Families Table" in Technical Policy C and past discussions at meetings of the NTEP Measuring Sector. Revisions are also proposed to ensure appropriate references to both Fahrenheit and Celsius temperatures.

NIST OWM also notes that there may be a need to address hot water meters (for which the American Water Works Association (AWWA) defines a boundary temperature of 90 °F) in NIST Handbook 44.

At their Fall 2012 meetings, NEWMA and SWMA supported moving this item forward as a Voting item. The SWMA also recommended that this item be consolidated with correlating items in the VTM and MFM during the voting process to help ensure consistency among these codes.

At the 2013 NCWM Interim Meeting, the Committee received comments in writing from NIST OWM as outlined in Item 330-2 and heard a synopsis of these comments from Mrs. Juana Williams (NIST OWM) during the Open Hearings. The Committee heard comments from Mr. Michael Keilty (Endress and Hauser), who agreed with NIST OWM's comments and further suggested that discussion be taken simultaneously on this item and Items 330-2 and 337-3 for expediency. Hearing no opposition to the proposed changes, the Committee agreed to move this item forward for a vote.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

331-2 V T.4. Product Depletion Test

Source:
Northeastern Weights and Measures Association (2009 Developing Items Part 3.31., Vehicle-Tank Meters - Item 1.)

Purpose:
Enable more consistent application of the tolerances between older and newer meters and address an unintentional gap that allows an unreasonably large tolerance for smaller meters.

Item Under Consideration:
Amend paragraph T.4. and delete Table T.4 as show below. Note that this option was identified as "Option 2" in the Committee's 2012 Final Report.

T.4. Product Depletion Test. – The difference between the test result for any normal test and the product depletion test shall not exceed ~~**tolerance shown in Table T.4.**~~ **0.5 % of the volume delivered in one minute at the maximum flow rate marked on the meter for meters rated higher than 380 Lpm (100 gpm) or 0.6 % of the volume delivered in one minute at the maximum flow rate marked on the meter for meters rated 380 Lpm (100 gpm) or lower.** Test drafts shall be of the same size and run at approximately the same flow rate.

[Note: The result of the product depletion test may fall outside of the applicable test tolerance as specified in Table 1.]

Delete current Table T.4.

~~**Table T.4.**~~ ~~**Tolerances for Vehicle-Tank Meters on Product Depletion Tests, Except Milk Meters**~~	
~~**Meters Size**~~	~~**Maintenance and Acceptance Tolerances**~~
~~**Up to, but not including, 50 mm (2 in)**~~	~~**1.70 L (104 in^3)[1]**~~
~~**From 50 mm (2 in) up to, but not including, 75 mm (3 in)**~~	~~**2.25 L (137 in^3)[1]**~~
~~**75 mm (3 in) or larger**~~	~~**3.75 L (229 in^3)[1]**~~
~~**Based on a test volume of at least the amount specified in N.3. Test Drafts.**~~	

Background / Discussion:
This item was submitted to NEWMA at its 2008 Interim Meeting to propose an alternative to existing product depletion test tolerances which are based on the size of the meter. The Committee has agreed with the concept of basing the product depletion test tolerances on the marked maximum flow rate of the meter rather than on the marked meter size and considered several proposals for modifying the tolerances since this item was introduced in 2008. Details of these proposals and associated discussion can be found in the Committee's 2009-2012 final reports.

While recognizing that one goal of the original proposal was to reduce what the submitter considered an unreasonably large tolerance for smaller meters, the Committee expressed concern about the impact the proposal would have on these meters based on comments from Meter Manufacturers Association (MMA). From 2009 to 2011, the Committee repeatedly requested data from industry and weights and measures officials to support or oppose the proposals under consideration. In late 2011, nine county jurisdictions submitted field test data to the Committee for review.

At the 2012 NCWM Interim Meeting, the Committee considered three options for modifying NIST Handbook 44. A summary of how the three options would apply is outlined in the following table. A second table illustrating examples of tolerances for common meter sizes and maximum flow rates is also included.

Summary of Product Depletion Tolerance Options Considered		
	Marked Maximum Flow Rate or Meter Size	**Tolerance (% of Marked Max Flow Rate)**
Current	Up to but not including 2"	104 in^3
	2" up to but not including 3"	137 in^3
	3" and larger	229 in^3
Option 1:	All Maximum Flow Rates	0.5 %
Option 2:	Marked Max ≤ 100 gpm	0.6 %
	Marked Max > 100 gpm	0.5 %
Option 3:	Marked Max ≤ 60 gpm	0.8 %
	Marked Max > 60 gpm up to and including 100 gpm	0.6 %
	Marked Max > 100 gpm	0.5 %

Examples of Product Depletion Tolerance Options for Different Meter Sizes/Flow Rates					
Size	**Marked Maximum Flow Rate (gpm)**	**Current Tolerance**	**Option 1 (0.5 % max)**	**Option 2 (0.6 % max) (0.5 % max)**	**Option 3 (0.8 % max) (0.6 % max) (0.5 % max)**
1-1/2"	60 gpm	104 in^3	69 in^3	83 in^3	111 in^3
2"	100 gpm	137 in^3	115 in^3	139 in^3	139 in^3
2"	150 gpm	137 in^3	173 in^3	173 in^3	173 in^3
3"	150 gpm	229 in^3	173 in^3	173 in^3	173 in^3
3"	200 gpm	229 in^3	231 in^3	231 in^3	231 in^3
3"	300 gpm	229 in^3	346 in^3	346 in^3	346 in^3
3"	350 gpm	229 in^3	404 in^3	404 in^3	404 in^3

The Committee reviewed the following summary of the data prepared by NIST Technical Advisor, Mrs. Tina Butcher and was given the opportunity to review a copy of the raw data. The first table summarizes for each jurisdiction the number of meters on which the product depletion test was conducted along with a comparison of the number that failed the current and proposed tolerances; the data includes both total meters for each option along with a breakdown of meters in three different flow rate categories. The second table provides a summary showing these totals for all jurisdictions combined.

Summary of Product Depletion Test Data Submitted by State and County Weights and Measures Jurisdictions As Of 1/20/12						
	Total Meters	**Failed Current Tolerance**	**Failed Option 1**	**Failed Option 2**	**Failed MMA**	**Marked Max**
Jurisdiction #1	67	0	2	1	1	---
	1	0	1	1	1	60 gpm
	53	0	1	0	0	100 gpm
	12	0	0	0	0	>100 gpm
	1	0	0	0	0	??
Jurisdiction #2	9	0	0	0	0	No Data
Jurisdiction #3	288	21	33	22	20	---
	28	1	5	3	1	60 gpm
	228	17	25	16	16	100 gpm
	32	3	3	3	3	>100 gpm
Jurisdiction #4	196	7	18	9	6	---

	14	0	3	3	0	60 gpm
	153	5	14	5	5	100 gpm
	29	2	1	1	1	>100 gpm
Jurisdiction #5	134	7	12	7	7	---
	10	2	3	2	2	60 gpm
	72	4	8	4	4	100 gpm
	52	1	1	1	1	>100 gpm
Jurisdiction #6	200	20	29	20	20	---
	0	0	0	0	0	60 gpm
	178	16	25	16	16	100 gpm
	22	4	4	4	4	>100 gpm
Jurisdiction #7	196	13	14	13	13	---
	0	0	0	0	0	60 gpm
	150	11	12	11	11	100 gpm
	46	2	2	2	2	>100 gpm
Jurisdiction #8	761	0	7	1	0	---
	103	0	1	1	0	60 gpm
	629	0	6	0	0	100 gpm
	29	0	0	0	0	>100 gpm
Jurisdiction #9	71	26	26	20	20	No Data

	Total Meters	**Failed Current Tolerance**	**Failed Option 1**	**Failed Option 2**	**Failed Option 3**	**Marked Maximum Flow Rate**
Summary of All Jurisdictions	156	3	13	10	4	60 gpm
	1463	53	91	52	52	100 gpm
	222	12	11	11	11	>100 gpm
	81	26	26	20	20	No Info
Totals	**1922**	**94**	**141**	**93**	**87**	

While recognizing that the data was not obtained under controlled conditions or as part of a structured study, the Committee noted that the data was extremely valuable in assessing the relative impact of the three options proposed. The Committee agreed that Option 2 represents a reasonable compromise between the original proposal (Option 1) and the MMA's proposal (Option 3). The Committee proposed this option as an Information Item to allow time for any additional input with the intent of moving the item to Voting in 2013.

At the 2012 NCWM Annual Meeting, the Committee heard comments from MMA supporting the proposal.

At their fall 2012 meetings, the regional weights and measures associations supported proposing Option 2 as a Voting item in 2013. At the Fall 2012 SWMA meeting, Mr. Michael Keilty (Endress + Hauser) reported on behalf of the Measuring Sector that the Sector thoroughly discussed this issue at its October 2012 meeting and agreed that Option 2 should be proposed for a vote.

During its 2013 NCWM Interim Meeting Open Hearings, the Committee heard comments from Mr. Ross Andersen (NY, retired) and Mr. Dmitri Karimov (Liquid Controls Corporation) supporting the proposed changes and encouraging the Committee to finalize the language. Hearing no opposition to the proposal, the Committee agreed to move it forward for a vote.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

336 WATER METERS

336-1 V UR.3. Installation Requirements

Source:
Neptune Technology Group Inc. (2013)

Purpose:
Establish installation requirements in the Water Meters Code.

Item Under Consideration:
Add a new paragraph UR.3. as follows:

UR.3. Installation Requirements.

UR.3.1. Manufacturer's Instructions. – A water meter shall be installed in accordance with the manufacturer's instructions. For utility type water meters, the installation shall be sufficiently secure and rigid to maintain this condition.

Background / Discussion:
There are no installation requirements for utility type meters in the Water Meters Code of Handbook 44. The submitter proposed the following new paragraph be added to Section 3.36.:

UR.3. Installation Requirements.

UR.3.1. Manufacturer's Instructions. – A utility type water meter shall be installed in accordance with the manufacturer's instructions, and the installation shall be sufficiently secure and rigid to maintain this condition.

At the 2012 WWMA Annual Meeting, Mr. Andre Noel (Neptune) indicated that Neptune, Badger, Sensus, Elster-AMCO, and Master Meter support this item. Mr. Ron Hassmeyer (Alameda County, California) supported the item, but voiced concerns related to installation such as meter visibility. Ms. Kristin Macey (California) advised that there may be possible conflicts with other code language coming from other organizations such as AWWA and the Public Utilities Commission (PUC). The WWMA found it reasonable that the manufacturer's instructions would be the basis for such installations. This proposal is similar to language used in Handbook 44 LMD Code paragraph UR.2.1.; MFM Code paragraph UR.2.1.; and Hydrogen Gas-Measuring Devices Code paragraph UR 2.1. The WWMA also noted that UR.2. Accessibility of Customer Indications already addresses the issues of visibility. WWMA forwarded the item to NCWM, recommending it as a Voting Item.

At the 2013 NCWM Interim Meeting, the Committee heard comments in support of the proposal from Mr. Noel, who indicated that he also spoke on behalf of Badger, Sensus, Elster-AMCO, and Master Meter and noted that the proposed change would mirror similar paragraphs in other NIST Handbook 44 measuring device codes. Mr. Jim Byers (San Diego County, CA) stated that he agreed with the proposed requirement, but notes that the General Code already addresses these requirements. He suggested that, if the language in the General Code is not sufficient, then that language should be reviewed and revised rather than including additional language in the specific code. Ms. Kristin Macy (CA) stated that California agrees with Mr. Byers and believes that the language in the General Code is sufficient. Mrs. Juana Williams (NIST OWM) also acknowledged the similarity with language in other codes.

While the Committee acknowledged comments regarding the redundancy of the proposed paragraph with current General Code requirements, the Committee believes the proposal has merit in helping to ensure proper installation of water meters. The Committee believes the requirement in the first sentence of the proposed paragraph regarding compliance with the manufacturer's instructions should apply to all water meters, not just utility type meters. Consequently, the Committee modified the language to restrict only the second sentence to utility type water meters and agreed to propose the modified paragraph (as shown in the Item Under Consideration above) for a vote.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

337 MASS FLOW METERS

337-1 I Appendix D – Definitions: Diesel Liter and Diesel Gallon Equivalents (DLE, DGE)

Source:
Clean Vehicle Education Foundation (2013)

Purpose:
Enable consumers to make cost and fuel economy comparisons between diesel fuel and natural gas.

Item Under Consideration:
Add the following definitions to Appendix D – Definitions:

Diesel Liter Equivalent (DLE). - means 0.756 kg of natural gas.

Diesel Gallon Equivalent (DGE). - means 2.863 kg (6.312 lb) of natural gas.

Background / Discussion:
The gasoline gallon equivalent (GGE) unit was defined by NIST/NCWM in 1994 (See Appendix A) to allow users of natural gas vehicles to readily compare costs and fuel economy of light-duty natural gas vehicles with equivalent gasoline powered vehicles. For the medium and heavy duty natural gas vehicles in widespread use today, there is a need to officially define a unit (already in widespread use) allowing a comparison of cost and fuel economy with diesel powered vehicles. Also natural gas is sold as a vehicle fuel as either Compressed Natural Gas (CNG) or Liqufied Natural Gas (LNG) and each method of sale is measured in mass. Therefore the generic term natural gas is proposed to be used in Handbook s 44 and 130 with out the existing term "compressed." The mathematics justifying the specific quantity (mass) of natural gas in a DLE and DGE is included in Appendix A.

The official definition of a DLE and a DGE will likely provide justification for California, Wisconson, and any other state to permit retail sales of LNG for heavy-duty vehicles in these convenient units.

2012 CWMA Interim Meeting: CWMA supported putting definitions of diesel liter equivalent and diesel gallon equivalent for natural gas into Handbook 44, provided that FALS confirms the conversion factor prior to voting. CWMA forwarded the item to NCWM, recommending it as a Voting Item.

2012 WWMA Annual Meeting: Ms. Juana Williams, NIST Technical Advisor advised that there are corresponding L&R Items 232-1 & 237-1, and suggested that the S&T and L&R Committees need to work on these items in tandem. The Committee believed this item has merit. The WWMA has concerns with the source of equivalency values derived and would like validation as to whether the values accurately represent the actual value of various types of natural gas products. The WWMA realized there are different compositions and sources. For example, LNG

has a higher methane composition. There may be a possibility of additional conversion factors based on BTU's from different sources. The WWMA S&T Committee acknowledged meeting with the WWMA L&R Committee regarding this item. The two committees differed in their recommendations, between Informational and Developmental Item Status on the NCWM agenda. WWMA forwarded the item to NCWM, recommending it as a Developing Item.

2012 NEWMA Interim Meeting: NEWMA forwarded the item to NCWM, recommending it as an Informational Item.

2012 SWMA Annual Meeting: Mr. Michael Keilty (Endress + Hauser) noted some confusion about the values designated in the proposal. He also commented that there appears to be confusion about what the dispenser will display, particularly for dispensers that will serve vehicle types that run on gasoline as well as vehicle types that could run on diesel. He asked whether the units will display in both GLE/GGE and DLE/DGE and how the dispenser will display this information. He suggested that this item be designated as a Developing Item to allow additional time to address these concerns. The SWMA does not believe that the proposal has been adequately developed with regard to the application of the proposed definitions, including aspects such as vetting of these values within the industry relative to actual gas supplies; explanation of how this will be applied consistently; and provisions for ensuring clear and understandable value comparisons by consumers (particularly given variations in gas supplies); and how this will apply to dispensers that may be used to fuel vehicles conventionally fueled by gasoline or diesel. The SWMA questioned whether it might be more appropriate for the community to consider establishing mass as the method of sale for natural gas and providing educational information through mechanisms such as pump toppers that would enable the consumer to compare the fuel costs with gasoline- or diesel-powered vehicles. This approach would eliminate concerns about designating equivalent values that may not accurately represent the product being sold through a specific dispenser. SWMA unanimously agreed to forward the item to NCWM, recommending it as a Developing Item with development assigned to the submitter.

At the 2013 NCWM Interim Meeting, the Committee heard multiple comments in opposition to the proposal. Mr. Keilty opposed the proposal, noting that a truck running on LNG would be dedicated to that type of fuel; thus, there is no need to make comparisons with diesel fuel on an ongoing basis. He stated that he believes natural gas should be sold in units of mass. Ms. Williams reviewed the following points prepared by OWM and suggested that the Committee consider these points in its deliberations on the proposals for this Item and Item 337-2. A copy of these points was also provided to the S&T Committee and the L&R Committee in writing in advance of the Interim Meeting.

Collaborative Work Effort

Work in joint session with the NCWM L&R Committee on corresponding L&R Agenda Items 232-1 (a proposal to recognize the diesel volume equivalent MOS for vehicle fuel) and 237-1 (a proposal to define the diesel volume equivalent unit in relation to mass) which specify the allowable unit of measurement for advertising and sale of natural gas. This collaboration between committees will ensure that the proposed volume equivalent unit for a delivery is properly indicated and calculated by a natural gas dispenser.

Facilitate Marketplace-Value Comparisons

A dispenser might serve vehicles that are powered by diesel or gasoline fuel. Therefore, which volume equivalent unit (the DGE or GGE) is appropriate to avoid confusing the consumer? What is the most appropriate means to provide sufficient information to customers attempting to make a comparison of fuel offered by the DGE and GGE, whether at the same station or stations on adjacent street corners? Today's value comparisons are made to petroleum products, but as other alternative fuels proliferate how easy will it be for consumers to make comparisons to other fuels such as electricity or hydrogen?

An alternative that would provide more flexibility for comparison with other fuels and which would potentially create less confusion than permitting multiple different "equivalent" values as "units" of measure is to require the sale of all natural gas in mass units (kg or lb) as suggested by the SWMA. With this approach, customers could still be provided with supplemental information through mechanisms such as pump toppers that provide information about estimated equivalent units of measurement for deliveries indicated in mass as well as information on web sites

such as those that already provide information about fuel economy. This approach might also reduce complaints from some suppliers about the accuracy of equivalent values relative to their product.

Another point that has been raised by some in the community and should be considered by the Committee is whether or not "equivalent values" are as necessary as they might have been at one time to encourage consumer acceptance of natural gas as an alternative fuel. For example, the SWMA questioned whether, once a consumer has purchased a vehicle he or she has the need to make ongoing value comparisons or whether this information is more useful prior to purchasing a vehicle. Given the concerns about consumer confusion with a potential proliferation of "equivalent" values at the dispenser, perhaps requiring mass units on the dispenser (with supplemental information about equivalents) is a more appropriate approach.

Compliance of Existing Approved Equipment-Indications

As noted above, NIST OWM suggests the Committee consider SWMA's recommendation for equipment to indicate in a mass unit of measurement. Currently, there are two LNG dispensers with NCWM NTEP Certificates of Conformance (CC). They are NCWM CC 02-075A2* (Chart Industries) and NCWM CC 04-073A1 (NorthStar, Inc.), which specify these dispensers display in mass. How will the proposal apply to this equipment which may not have the capability to display in units other than mass?

Earlier S&T Committee Positions

Does the S&T Committee plan to revisit its 1999 recommendation where it requested data on LNG be submitted prior to the recognition of this product in a metering application? The Committee might also recall that the S&T Committee took a position in 2008 on a related proposal to recognize the "DGE" recommending that a consensus between stakeholders exist on any single energy value used as a conversion factor. NIST OWM notes that several CNG suppliers have raised concerns about the use of 5.660 lb of CNG for each GGE commenting that this value is too low for the fuel they are providing to customers. OWM asks are other sectors, which rely on the accurate accounting of vehicle motor fuel sales, aware of and in agreement with the proposed mass to volume equivalent unit being proposed as a conversion factor value for natural gas (CNG and LNG)?

The data for the heating values cited in Table B.4. "Heat Content for Various Fuels" in the Transportation Energy Data Book Edition 30 (June 2011) was not developed as part of an NCWM study, but represents an account of work by a government sponsored agency to characterize transportation activity and other factors that influence transportation energy use. The book includes a disclaimer which states "in any attempt to compile a comprehensive set of statistics on transportation activity, numerous instances of inadequacies and inaccuracies in the basic data are encountered;" points out that "an appendix is included to document the estimation procedures;" and notes that "neither ORNL nor DOE endorses the validity of these data."

Ms. Kristin Macey (CA) opposed the proposal and urged the Committee to stop the proliferation of "equivalent units." She noted that mass units are perfectly good for routine transactions and echoed comments that comparisons with other fuels are only relevant when making a purchase decision. Ms. Carol Hockert (NIST OWM) further suggested that, during its deliberations, the Committee should consider how the establishment of artificial units would affect metrological traceability. Mr. Dmitri Karimov (Liquid Controls, LLC), speaking on behalf of MMA, agreed with Ms. Hockert, noting that extensive work is done by companies to establish and maintain metrological traceability and the establishment of what amounts to arbitrary values is counterproductive. Mr. Dan Peterson (Yokogawa Corporation of America) echoed all of the statements made in opposition to the proposal.

Mr. Curtis Williams (CP Williams Energy Consulting) stated that he has had concerns about the use of the GGE and GLE for some years and he is glad that some are questioning the need to reconsider the use of equivalent units. As a participant in the U.S. National Working Group on Hydrogen, he was grateful that the associated code for that alternative fuel established requirements for mass units. He suggested that the Committee also consider examining the potential use of mass units for other fuels and noted that the use of mass units also eliminates questions about temperature compensation.

Ms. Judy Cardin (WI) acknowledged the need for the L&R Committee and the S&T Committee to work together on this and related items. She cited two main tasks to be addressed as: (1)What is the right conversion value for the proposed units?; and (2) Should units for the sale of natural gas be in "equivalent" units or mass units?

The Committee heard no comments in support of the proposal during its Open Hearings.

During its work sessions at the Interim Meeting, the S&T Committee met with the L&R Committee to discuss this item and related items on the two Committees' agendas; the corresponding items on the L&R Committee Agenda are Items 232-1 and 237-1. During the joint meeting, the L&R Committee advised the S&T Committee that it had decided to make the related item on their agenda "Informational" to allow additional time for the community to study the issue and hear from other stakeholders in the community. A proposal was made to ask the FALS to deliberate on an appropriate equivalent value for each of the proposed "units." However, the two Committees recognized that before asking the FALS to expend resources on further definition, the questions and concerns raised in the Open Hearings regarding the appropriateness of recognizing such units should first be addressed. The Committees agreed to recommend to the NCWM Chairman that a small task group be established to further study this issue. The Committees each agreed to develop a list of tasks that they would ask such a task group to take on and to recommend possible members of the group to ensure balanced representation of stakeholders.

After discussion with the L&R Committee, the S&T Committee reviewed and summarized key comments made during the Open Hearings for S&T Committee Agenda items 337-1 and 337-2:

- Are equivalent units necessary to promote consumer acceptance of this fuel?
- Is there a significant need for continued comparison to other fuels once you have purchased a vehicle? Does this justify the proliferation of "equivalent" values?
- The intent is to add this for medium- and heavy-duty vehicles such as trucks that operate on LNG. Trucks that operate on LNG are generally dedicated fuel vehicles that run only on a single fuel.
- Is the dispenser the appropriate place to make comparisons with other fuels or is a better place to make those comparisons via mechanisms such as pump toppers, websites, etc.?
- Striking the word "compressed" (in the changes proposed in Item 337-2) expands the proposal to LNG.
- California's approval of LNG meters indicating in mass units was correct.
- What will the impact be on existing approval of LNG dispensers currently indicating in mass?
- There is much opposition to the proliferation of "equivalent units" for various types of fuels.
- The current recognition of GGE and GLE units has led to complaints about equivalent values from both industry and regulatory officials.
- Mass units should be considered for natural gas and other fuels.
- Will the establishment of equivalent values provide traceability to SI units?
- The community expends significant resources to achieve good meter performance and establishing "fuzzy" equivalent values seems to undermine these efforts.
- The factor for any "equivalent unit" will represent only an "estimate" of an equivalent value.
- There is disagreement amongst the industry regarding the appropriate equivalent value in this proposal. The report containing the data that is referenced as the basis for the proposal includes a disclaimer from

Oakridge National Laboratory and U.S. Department of Energy regarding its validity for other than general use in the transportation industry.

- The S&T Committee only heard comments in opposition to the proposal.
- Harmonization with OIML requirements should be considered in the method of sale and associated device requirements.

With respect to items 337-1 and 337-2, the Committee agreed to work collaboratively with the L&R Committee and to develop a small work group to decide: 1) whether or not DLE and DGE should be considered an acceptable method of sale for natural gas; and 2) if so, what should the factor be to determine their equivalents to gasoline. The Committee agreed that the above list of key points and questions heard during its Open Hearings should be considered, along with other Open Hearing comments, by the chairs of both the L&R and S&T Committee in the development of a list of points to be addressed by the small task group.

Additional Contacts: Clean Energy, Seal Beach, CA, NGVAmerica, Washington, DC, Clean Vehicle Education Foundation, Acworth, GA

337-2 I S.1.2. Compressed Natural Gas Dispensers, S.1.3.1.1. Compressed Natural Gas Used as an Engine Fuel, S.5.2. Marking of Gasoline Volume Equivalent Conversion Factor

Source:
Clean Vehicle Education Foundation (2013)

Purpose:
Enable consumers to make cost and fuel economy comparisons between diesel fuel and natural gas.

Item Under Consideration:
Amend paragraphs S.1.2., S.1.3.1.1., and S.5.2. as follows:

S.1.2. ~~Compressed~~ Natural Gas Dispensers. – Except for fleet sales and other price contract sales, a ~~**compressed**~~ natural gas dispenser used to refuel vehicles shall be of the computing type and shall indicate the quantity, the unit price, and the total price of each delivery. The dispenser shall display the mass measured for each transaction either continuously on an external or internal display accessible during the inspection and test of the dispenser, or display the quantity in mass units by using controls on the device.
(Added 1994)

S.1.3.1.1. ~~Compressed~~ Natural Gas Used as an Engine Fuel. – When ~~**compressed**~~ natural gas is dispensed as an engine fuel, the delivered quantity shall be indicated in**:** ~~**"gasoline liter equivalent (GLE) units" or "gasoline gallon equivalent (GGE) units" (see definitions).**~~

(a) "gasoline liter equivalent (GLE) units" or gasoline gallon equivalent (GGE) units",

(b) "diesel liter equivalent (DLE) units" or "diesel gallon equivalent (DGE) units" (see definitions).

(Added 1994)

S.5.2. Marking of Diesel and Gasoline Volume Equivalent Conversion Factor. – A device dispensing ~~**compressed**~~ natural gas shall have**:** ~~**either the statement "1 Gasoline Liter Equivalent (GLE) is Equal to**~~

~~**0.678 kg of Natural Gas" or "1 Gasoline Gallon Equivalent (GGE) is Equal to 5.660 lb of Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.**~~

(a) either the statement "1 Gasoline Liter Equivalent (GLE) is Equal to 0.678 kg of Natural Gas" or "1 Gasoline Gallon Equivalent (GGE) is Equal to 5.660 lb of Natural Gas",

(b) either the statement "1 Diesel Liter Equivalent (DLE) is Equal to 0.756 kg of Natural Gas" or "1 Diesel Gallon Equivalent (DGE) is Equal to 6.312 lb of Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

(Added 1994)

Background / Discussion:
The gasoline gallon equivalent (GGE) unit was defined by NIST/NCWM in 1994 (see Appendix A) to allow users of natural gas vehicles to readily compare costs and fuel economy of light-duty natural gas vehicles with equivalent gasoline powered vehicles. For the medium and heavy duty natural gas vehicles in widespread use today, there is a need to officially define a unit (already in widespread use) allowing a comparison of cost and fuel economy with diesel powered vehicles. Also natural gas is sold as a vehicle fuel as either Compressed Natural Gas (CNG) or Liqufied Natural Gas (LNG) and each method of sale in measure in mass. Therefore the generic tern natural gas is proposed to be used in Handbook s 44 and 130 with out the existing term "compressed". The mathematics justifying the specific quantity (mass) of natural gas in a DLE and DGE is included in Appendix A.

The official definition of a DLE and a DGE will likely provide justification for California, Wisconsin and any other state to permit retail sales of LNG for heavy-duty vehicles in these convenient units.

At its 2012 Interim Meeting, the CWMA supported putting definitions of diesel liter equivalent and diesel gallon equivalent for natural gas into Handbook 44, provided that FALS confirms the conversion factor prior to voting. CWMA forwarded the item to NCWM, recommending it as a Voting Item with this provision.

At its 2012 Interim Meeting, NEWMA recommended that this item be forwarded to the NCWM as an information item and suggested it be assigned to the FALS.

At the 2012 WWMA Annual Meeting, Ms. Juana Williams (NIST Technical Advisor) advised that there are corresponding L&R Items 232-1 & 237-1 and S&T and L&R need to work on these items in tandem. The WWMA believed this item has merit. The WWMA has concerns with the source of equivalency values derived and would like validation as to whether the values accurately represent the actual value of various types of natural gas products. The WWMA realized there are different compositions and sources. For example, LNG has a higher methane composition. There may be a possibility of additional conversion factors based on BTU's from different sources. The WWMA S&T Committee met with the WWMA L&R Committee regarding this item, but differed on their recommendations regarding whether the status of the related items on their agendas should be Informational or Developmental. The WWMA forwarded this item to NCWM, recommending it as a Developing Item.

At the 2012 SWMA Annual Meeting, Mr. Michael Keilty (Endress + Hauser) noted that there appears to be confusion about what the dispenser will display, particularly for dispensers that will serve vehicle types that run on gasoline as well as vehicle types that could run on diesel. He asked whether the units will display in both GLE/GGE and DLE/DGE and how the dispenser will display this information. He suggested that this item be designated as a "Developing" item to allow additional time to address these concerns. The Committee does not believe that the proposal has been adequately developed with regard to the application of the proposed code changes, including aspects such as vetting of the referenced values within the industry with relative to actual gas supplies; explanation of how these requirements will be applied consistently; and provisions for ensuring clear and understandable value comparisons by consumers (particularly given variations in gas supplies); and how this will apply to dispensers that may be used to fuel vehicles conventionally fueled by gasoline or diesel. The Committee questioned whether it might be more appropriate for the community to consider establishing mass as the method of sale for natural gas and providing educational information through mechanisms such as pump toppers that would enable the consumer to compare the fuel costs with gasoline or diesel powered vehicles. This approach would eliminate concerns about designating equivalent values that may not accurately represent the product being sold through a specific dispenser.

SWMA unanimously agreed to forward the item to NCWM, recommending it as a Developing Item with development assigned to the submitter.

At the 2013 NCWM Interim Meeting, the Committee heard comments from Mr. Keilty who expressed concern about the adoption of the proposed equivalent value as a unit of measure. He noted that the intent of this item is not to allow the user to toggle between mass units and equivalent units at the push of a button. He also noted that, if the units are set as "DLE" or "DGE," the customer cannot also view units in "GLE" or "GGE." Mr. Dmitri Karimov (Liquid Controls LLC), indicated opposition to the proposal to strike the work "compressed." Ms. Williams referenced NIST OWM's comments made in association with Agenda Item 337-1 and suggested that the Committee consider those same comments in their deliberations of this item.

The Committee heard no comments in support of the proposal during its Open Hearings.

See Item 337-1 for details regarding the S&T Committee's collaborations with the NCWM L&R Committee on Items 337-1 and 337-2 on the S&T Committee's agenda and Items 232-1 and 237-1 on the L&R Committee's agenda.

Additional Contacts: Clean Energy, Seal Beach, CA, NGVAmerica, Washington, DC, Clean Vehicle Education Foundation, Acworth, GA.

337-3 V Table T.2. Accuracy Classes and Tolerances for Mass Flow Meters

Source:
NIST, Office of Weights and Measures (2013)

Purpose:
Resolve inconsistencies in the temperature ranges defined for Heated Products among NIST Handbook 44 Liquid-Measuring Devices, Vehicle Tank-Meters, and Mass Flow Meters Codes.

Item Under Consideration:
Amend Table T.2. as follows:

Table T.2. Accuracy Classes and Tolerances for Mass Flow Meters				
Accuracy Class	**Application or Commodity Being Measured**	**Acceptance Tolerance**	**Maintenance Tolerance**	**Special Tolerance**
0.3	- Large capacity motor-fuel dispensers (maximum discharge flow rates greater than 100 L/min or 25 gal/min) - Heated products **(other than asphalt) at temperatures greater than 50 °C (122 °F)** - Asphalt **at temperatures** at or below ~~a temperature of~~ 50 °C **(122 °F)** - Loading rack meters - Vehicle-tank meters - Home heating oil ~~- Asphalt at or below 50 °C~~ - Milk and other food products - All other liquid applications not shown in the table where the minimum delivery is at least 700 kg (1500 lb)	0.2 %	0.3 %	0.5 %
0.3A	- Asphalt at temperatures greater than 50 °C **(122 °F)**	0.3 %	0.3 %	0.5 %
0.5	- Small capacity (retail) motor-fuel dispensers - Agri-chemical liquids - All other liquid applications not shown in the table where the minimum delivery is less than 700 kg or 1500 lb	0.3 %	0.5 %	0.5 %
1.0	- Anhydrous ammonia - LP Gas (including vehicle-tank meters)	0.6 %	1.0 %	1.0 %
2.0	- Compressed natural gas as a motor-fuel	1.5 %	2.0 %	2.0 %
2.5	- Cryogenic liquid meters - Liquefied compressed gases other than LP Gas	1.5 %	2.5 %	2.5 %

(Added 1994) (Amended 1999**,** ~~**, and**~~ 2001 **and 2013**)

Background / Discussion:

This item was initiated as a result of discussions at an NTEP measuring labs meeting and forwarded to the Measuring Sector for review in 2011. In reviewing criteria for heated products during discussions at the 2011 annual NTEP Laboratory Meeting, the Measuring Laboratories noted inconsistencies in the way that heated products are referenced in the LMD, VTM, and MFM Codes.

The differentiation between "heated" and "non-heated" products first appeared in NIST Handbook 44 in 2000 as a result of a proposal adopted by the NCWM in 1999 to expand the tolerances applicable to meters used to measure asphalt above 50 °C (see S&T Committee Items 330-6 and 337-4 in the 1999 NCWM S&T Committee Final Report for details). This reference was refined by the Committee in 2001 when changes were adopted to clarify the application of tolerances to asphalt at 50 °C in the LMD and MFM Codes. When the LMD and VTM Codes were modified in 2003 and 2004 to adopt an accuracy class table to mirror the MFM Code, inconsistencies first appeared in the way that heated products were referenced among the codes.

This proposal, and similar proposals elsewhere in the Committee's agenda, suggests changes to correct these inconsistencies. A summary of the proposals is listed below.

Section: 3.30 Liquid-Measuring Devices; Table T.2. (S&T Item 330-2)
Section: 3.31 Vehicle-Tank Meters; Table 1. (S&T Item 331-1)
Section: 3.37 Mass Flow Meters; Table T.2. (S&T Item 337-3)

The proposed changes in these items take into account corresponding references to heated products in NCWM Publication 14, including the "Product Families Table" in Technical Policy C and past discussions at meetings of the NTEP Measuring Sector. Revisions are also proposed to ensure appropriate references to both Fahrenheit and Celsius temperatures.

NIST OWM also notes that there may be a need to address hot water meters (for which the American Water Works Association (AWWA) defines a boundary temperature of 90 °F) in NIST Handbook 44.

At their Fall 2012 meetings, NEWMA and SWMA supported moving this item forward as a Voting item. The SWMA also recommended that this item be consolidated with correlating items in the VTM and MFM during the voting process to help ensure consistency among these codes.

At the 2013 NCWM Interim Meeting, the Committee received comments in writing from NIST OWM as outlined in Item 330-2 and heard a synopsis of these comments from Mrs. Juana Williams (NIST OWM) during the Open Hearings. Hearing no opposition to the proposed changes, the Committee agreed to move this item forward for a vote.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

354 TAXIMETERS

354-1 D Global Positioning Systems for Taximeters

Note: At the 2013 NCWM Interim Meeting, the Committee considered a proposal to amend Section 5.54. in NIST Handbook 44 to make it specifically apply to Global Positioning System (GPS) system applications used commercially to compute fares based upon distance and/or time measurements. There was no specific language proposed for consideration. That item (Item 354-1) has been combined with 2013 Agenda "Item 360-5 S.5. Provision for Security Seals" and "Item 360-6 Global Positioning Systems for Taximeters" to create a new, consolidated Developing Item. The consolidated Developing Item is designated as "Item 360-5 titled "USNWG on Taximeters – Taximeter Code Revisions and Global Positioning Systems for Time and Distance Measurement." See Item 360-5 for details.

356 GRAIN MOISTURE METERS

356-1 V Table S.2.5. Categories of Device and Methods of Sealing

Source:
NTEP Grain Analyzer Sector (2013)

Purpose:

Clarify that the requirements of Category 3 apply whether accessed manually using the keyboard or accessed by remote means, and that these requirements apply to all the subcategories of Category 3.

Item Under Consideration:
Amend Table S.2.5. as follows:

Table S.2.5. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999). If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *A device shall clearly indicate that it is in the remote configuration mode and shall not be capable of operating in the measure mode while enabled for remote configuration.*	*The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999). If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *When accessed* ~~***remotely***~~ *for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measuring mode.*	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants). A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)*
Category 3a: *No remote capability, but operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc.) in normal operation.* ***When accessed for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measuring mode.***	*Same as Category 3*
Category 3b: *No remote capability, but access to metrological parameters is controlled through a software switch (e.g., password).* ***When accessed for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measuring mode.***	*Same as Category 3*

[Nonretroactive as of January 1, 1999 ***and January 1, 201X****]*

Background / Discussion:
All of the grain moisture meters (GMMs) in Categories 3, 3a, and 3b of Table S.2.5. use an electronic method of sealing, and most of them also offer access to the configuration mode thorough a keyboard entered password. In this mode, sealable parameters can also be changed locally through the keyboard. Category 3 of Table S.2.5. currently includes the following requirement:

> When accessed remotely for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measuring mode.

At its 2011 Grain Analyzer Sector Meeting the sector agreed by consensus that the following changes to Table S.2.5. of §5.56.(a) of NIST Handbook 44 should be forwarded to the S&T Committee for consideration:

- Add a note to Table S.2.5. to recognize the expanded scope of remote capability.
- Delete "remotely" from the second paragraph of Category 3 requirements that begins, "When accessed remotely …" to make it clear that the requirements of Category 3 apply whether accessed manually using the keyboard or accessed by remote means.
- Add the modified second paragraph of Category 3 requirements to Categories 3a and 3b to make it clear that these requirements apply to all the subcategories of Category 3.

After additional review of this item, NIST, OWM recommended that the changes to Table S.2.5. approved by the sector in 2011 be separated into two independent proposals: one dealing with the changes to Category 3 and its subcategories (as shown in this proposal) and the other recommending a modification of the definition of remote configuration capability appearing in Appendix D of NIST Handbook 44 to recognize the expanded scope of remote capability, instead of adding a note to the bottom of Table S.2.5 to expanded the definition for remote configuration for grain moisture meters. A change to the definition of remote configuration capability will apply to other device types.

2012 Grain Analyzer Sector Meeting: The sector agreed by consensus to separate its original proposal into two separate proposals and that the following changes to Table S.2.5. of §5.56.(a) of NIST Handbook 44 should be forwarded to the S&T Committee for consideration:

- Delete "remotely" from the second paragraph of Category 3 requirements that begins, "When accessed remotely …" to make it clear that the requirements of Category 3 apply whether accessed manually using the keyboard or accessed by remote means.

- Add the modified second paragraph of Category 3 requirements to Categories 3a and 3b to make it clear that these requirements apply to all the subcategories of Category 3.

This proposal is consistent with the philosophy of sealing for grain moisture meters. Item 4 of the NTEP, Grain Analyzer Sector August 2012 Meeting Summary covers this subject and will be available on NCWM Website November 2012.

2012 CWMA Interim Meeting: CWMA forwarded the item to NCWM, recommending it as a Voting Item.

2012 WWMA Annual Meeting: Ms. Juana Williams, NIST, OWM expressed general support for the intent of this item; that the device should indicate when it is in configuration mode and not be capable of operating in the measuring mode. The Committee acknowledged the proposed recommendation from the NTEP Grain Analyzer Sector to add a note to Table S.2.5 to expand the scope of remote capability by modifying its definition for remote configuration capability as shown in S&T Item 356-3. The Committee did not support that item. WWMA forwarded this item to NCWM, recommending it as a Voting Item.

2012 SWMA Annual Meeting: There were no comments. The Committee acknowledged that the proposal is supported by the NTEP Grain Sectors. Recognizing the expertise of the Sector members, the Committee believed it is appropriate to support the proposal as recommended by the Work Group. SWMA forwarded the item to NCWM, recommending it as a Voting Item.

During its Open Hearings at the 2013 NCWM Interim Meeting, the Committee heard comments from Ms. Juana Williams (NIST OWM) who noted that OWM agrees with the Sector's decision to separate their original proposal into two parts. OWM also agrees with the elimination of the note originally proposed for Table S.2.5. OWM also believes the proposed change to require that Category 3 and all subcategories 3a and 3b devices clearly indicate when a device is in the configuration mode and not be capable of operating in the measuring mode is appropriate. These proposed changes are generally consistent with the sealing requirements for all similar tables in Section 3 of NIST Handbook 44. The committee may wish to consider proposing similar changes where appropriate in other NIST Handbook 44 device codes. The Committee heard no other comments on this item. Hearing no opposition to the proposed changes, the Committee agreed to recommend the proposal for a vote.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

356-2 V UR.3.4. Printed Tickets

Source:
Grain and Feed Association of Illinois (2012)

Purpose:
Change the mandatory printing of tickets from grain moisture meters to an on demand at the time of transaction printing and remove the requirement of printing the calibration version identification. Note that the Committee did not agree with proposed removal of the requirement to print the calibration version identification; this position is reflected in the version of the proposal currently under consideration by the Committee.

Item Under Consideration:
Amend paragraph UR.3.4. as follows:

UR.3.4. Printed Tickets.

(a) Printed tickets shall be free from any previous indication of moisture content or type of grain or seed selected.

(b) The customer shall be given a printed ticket **at the time of the transaction or as otherwise specified by the customer. The printed ticket shall include** ~~**showing**~~ the date, grain type, grain moisture results, test weight per bushel, and calibration version identification. The ticket **information** shall be generated by the grain moisture meter system.

(Amended 1993, 1995, ~~**and**~~ 2003**, and 2013**)

Background / Discussion:
According to the submitter, the user requirement to provide a printed ticket for every single load is unrealistic in the country elevator industry. Traffic patterns at country elevators do not lend themselves to providing a printed ticket to all customers and customers really don't want them. As the speed and capacity increases in the industry, outbound scales are being located at a distance from the inbound scale and the scale house where the moisture tester is located to alleviate traffic bottlenecks. When the outbound scale is located away from where the ticket is printed, the truck driver must circle back around to pick up the ticket, thus, causing logistical problems. In addition, since meters are sealed, inspected and required to have the correct calibration, there is no need for the calibration version identification to be printed on the ticket. Also, most customers are not going to know if it is the correct calibration version identification or not. There have been problems getting the information from the grain moisture meter to the grain accounting system – especially the calibration version identification. Some grain accounting systems have to be "hard coded" for calibration version identification which must be changed whenever the calibration changes. The change will be at an added cost for the industry.

When a consumer pays at a gas pump, they have the option of a receipt on demand at the time of transaction or not receiving a receipt. There would be a cost savings to moisture meter users as they would save on paper and filing space, and in the situation where the calibration version identification is "hard coded," there will be a cost savings of the expense to have the grain accounting software provider make those changes.

Since moisture meters are capable of printing the ticket, some would argue that they should just go ahead and print them and provide them to the customer. In addition, the requirement does not say when the ticket shall be given to the customer; thus, the printed tickets could be saved for weeks, months, or even years in case the customer had a concern at some point. Printing the calibration version identification ensures the correct calibration is being used.

The submitter proposed amendments to paragraph UR.3.4. Printed Tickets as follows:

UR.3.4. Printed Tickets.

(a) Printed tickets shall be free from any previous indication of moisture content or type of grain or seed selected.

(b) The customer shall be given a printed ticket **on demand at the time of the transaction** showing the date, grain type, grain moisture results, test weight per bushel, ~~**and calibration version identification**~~. The ticket **information** shall be generated by the grain moisture meter system.

(Amended 1993, 1995, ~~**and**~~ 2003**, and 20XX**)

2011 CWMA Interim Meeting: Some jurisdictions opposed the proposal citing that it is a fundamental element of a point of sale transaction that there is either a witness to the transaction or that a receipt is made available. Others supported the item and recognized that many customers refuse to take the printed tickets. The CWMA believes that the calibration version identification is not necessary on the ticket since most jurisdictions are already verifying the calibrations version when the device is inspected. This proposal is not eliminating the opportunity for the seller to obtain a printed ticket. CWMA forwarded the item to NCWM, recommending it as a Voting Item.

2011 WWMA Annual Meeting: The Committee heard no comments on this item. The WWMA amended the proposal to make the language consistent with other codes such as 3.32. LPG and Anhydrous Ammonia Liquid-Measuring Devices Code paragraph UR.2.6. Ticket Printer: Customer Tickets. WWMA forwarded the modified version below to NCWM, recommending it as a Voting Item.

UR.3.4. Printed Tickets.

(a) Printed tickets shall be free from any previous indication of moisture content or type of grain or seed selected.

(b) The customer shall be given a printed ticket ~~**showing**~~ **at the time of the transaction or as otherwise specified by the customer. The printed ticket shall include** the date, grain type, grain moisture results, **and** test weight per bushel~~**, and calibration version identification**~~. The ticket **information** shall be generated by the grain moisture meter system.

(Amended 1993, 1995, ~~**and**~~ 2003**, and 20XX**)

2011 NEWMA Interim Meeting: There were no comments. Deferring to the expertise of the Grain Analyzer Sector, NEWMA forwarded the item to NCWM, recommending it as a Developing Item.

2011 SWMA Annual Meeting: Ms. Butcher, NIST Technical Advisor, noted that the proposed language submitted was slightly different from that discussed by the NTEP Grain Analyzer Sector and provided a summary corresponding to this item prepared by Ms. Lee, Grain Analyzer Sector Technical Advisor. Ms. Butcher also pointed out that WWMA proposed alternate language that is consistent with printed tickets requirements in other codes. SWMA agreed that the customer should be given the option of receiving a printed ticket from a transaction and that the proposed changes would clarify the responsibility of the device user. SWMA preferred the option

forwarded by WWMA since it mirrors existing language in other *NIST Handbook 44* codes. SWMA forwarded the item to NCWM, recommending it as a Voting Item as revised by WWMA.

2012 NCWM Interim Meeting: The Committee received comments in support of the alternative language submitted by the WWMA. NIST, OWM reported that the proposed language submitted to the regional weights and measures associations was different from that agreed to by the Grain Analyzer Sector at its August 2011 meeting. The Grain Analyzer Sector had specifically opposed deleting the phrase "calibration version identification." NIST, OWM also noted that not all grain moisture meters are Category 3 devices; consequently, calibration version identification information is a critical component on the printed receipt to reconstruct the basis for a sale and help officials to resolve complaints.

The Committee agreed that the version proposed by WWMA and SWMA was preferable since it mirrors similar language in other NIST Handbook 44 codes. The Committee also agreed that, given the Grain Analyzer Sector's opposition to deleting the reference to "calibration version identification," this phrase should be retained in the paragraph. The Committee presented an amended version of the proposal. The Committee recognized that the regional associations were not aware of the sector's position on the proposed deletion of the reference to the calibration version and that the submitter has not had an opportunity to review the significant changes from the original version. The 2012 S&T Committee designated this item as an Informational Item to allow additional opportunity for input.

2012 NEWMA and CWMA Annual Meetings: NEWMA and CWMA supported this item as a Voting Item.

2012 NCWM Annual Meeting: The Committee heard no additional comments during its Open Hearings. The Committee reiterates its request for input on the modifications to the proposal, particularly from the original submitter and any regional weights and measures association that has not had an opportunity to review the modifications. The Committee is recommending no changes to the Item Under Consideration.

2012 CWMA Interim Meeting: CWMA recommended that the item be Withdrawn.

2012 WWMA Annual Meeting: There were no comments on the item. The Committee believed the intent in the amended proposed language is similar to other codes in HB 44 and sufficiently gives options of how printed tickets are provided to the customer. WWMA supported the item and recommended that it be a Voting Item.

2012 NEWMA Interim Meeting: NEWMA supported the item and recommended that the item be a Voting Item.

2012 SWMA Annual Meeting: No comments were heard. The Committee recognized that the NCWM S&T Committee designated this as an Information Item to allow additional time for the weights and measures community, including the original submitter to review the changes made to the proposal during the 2012 NCWM Interim Meeting. The Committee believes that adequate time has elapsed to allow for comment. The Committee noted that the NTEP Grain Sectors have also reviewed the proposal, as modified, and have expressed no opposition. SWMA recommended that the item be a Voting Item.

During its Open Hearings at the 2013 NCWM Interim Meeting, the Committee heard comments from Ms. Juana Williams (NIST OWM) who noted that OWM believes the suggested changes to UR.3.4. Printed Tickets are appropriate and notes that the language is similar to other codes in NIST Handbook 44. OWM agrees with the Grain Analyzer Sector's decision to retain the requirement for recording the "calibration version identification." OWM notes that while "Category 3" devices would require the printing of the calibration version identification information, not all grain moisture meters are "Category 3" devices. Having this information printed on receipts provides customers and officials with the means to verify that correct calibration settings are being used for a given transaction. The Committee received no other comments on this item. Hearing no opposition to the proposed changes, the Committee agreed to recommend the proposal for a vote.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

356-3 D Appendix D – Definitions: Remote Configuration Capability

Note: Following deliberations at the NCWM 2013 Interim Meeting, the Committee designated this item as a Developing Item. It has been moved to the Developing Items section of the agenda and designated as Item 360-7.

360 OTHER ITEMS – DEVELOPING ITEMS

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

Many issues before the OIML, the Asian-Pacific Legal Metrology Forum, 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 www.oiml.org. NIST, OWM staff will provide the latest updates on OIML activities during the Open Hearings at NCWM meetings. For more information on specific OIML related device activities, contact the OWM staff listed in the table below. The list below of OIML projects only represents active projects.

NIST Office of Weights and Measures Staff Contact List for International Activities	
Contact Information	**Responsibilities**
Mr. John Barton –LMDP Phone: (301) 975-4002 Email: john.barton@nist.gov	• R 21 *Taximeters* • R 50 *Continuous Totalizing Automatic Weighing Instruments (Belt Weighers)* • R 60 *Metrological Regulations for Load Cells* • R 106 *Automatic Rail-weighbridges*
Mr. Kenneth Butcher –LMP Phone: (301) 975-4859 Email: k.butcher@nist.gov	• TC 6 *Prepackaged Products*
Dr. Charles Ehrlich –ILMP Phone : (301) 975-4834 Email : charles.ehrlich@nist.gov	• International Committee of Legal Metrology Member for the U.S. • V1 *International Vocabulary of Terms in Legal Metrology* • V2 *International Vocabulary of Basic and General Terms in Metrology* • B 3 *OIML Certificate System for Measuring Instruments* • B 6 *OIML Directives for the Technical Work* • B 10 *Framework for a Mutual Acceptance Arrangement on OIML Type Evaluations* • TC 3/SC 5 *Expression of Uncertainty in Measurement in Legal Metrology Applications, Guidelines for the Application of ISO/IEC 17025 to the Assessment of Laboratories Performing Type Evaluation Tests* • TC 3 *Metrological Control* • ISO/IEC *Guide to the Expression of Uncertainty in Measurement*
Mr. Richard Harshman –LMDP Phone: (301) 975-8107 Email: richard.harshman@nist.gov	• R 51 *Automatic Catchweighing Instruments* • R 61 *Automatic Gravimetric Filling Instruments* • R 76 *Non-automatic Weighing Instruments* • R 107 *Discontinuous Totalizing Automatic Weighing Instruments* (totalizing hopper weighers) • R 134 *Automatic Instruments for Weighing Road Vehicles In-Motion and Measuring Axle Loads*
Ms. Diane Lee –LMDP	• R 59 *Moisture Meters for Cereal Grains and Oilseeds*

Phone: (301) 975-4405 Email: diane.lee@nist.gov	• 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 –ILMP Phone: (301) 975-3997 Email: ralph.richter@nist.gov	• D 11 *General Requirements for Electronic Measuring Instruments* • R 35 *Material Measures of Length for General Use* • R 49 *Water Meters* (Cold Potable Water and Hot Water Meters) • R 71 *Fixed Storage Tanks* • R 80 *Road and Rail Tankers* (static measurement) • R 85 *Automatic Level Gauges for Measuring the Level of Liquid in Fixed Storage Tanks* • R 95 *Ship's Tanks* • R 117 *Measuring Systems for Liquids Other Than Water* (all measuring technologies) • R 118 *Testing Procedures and Test Report Format for Pattern Examination of Fuel Dispensers for Motor Vehicles* • TC 3/SC 4 *Verification Period of Utility Meters Using Sampling Inspections* • R 137 *Gas Meters* (all measuring technologies) • R 140 *Measuring Systems for Gaseous Fuel* (i.e., large pipelines) • ISO TC 30/SC 7 *Water Meters*
Dr. Ambler Thompson –ILMP Phone: (301) 975-2333 Email: ambler@nist.gov	• D 16 *Principles of Assurance of Metrological Control* • D 19 *Pattern Evaluation and Pattern Approval* • D 20 *Initial and Subsequent Verification of Measuring Instruments and Processes* • D 27 *Initial Verification of Measuring Instruments Using the Manufacturer's Quality Management System* • D 31 *General Requirements for Software Controlled Measuring Instruments* • R 34 *Accuracy Classes of Measuring Instruments* • R 46 *Active Electrical Energy Meters for Direct Connection of Class 2*
Ms. Juana Williams –LMDP Phone: (301) 975-3989 Email: juana.williams@nist.gov	• R 81 Dynamic Measuring Devices and Systems for Cryogenic Liquids • R 139 Compressed Gaseous Fuels Measuring Systems for Vehicles

List of Acronyms

B	Basic Publication	LMDP	Legal Metrology Devices Program
CIML	International Committee of Legal Metrology	P	Project
D	Document	R	Recommendation
ILMP	International Legal Metrology Program	SC	Subcommittee
LMP	Laws and Metrics Program	TC	Technical Committee

The WWMA and the SWMA support these issues and the related device activities as an Informational Item. At the 2012 NEWMA Interim Meeting it was noted that Dr. Charles Ehrlich (NIST OWM) does a great job at annual and interim meetings explaining OIML issues. NEWMA supports the efforts of NIST to harmonize with OIML wherever possible to create a marketplace that reflects the global marketplace of today.

2012 WWMA Annual Meeting: Ms. Carol Hockert, NIST, OWM reported that OIML will be meeting in Budapest, Romania in October of 2012. The Committee looks forward to any future report updates following this meeting. WWMA recommended that the item remain as a Developing Item.

2012 SWMA Annual Meeting: SWMA unanimously recommended that the item remain as a Developing Item.

Contact Point: See contacts listed in the table above for specific technical areas.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to www.ncwm.net/content/2012pub-16 to review these documents.

360-2 D G-S.1. Identification. – (Software)

Source:
This item originated from the NTEP Software Sector and first appeared on NCWM S&T Committee's 2007 agenda as Developing Item Part 1, Item 1. and in 2010 as Item 310-3.

Purpose:
Provide marking requirements that enable field verification of the appropriate version or revision for metrological software, including methods other than "permanently marked," for providing the required information.

Item Under Consideration:
Amend NIST Handbook 44*:* G S.1. Identification and G S.1.1. Location of Marking Information for Not-Built-for-Purpose, Software-Based Devices as follows:

G S.1. Identification. – All equipment, except weights**,** ~~**and**~~ separate parts necessary to the measurement process but not having any metrological effect, ***and software-based devices covered in G-S.1.1. Location of Marking Information****, shall be clearly and permanently marked for the purposes of identification with the following information:

[*Nonretroactive as of January 1, 20XX]

(Amended 20XX)

(a) the name, initials, or trademark of the manufacturer or distributor;

(b) a model identifier that positively identifies the pattern or design of the device;

(1) The model identifier shall be prefaced by the word "Model," "Type," or "Pattern." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The abbreviation for the word "Model" shall be "Mod" or "Mod." Prefix lettering may be initial capitals, all capitals, or all lowercase.
[Nonretroactive as of January 1, 2003]
(Added 2000) (Amended 2001)

(c) a non-repetitive serial number, except for equipment with no moving or electronic component parts ~~***and not built-for-purpose software-based software device***~~*;*
[Nonretroactive as of January 1, 1968]
(Amended 2003 **and 20XX**)

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

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

(d) the current software version or revision identifier for ~~***not built for purpose***~~ ***software-based electronic*** *devices;*
[Nonretroactive as of January 1, 2004]
(Added 2003) **(Amended 20XX)**

(1) The version or revision identifier shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision.
[Nonretroactive as of January 1, 2007]
(Added 2006)

(2) Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number." Abbreviations for the word "Revision" shall, as a minimum, begin with the letter "R" and may be followed by the word "Number." The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).
[Nonretroactive as of January 1, 2007]
(Added 2006)

(e) an NTEP CC number or a corresponding CC Addendum Number for devices that have a CC. The CC Number or a corresponding CC Addendum Number shall be prefaced by the terms "NTEP CC," "CC," or "Approval." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.)
[Nonretroactive as of January 1, 2003]

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device.
(Amended 1985, 1991, 1999, 2000, 2001, 2003, ~~**and,**~~ 2006**, and 20XX**)

G-S.1.1. Location of Marking Information for ~~***Not Built For Purpose***~~ ***all Software-Based Devices.*** *– For* ~~***not built for purpose,***~~ *software-based devices, either:*

(a) The required information in G S.1. Identification. ~~***(a), (b), (d), and (e)***~~ *shall be permanently marked or continuously displayed on the device; or*

(b) The Certificate of Conformance (CC) Number shall be:

(1) permanently marked on the device;

(2) continuously displayed; or

(3) accessible through ~~***an easily recognized menu and, if necessary, a submenu. Examples of menu and submenu identification include, but are not limited to, "Help," "System Identification," "G S.1. Identification," or "Weights and Measures Identification."***~~ ***one or, at most, two levels of access.***

(i) For menu based systems, "Metrology," "System Identification," or "Help."

(ii) For systems using icons, a metrology symbol "(M)", "(SI)," or a help symbol ("?," "i," or an "i" within a magnifying glass).

Note: *For (b), clear instructions for accessing the information required in G S.1. (a), (b), and (d) shall be listed on the CC, including information necessary to identify that the software in the device is the same type that was evaluated.*
[Nonretroactive as of January 1, 2004]
(Added 2003) (Amended 2006 **and 20XX**)

Background / Discussion:
Among other tasks, the NTEP Software Sector was charged by the NCWM Board of Directors to recommend NIST Handbook 44 specifications and requirements for software incorporated into weighing and measuring devices, which may include tools used for software identification. During its October 2007 meeting, the sector discussed the value and merits of required markings for software, including possible differences in some types of software-based devices and methods of marking requirements. After hearing several proposals, the sector agreed to the following technical requirements applicable to the marking of software:

1. The NTEP CC Number must be continuously displayed or hard-marked;
2. The version must be software-generated and shall not be hard-marked;
3. The version is required for embedded (Type P) software;
4. Printing the required identification information can be an option;
5. Command or operator action can be considered as an option in lieu of a continuous display of the required information; and
6. Devices with Type P (embedded) software must display or hard-mark the device make, model, and serial number to comply with G S.1. Identification.

In 2008, the Software Sector developed and submitted a proposal to the NCWM S&T Committee to modify G-S.1. and associated paragraphs to reflect these technical requirements. Between 2008 and 2011, this item appeared on the S&T Committee's main agenda and the Committee and the sector received numerous comments and suggestions relative to the proposal. The sector developed and presented several alternatives based on feedback from weights and measures officials and manufacturers. Among the key points and concerns raised during discussions over this period were how to address the following:

(a) **Limited Character Sets and Space.** – How to address devices that have limited character sets or restricted space for marking.

(b) **Built-for-Purpose vs. Not-Built-for-Purpose.** - Whether or not these should be treated differently.

(c) **Ease of Access.** – Ease of accessing marking information in the field.
- Complexity of locating the marking information
- Use of menus for accessing the marking information electronically
- Limits on the number of levels required to access information electronically
- Possibility of single, uniform method of access

(d) **Hard Marking vs. Electronic.** – Whether or not some information should be required to be hard marked on the device.

(e) **Continuous Display.** – Whether or not required markings must be continuously displayed.

(f) **Abbreviations and Icons.** – Establishment of unique abbreviations, identifiers, and icons and how to codify those.

(g) **Certificate of Conformance Information.** – How to facilitate correlation of software version information to a CC, including the use of possible icons.

Further details on the alternatives considered can be found in the Committee's Final Reports from 2008 to 2011.

2011 NCWM Interim Meeting: The S&T Committee concurred with the Software Sector Chair that this item is not ready to move forward as a Voting Item. The Committee recommended the sector review a number of specific comments and points (see the Committee's 2011 Final Report for details.)

2011 NCWM Annual Meeting: The Committee heard support for the continued work of the sector. The 2011 S&T Committee designated this item as a Developing Item to provide the Software Sector additional time to more fully develop the item. The Committee looked forward to considering the sector's future recommendations.

2011 Fall Regional Meetings: The regional weights and measures associations noted the importance of this work. All regional associations recommended that the item remain as a Developing Item to allow the sector to further develop the issue.

At the Fall 2012 Regional Meetings, the regional associations reported a desire to receive an update on the progress of the Software Sector regarding this item. Three of the regions recommended the item remain Developing. NEWMA recommended the item be withdrawn unless new information is introduced.

During the 2013 NCWM Interim Meeting, no comments were received relative to this item during the Open Hearings. In considering the item, the Committee questioned whether or not the Software Sector was still actively working the item. It was reported that the Software Sector believed they had developed the item as much as possible, yet the different stakeholders affected by the proposal could not agree on the changes that the Sector had proposed. Based upon that update, the Committee agreed to add to its report a request that the Software Sector work with the Weighing Sector and Measuring Sector to identify which portions of the proposal need to be modified in order that they might be accepted by the entire community. The Committee acknowledges and appreciates the efforts of the Software Sector and looks forward to being able to consider a proposal that addresses both the identification of software and how it may be accessed.

Additional letters, presentations, and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

360-3 D Part 3.30. Price Posting and Computing Capability and Requirements for a Retail Motor-Fuel Dispenser (RMFD)

Source:
NIST, OWM and the Regional Weights and Measures Associations (2008)

Purpose:
Review and update criteria in the LMD Code related to price posting and computing capability of RMFDs to reflect current market practices.

Item under Consideration:
The NCWM Task Group on RMFD Price Posting and Computing Capability developed specific proposals for modifying the LMD Code to address price posting and computing requirements for RMFDs. These proposals were adopted by the NCWM in 2012 and published in the 2013 NIST Handbook 44; they are being revisited at the request of the NCWM S&T Committee who has asked the Task Group to complete its review of sample receipts and provide guidance on applying the new criteria. This item, 360-3, is being retained as a Developing Item pending any additional assignments that may be given by the Committee to the Task Group relative to the implementation of new code requirements that may be adopted. Comments or inquiries may be directed to NIST Technical Advisor, Ms. Juana Williams, at (301) 975-3989 or juana.williams@nist.gov.

Background / Discussion:
In the early 1990s, various sections of the LMD Code in NIST Handbook 44 were modified to address multi-tier pricing applications in instances where the same product is offered at different unit prices based on the method of payment (such as cash or credit) or other conditions of the sale. Since that time, marketing practices have evolved to include the addition of new practices, such as frequent shopper discounts and club member discounts. Numerous questions have been posed to NIST OWM and weights and measures officials regarding the requirements for posting unit prices, calculation of total price, customer-operated controls, and other related topics, such as definitions for associated terminology. It is clear from these questions that changes are needed to NIST Handbook 44 to ensure the requirements adequately address current marketplace conditions and practices. The Committee agreed that changes are needed to the LMD Code relative to these issues, and in 2010 the Committee established a task group to further develop this issue and present an alternative recommendation for its consideration.

Additional details on this item can be found in the Committee's 2008-2012 Final Reports.

At the 2012 WWMA Annual Meeting, Ms. Juana Williams (NIST OWM) reported that the NCWM Task Group (TG) on RMFD Price Posting and Computing Capability recently reviewed and approved NIST editorial changes to NIST Handbook 44, Section 3.30, paragraph S.1.6.5.4 Selection of Unit Price. The TG Chair, Ms. Fran Elson-Houston (OH), continues to communicate with the NCWM S&T Committee Chair and the NCWM Chairman to determine if the TG has any remaining assignments. Mr. Kurt Floren (LA County, California) encouraged feedback and input after everyone reviews the six paragraphs that will go into NIST Handbook 44 January 2013. He also suggested reviewing how these changes affect real life applications. The WWMA suggested the TG remain in place for at least a year after implementation of these six new requirements because it has the best knowledge of this issue to deal with any implementation issues that surface. WWMA recommended that the item remain as a Developing Item.

At its 2012 Interim Meeting, NEWMA supported the efforts of the working group and recommended that the item remain as a Developing Item.

At the 2012 SWMA Annual Meeting, the NCWM S&T Chairman reported that the NCWM S&T Committee has asked the RMFD Price Posting and Computing Capability TG to continue developing guidelines and examples, including sample receipt layouts, to illustrate how the changes to the LMD Code adopted in July 2012 are intended to be implemented. The SWMA looks forward to the TG's development of these guidelines. SWMA unanimously recommended that the item remain as a Developing Item while the TG continues its work.

During the 2013 NCWM Interim Meeting Open Hearings, the Committee heard a suggestion from Ms. Elson-Houston, speaking as Chair of the TG on RMFD Price Posting and Computing Capability on a TG proposal, to further modify paragraph UR.3.3. Computing Device. Ms. Elson-Houston reported that the TG had met and agreed: (1) to develop sample receipts for transactions where motor fuel pricing is discounted after the delivery; (2) the Chair would provide input on the "Do's and Don'ts" for complying with the requirements that went into effect January 2013 for posting on The Oil Express web newsletter; and (3) to recommend additional amendments to paragraph UR.3.3., which were provided to the Committee. During its deliberations, the Committee reviewed the proposed changes recommended by the TG and agreed to establish a new Information item to address those modifications. The Committee also agreed to retain Developing item 360-3 while the TG continues work to develop guidelines and examples on how the changes made last year to the LMD Code will apply to receipts for post-delivery discounted transactions. The above new information item established by the Committee is available in S&T Agenda Information Item 330-4 and is included in the section of this report that addresses Liquid-Measuring Devices Code requirements.

Additional letters, presentations, and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

360-4 I Part 2.20. Weigh-In-Motion Vehicle Scales for Law Enforcement – Work Group

Source:
NIST, OWM, Mr. Richard Harshman, on behalf of the U.S. Federal Highway Administration (FHWA) (2011)

Purpose:
To provide the U.S. Weights and Measures community (equipment manufacturers, weights and measures officials, truck weight enforcement officials, and other users) with legal metrology requirements to address WIM systems used for vehicle enforcement screening.

Item under Consideration:
Adopt the proposed Section 2.25. Weigh-In-Motion Systems Used for Vehicle Enforcement Screening Code shown in Appendix B as a tentative code in NIST Handbook 44, and adopt the proposed definitions of terms used in the tentative code (also included in Appendix B) into NIST Handbook 44 Appendix D - Definitions.

Background / Discussion:
The nation's highways, freight transportation system, and enforcement resources are being strained by the volume of freight being moved and the corresponding number of commercial vehicles operating on its roads. Traditional, static-based vehicle inspection activities simply cannot keep pace with anticipated truck volume increases. Current U.S. Department of Transportation (DOT) forecasts project freight volumes to double by 2035 and commercial vehicles to travel an additional 100 billion miles per year by 2020. WIM technology has been targeted by FHWA and Federal Motor Carrier Safety Administration as a technology capable of supporting more effective and efficient truck weight enforcement programs.

Several DOT efforts are underway and planned for the future to maintain adequate levels of enforcement that ensure equity in the trucking industry market and protection of highway infrastructure. Judicial support for enforcement decisions to apply more intense enforcement actions on specific trucks depends on support from the U.S. legal metrology community. Standards are needed in NIST Handbook 44 to address the design, installation, accuracy, and use of WIM systems used in a screening/sorting application. The implementation of a uniform set of standards will greatly improve the overall efficiency of the nation's commercial vehicle enforcement process.

Once adopted by the truck weight enforcement community, these requirements will enhance the accuracy of the nation's WIM scale systems; serve as a sound basis for judicial support of next-generation truck weight enforcement programs; and result in fewer legally loaded vehicles being delayed at static weigh station locations, thus reducing traffic congestion and non-productive fuel consumption and improving the movement of freight on our nation's roadways.

Purpose of the Project:
The FHWA's Office of Freight Management and Operations recognized a need to encourage uniformity in the design, testing, installation, and performance of WIM technology and subsequently encourage acceptance by prosecution agencies (administrative or judicial) regarding the validity of WIM technology's role in supporting commercial motor vehicle weight enforcement.

In response to this need and recognizing the value of having a standard included in NIST Handbook 44 because it lends integrity and is more recognizable in legal actions, the FHWA seeks to integrate WIM technology into the Handbook. The FHWA contracted the services of the Texas Transportation Institute—The Texas A&M University System and Battelle (a private company) to begin this process. Additionally, a small oversight Committee was formed by the FHWA, made up of three representatives from the FHWA, a NIST Technical Advisor, and a representative of a U.S. manufacturer of WIM equipment to validate that each contract deliverable is completed according to contract. NIST OWM agreed to provide a technical advisor to the associated work group tasked with development of the proposed code.

The intended application of the proposed new code is for screening purposes only (i.e., for screening/sorting commercial vehicles for possible violations of FHWA vehicle weight requirements).

The dates and descriptions below under the heading "Timeline of Completed Tasks Relating to the Project" are intended to provide an updated summary on the progress of the project since its inception.

Timeline of Completed Tasks Relating to the Project:
December 2010: A detailed project work plan, intended to guide activities and establish lines of communication from project inception to project completion, is developed. At about this same time, the NCWM and the S&T Committee are contacted and made aware of the project. Members of the NCWM S&T Committee are invited to participate on the USNWG charged with developing WIM standards that is about to be formed.

April 2011: A USNWG is established from the WIM stakeholder community comprised of representatives from state departments of transportation, state law enforcement agencies, weights and measures officials, WIM technology manufacturers and vendors, academic researchers, and others.

July 2011: The USNWG holds its first face to face meeting. Mr. Darrell Flocken (Mettler-Toledo, Inc.) accepts the position of WIM USNWG chair, and encourages stakeholders to submit comments to the work group. During the

meeting, Mr. Rick Harshman, (NIST OWM) Technical Advisor to the USNWG, presents an overview of the process to develop the technical content of a new WIM Code. He explains how NIST Handbook 44 is organized and how requirements developed by the USNWG will fit into the various sections of a new NIST Handbook 44 code. He also provides an overview of the standards development process and discusses the benefits of the USNWG using a "straw man," which he had already created to develop the new draft code. Mr. Steve Langford (Cardinal Scale Manufacturing Co.) gives a presentation on the NIST Handbook 44 amendment process, which detailed the various steps the USNWG will need to complete to add a new device code to NIST Handbook 44.

Several concerns/questions are raised by participants during the open discussion portion of the meeting. The following are some of the most important concerns/questions discussed:

- The application section of the code is critical. The types of WIM systems in which the code does and does not apply will significantly impact all other sections of the code.
- What tolerance should be specified in the draft code? An important related question is: What degree of accuracy will the judicial system (courts) accept as being sufficiently accurate enough to screen commercial vehicles for possible overweight violations? The degree of accuracy required will have a large impact on the kinds of systems that get included or excluded in the application section of the code.
- There needs to be a separation of requirements. That is, a separation of requirements that apply to virtual weigh stations and those that apply to WIM systems installed at weigh stations having a static scale.
- To adopt a draft code at the national level, two things must happen: 1) A legitimate test procedure is needed to enable states to test these systems; and 2) federal funding is needed to help cover the cost of testing.
- Will NCWM Publication 14 type evaluation criteria be needed since these systems are not commercial and are unlike other devices typically covered by NIST Handbook 44?

The USNWG agrees to discuss these concerns/questions and any others brought to their attention during their next meeting.

November 2011: The "straw man" draft code developed earlier by Mr. Harshman, along with a checklist developed by Mr. Flocken is distributed to members of the USNWG. Participants are asked to complete the checklist as they review the draft code, identifying sections within the draft code, which they believe need additional work.

May 2012: The first working draft of a WIM Code is developed based on comments received from the "strawman" code and checklist that had been previously distributed in November 2011. A separate draft document containing definitions of terms that may need to be added to Appendix D of NIST Handbook 44 is also developed.

October 2012: Following a delay due to funding issues within the FHWA, the first working draft code and draft definitions are distributed to members of the USNWG for discussion at the next face to face meeting, which is scheduled November 2012.

November 2012: The USNWG conducts their second face to face meeting. During the meeting, the first working draft WIM Code is reviewed, discussed, and revised. Members of the USNWG agree that the revised draft code and associated definitions should be submitted to the NCWM for review and comment. The revised draft and associated definition documents are forwarded to the Chairman of the 2013 S&T Committee and to the NCWM. NCWM agrees to post these documents onto its website and notifies members of their presence.

Summary of 2012 Regional Weights and Measures Association and NCWM Meetings.
During their Spring 2012 Regional Association meetings, NEWMA recommended that the status of this item remain Developing, as it awaits further proposals from the USNWG and the CWMA did not take a position on the item.

Mr. Flocken, speaking as Chair of the WIM USNWG, provided an update to both regional associations on the progress of the USNWG, noting that work had been delayed pending the resolution of funding issues within the FHWA.

At the 2012 NCWM Annual Meeting, Mr. Flocken noted a delay due to funding issues, but those issues had been resolved and the USNWG would now be able to move ahead with its work. Mr. Langford spoke as a member of the Project Oversight Committee. He apologized for the delays in being able to progress with this work, citing factors outside of the WG's control, but echoed Mr. Flocken's assurances that the work is once again progressing. The Committee expressed appreciation for updates on this issue and stated that it looked forward to further progress by the USNWG.

During their fall 2012 Regional Association Meetings, WWMA, CWMA, and SWMA recommended that the item remain Developing. NEWMA recommended the item be withdrawn, citing a concern expressed by its members that such a code does not belong in NIST Handbook 44. An update on the project was provided by Mr. Flocken at the WWMA and SWMA meetings. In addition to providing an update on the project, Mr. Flocken also pointed out during those meetings that the code is not intended for commercial application, but rather, to sort and possibly redirect commercial vehicles to static scales for further evaluation. Additionally, he stated that he did not anticipate that application would change.

During the 2013 NCWM Interim Meeting Open Hearings, Mr. Flocken recommended that the Committee consider moving this item forward as an Information item so that it might be provided a greater level of consideration by the weights and measures community. Mr. Flocken reported that a new Draft WIM Code had recently been developed by members of the USNWG, and, although not perfect, the consensus of the USNWG is that it is ready for an initial review. There are two parts to the draft code; one of which is the draft code itself; and the other is a document containing definitions of terms used in the draft code. Both have been posted and are available for review from the NCWM website. The USNWG is requesting feedback from the W&M community on both parts of the draft.

Additional comments in support of the draft were received during the Open Hearings from a member of the FHWA's Project Oversight Committee, the SMA, and a State of Florida DOT enforcement official.

Based on the comments received in support of this item, the Committee agreed to designate the item Informational.

Additional letters, presentations, and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

360-5 D USNWG on Taximeters – Taximeter Code Revisions and Global Positioning System-Based Systems for Time and Distance Measurement

Note: This item was originally titled "Item 360-5 S.5. Provision for Security Seals" in the Committee's 2013 Interim Agenda. At the 2013 NCWM Interim Meeting, the Committee combined that item with "Item 354-1 Global Positioning Systems for Taximeters" and "Item 360-6 Global Positioning Systems for Taximeters" to create this new, consolidated item to address the development of recommendations on multiple topics related to taximeters and GPS-based time and distance measuring systems.

Source:
NIST USNWG on Taximeters

Purpose:
Develop recommendations for modifying the existing Taximeters Code to reflect current technology (including requirements for sealing, display requirements, and other features) and to examine GPS-based time and distance measuring systems to determine how to best address these measuring systems in NIST Handbook 44 to ensure accuracy and transparency for passengers and businesses.

Item Under Consideration:
This item is under development. Comments and inquiries may be directed to Mr. John Barton, NIST OWM at (301) 975-4002 or john.barton@nist.gov.

The USNWG is considering proposals to modify the sealing requirements in the Taximeters Code to reflect more advanced sealing methods (see 2012 NCWM Final S&T Report); to amend the Taximeters Code to specifically recognize GPS-based time and distance measuring systems; and to amend other sections of the Taximeters Code to reflect current technology and business practices while ensuring accuracy and transparency for customers and a level playing field for transportation service companies.

Background / Discussion:
In January 2012, the Committee considered a proposal from Frias Transportation Infrastructure LLC to modify paragraph Taximeters Code paragraph S.5. Provision for Security Seals to recognize more advanced methods of sealing. See Item 360-5 in the Committee's 2012 Final Report for details; this item appeared as "Item 360-5 S.5. Provision for Security Seals" in the Committee's 2013 Interim Agenda.

In January 2013, the Committee also considered a proposal from the City of Seattle's Consumer Affairs to amend NIST Handbook 44, Section 5.54 Taximeters to make it specifically apply to Global Positioning System (GPS) system applications used commercially to compute fares based upon distance and/or time measurements. See Item 360-6 in the Committee's 2012 Final Report for details; this item appeared as "Item 360-6 Global Positioning Systems for Taximeters" in the Committee's 2013 Interim Agenda.

In April 2012, in response to requests from the NCWM and members of the weights and measures community, NIST OWM formally established a USNWG on Taximeters. The purpose of the USNWG was to continue work already in progress at NIST to develop proposed changes to the Taximeters Code to reflect current technology and to provide a forum in which stakeholders could work together to address issues such as those outlined in Items 360-5 and 360-6 on the Committee's 2012 Agenda. The USNWG includes participants from the taxi/vehicle-for-hire industry (owners & operators), manufacturers and developers of taximeters and taximeter systems, regulatory officials, and technical experts.

At the 2012 WWMA Annual Meeting, Ms. Juana Williams, NIST OWM submitted a status report for NIST USNWG on Taximeters. Ms. Kristin Macey, California, expressed strong interest in the issue of GPS system applications being used to compute fares based upon distance and/or time. Currently, California DMS is the only NTEP type approval lab and while they look forward to having a device submitted, they wouldn't know what to do with the request. She opposed the carryover item (Item 360-6 Global Positioning Systems for Taximeters on the NCWM S&T Committee's Agenda) and asked that it be withdrawn, stating that it might be better considered under a new, separate code section. Mr. John Gaccione (Westchester County, New York) expressed other consumer concerns, such as access to receipts, the need of expensive smart phones, and that currently there is no regulatory oversight, whereas there are over 13,000 taxis now operating in that jurisdiction. Mr. Miguel Monroy (San Francisco, California), echoed Kristin Macey's concern that there was no regulatory oversight and that GPS systems have been active in his jurisdiction for two years. The WWMA concluded that it didn't have enough information on metrological accuracy of GPS in measurement of distance and time, and there may be other metrological parameters that will be part of the charges.

At the 2012 SWMA Annual Meeting, Ms. Tina Butcher, NIST Office of Weights and Measures, submitted a status report for the NIST USNWG on Taximeters.

All of the regional weights and measures associations support the efforts of the USNWG. The WWMA and the SWMA further recommended that the NCWM S&T Committee consider consolidating the related items on Taximeters and GPS-based systems into a single item and designating the contact point as the USNWG.

At the 2013 NCWM Interim Meeting, the Committee considered another proposal from the City of Seattle's Consumer Affairs to amend NIST Handbook 44, Section 5.54 Taximeters to make it specifically apply to Global Positioning System (GPS) system applications used commercially to compute fares based upon distance and/or time measurements. This proposal was designated as Item 354-1 in the Committee's Interim Agenda. No proposed language modifying the current Taximeters Code was submitted. At its fall 2012 Annual Meeting, the WWMA

considered this item (the item was not submitted to the other regional associations) and noted that it is similar to Item 360-6 in the NCWM S&T Committee's 2012 Final Report and seeks to develop the Taximeter Code to apply specifically to GPS applications inputs and software programming in smart phone applications used commercially to compute fares based upon distance and/or time measurements. The WWMA forwarded the item to NCWM S&T Committee and recommended that it be combined with the Item designated in the NCWM S&T Committee's Final Report as Developing Item 360-6: Global Positioning Systems for Taximeters and be addressed by the NIST USNWG on Taximeters; however, this Item was designated as Item 354-1 on the NCWM S&T Committee's 2013 Interim Agenda.

During Open Hearings at the 2013 NCWM Interim Meeting, the Committee heard comments under Item 354-1 in support of work to further develop requirements to address GPS-based systems and to continue work on proposed revisions to the Taximeter Code to reflect current technology. NIST OWM provided the following update on the progress of the USNWG:

The USNWG on Taximeters held its first face-to-face meeting at NIST's Gaithersburg facility September 24-26, 2012. To provide the USNWG with necessary input and analysis regarding the capability of the GPS system, expertise in that area was solicited. A staff member from the NIST Time and Frequency Division has agreed to assist the USNWG in matters related to GPS and act as an observing member of the USNWG. While the September 2012 meeting was very productive a great deal of work remains to be completed. Additional meetings are anticipated; the next meeting is scheduled via web conference for March 13, 2013 from 1:30 p.m. to 4:00 p.m. EST. The direction of the USNWG's continuing work will take place in the form of two concurrent projects.

The main body of the work group will target the completion of updating the existing Taximeters Code so that specifications and requirements apply to devices and technologies currently in use in this industry. The work of the USNWG will result in proposals to amend the Taximeters Code and NCWM Publication 14 where needed. Those proposals will then be submitted for consideration by the NCWM.

In addition to the work in updating the existing Taximeters Code, a subcommittee is being formed and will specifically work towards the development of standards and requirements that will address the use of GPS as a source of commercial time and distance measurements. The work will involve amendment as needed of existing specification and performance requirements and the possible development of new requirements that will encompass the use of GPS.

This subcommittee will also develop the necessary standards and test procedures for the evaluation of transportation-for-hire services that have recently been introduced using mobile telephone applications ("apps") in the process of requesting, dispatching, and the calculation of fares for these services.

Mr. James Cassidy (City of Cambridge, MA) and member of the USNWG rose in support of these efforts and to encourage others with interest and expertise to participate in the work. The Committee also heard comments from Mr. Ross Andersen (NY, retired) who reflected on differences between standard length-measuring devices such as steel tapes and GPS-based systems. He also noted the need to address electronic receipts in any proposed revisions to the language.

The Committee heard no comments on Items 360-5 (S.5. Provision for Security Seals) or 360-6 (Global Positioning Systems for Taximeters) during its Open Hearings. After considering the summary of the work being done by the USNWG; the comments heard during its Open Hearings; and comments from the regional associations regarding the overlap among these related items, the Committee decided to consolidate Item 354-1 Global Positioning Systems for Taximeters; Item 360-5 S.5. Provision for Security Seals; and Item 360-6 Global Positioning Systems for Taximeters into a single Developing Item and to designate the USNWG on Taximeters as responsible for the item's development.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

360-6 D Global Positioning Systems for Taximeters

Note: At the 2013 NCWM Interim Meeting, the Committee combined this item with "Item 354-1 Global Positioning Systems for Taximeters" and "Item 360-5 S.5. Provision for Security Seals" to create a new, consolidated Developing Item. The consolidated Developing Item is designated as "Item 360-5 USNWG on Taximeters – Taximeter Code Revisions and Global Positioning Systems for Time and Distance Measurement." See Item 360-5 for details.

360-7 D Appendix D – Definitions: Remote Configuration Capability

Source:
NTEP Grain Analyzer Sector (2013)

Purpose:
Expand the scope of definition to cover instances where the "other device," as noted in the current definition, may be necessary to the operation of the weighing or measuring device or which may be considered a permanent part of that device.

Item Under Consideration:
This item is under development. Comments and inquiries may be directed to NIST Office of Weights and Measures.

A proposal to modify the definition for "remote configuration capability" as follows is under consideration:

> **remote configuration capability. –** The ability to adjust a weighing or measuring device or change its sealable parameters from or through some other device that ~~**is not**~~ **may or may not** itself **be** necessary to the operation of the weighing or measuring device or ~~**is not**~~ **may or may not be** a permanent part of that device.[2.20, 2.21, 2.24, 3.30, 3.37, 5.56(a)]
>
> (Added 1993, **Amended 20XX**)

Background / Discussion:
Removable digital storage devices can be used in GMMs as either data transfer devices that are not necessary to the operation of the GMM or as data storage devices which are necessary to the operation of the GMM. If removal data storage devices are necessary to the operation of the device, they are not covered by the current definition of remote configuration capability.

A USB flash drive is most likely to be used as a data transfer device. In a typical data transfer application, the USB flash drive is first connected to a computer with access to the GMM manufacturer's web site to download the latest grain calibrations that are then stored in the USB flash drive. The USB flash drive is removed from the computer and plugged into a USB port on the GMM. The GMM is put into remote configuration mode to copy the new grain calibration data into the GMM's internal memory. When the GMM has been returned to normal operating (measuring) mode the USB flash drive can be removed from the GMM.

Although a Secure Digital (SD) memory card could also be used as a data transfer device it is more likely to be used as a data storage device. In a typical "data storage device" application, the SD memory card stores the grain calibrations used on the GMM. The SD memory card must be plugged into an SD memory card connector on a GMM circuit card for the GMM to operate in measuring mode. To install new grain calibrations the GMM must be turned "off" or put into a mode in which the SD memory card can be safely removed. The SD memory card can either be replaced with an SD memory card that has been programmed with the new grain calibrations or the original SD memory card can be re-programmed with the new grain calibrations in much the same way as that described in the preceding paragraph to copy new grain calibrations into a USB flash drive. In either case, the SD memory card containing the new calibrations must be installed in the GMM for the GMM to operate in measuring mode. In that

regard, the SD memory card (although removable) can be considered a permanent part of the GMM in that the GMM cannot operate without it.

Note: In the above example SD memory card could be any removable flash memory card such as the Secure Digital Standard-Capacity, the Secure Digital High-Capacity, the Secure Digital Extended-Capacity, and the Secure Digital Input/Output, which combines input/output functions with data storage. These come in three form factors: the original size, the mini size, and the micro size. A Memory Stick is a removable flash memory card format, launched by Sony in 1998, and is also used in general to describe the whole family of Memory Sticks. In addition to the original Memory Stick, this family includes the Memory Stick PRO, the Memory Stick Duo, the Memory Stick PRO Duo, the Memory Stick Micro, and the Memory Stick PRO-HG.

At its 2011 Grain Analyzer Sector Meeting the sector agreed by consensus that the following changes to Table S.2.5. of §5.56.(a) of *NIST Handbook 44* should be forwarded to the S&T Committee for consideration:

- Add a note to Table S.2.5. to recognize the expanded scope of remote capability.
- Delete "remotely" from the second paragraph of Category 3 requirements that begins, "When accessed remotely …" to make it clear that the requirements of Category 3 apply whether accessed manually using the keyboard or accessed by remote means.
- Add the modified second paragraph of Category 3 requirements to Categories 3a and 3b to make it clear that these requirements apply to all the subcategories of Category 3.

After additional review of this item, the NIST, OWM recommended that the changes to Table S.2.5. approved by the sector in 2011 be separated into two independent proposals: one dealing with the changes to Category 3 and its subcategories and one recommending a modification of the definition of Remote Configuration Capability appearing in Appendix D of NIST Handbook 44 to recognize the expanded scope of remote capability, instead of adding a note to the bottom of Table S.2.5 to expanded the definition for remote configuration for grain moisture meters (as shown in this proposal). A change to the definition of remote configuration capability will apply to other device types.

2012 Grain Analyzer Sector Meeting: The sector agreed by consensus to separate its original proposal into two separate proposals and that this proposal to change the definition of Remote Configuration Capability should be forwarded to the S&T to Committee for consideration.

Item 5 of the NTEP, Grain Analyzer Sector August 2012 Meeting Summary covers this subject and will be available on NCWM Website November 2012.

2012 NCWM Annual Meeting: Ms. Juana Williams NIST, OWM supported the intent. She talked about this item in conjunction with Item 356-1: S.2.5. Categories of Device and Methods of Sealing. This is such a complex item affecting multiple other devices; therefore the proposal requires further consideration. The language in the proposal to amend the definition of remote configuration capability is confusing. The Committee believes the current definition already allows the use of remote configuration devices and allows the flexibility desired. The ramifications of changing the definition could affect other devices in HB 44. WWMA did not forward this item to NCWM.

2012 SWMA Annual Meeting: There were no comments. After reviewing the proposal and considering the potential impact on other device types, the Committee recommended this as a Developing Item. The Committee asks that the Sector continue to obtain input on the definition and the impact the changes would have on other device types. SWMA forwarded the item to NCWM, recommending it as a Developing Item and assigning its development to the Grain Analyzer Sector.

During its Open Hearings at the 2013 NCWM Interim Meeting, the Committee heard comments from Ms. Juana Williams (NIST OWM). OWM suggests the Committee consider this item as a Developing item to allow other Sectors to discuss how a change to the definition may affect other device types of similar design and to consider changes if needed. OWM recognizes that the current definition for "remote configuration capability" may <u>not</u> address those grain moisture meters (GMMs) which can only be operated with a removable data storage device, containing, among other things, the grain calibratins intended for use with the GMM, inserted in the device (as was

described by the Grain Analyzer Sector). As such, OWM notes that current sealing requirements were developed at a time when such technology likely didn't exist, nor could be envisioned, and are based on the current definition of remote configuration capability. Because the current definition was never intended to apply to this "next generation" technology, OWM suggests that those charged with further development of this item may wish to revisit the five philosophies of sealing and consider whether a new paragraph, completely separate from current sealing requirements, might be appropriate and a better option, than the one currently proposed. The five philosophies of sealing are included in the 1992 Report of the 77th National Conference on Weights and Measures (Report of the Specifications and Tolerances Committee). Another option, preferred over the changes currently proposed, would be to add a separate statement to the current definition of "remote configuration capability" to address removable storage devices. For example, the following sentence might be considered as an addition to the current definition for "remote configuration capability:"

> **Devices which are programmed using removable media (such as SD cards, flash drives, etc.) that may or may not be required to remain with the device during normal operation are also considered to be remotely configured devices.**

The Committee also heard comments from Dmitri Karimov (LC), speaking on behalf of the MMA, who made two points: (1) Flow computers may already have these capabilities, thus it may be more appropriate to consider adding requirements to the General Code so that the requirements will be uniformly applied to all device types; and (2) the Committee should look ahead and consider other capabilities that may or already have emerged such as wireless communication and configuration.

The Committee acknowledged the comments indicating that the current definition of "remote configuration capability" was developed at a time when certain technologies, such as blue tooth, SD storage devices, flash drives, etc., didn't exist. The Committee recognized that it may be difficult to modify the existing definition and associated requirements to be flexible enough to address emerging and future technologies without having a significant (and possibly detrimental impact) on existing devices. Consequently, rather than modifying the current definition, the Committee concluded that a better approach might be to develop an entirely separate set of security requirements that would apply to emerging technologies. The Committee believes that additional work is needed to develop proposed definition(s) and associated requirements and decided to designate the item as Developmental. The Committee requests other Sectors review the Grain Sector's proposed modification to the definition as well as OWM's suggestions and provide input.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to http://ncwm.net/meetings/annual/publication-16 to review these documents.

Mr. Kenneth Ramsburg, Maryland | Committee Chair
Mr. Paul Moyer, Nebraska | Member
Mr. Brett Gurney, Utah | Member
Mr. Mahesh Albuquerque, Colorado | Member
Ms. Jane Zulkiewicz, Town of Barnstable, MA | Member
Mr. Luciano Burtini, Measurement Canada | Canadian Technical Advisor
Ms. Tina Butcher, NIST, OWM | NIST Technical Advisor
Mr. Rick Harshman, NIST, OWM | NIST Technical Advisor

Specifications and Tolerances Committee

Appendix A

Items 337-1 and 337-2: Background and Justification for Handbook 44 Definition of "Diesel Gallon Equivalent (DGE)" of Natural Gas as a Vehicular Fuel

Clean Vehicle Education Foundation

Development of the "Gasoline Gallon Equivalent" by NCWM*

In 1993, under the auspices of the National Conference on Weights and Measures (NCWM), a Compressed Natural Gas (CNG) Working Group came together to determine the way in which CNG would be sold to the public at retail as a motor fuel. .

The working group focused on three issues:

1. How to provide the Natural Gas Vehicle (NGV) industry a method of sale that would be familiar and acceptable to consumers
2. How to provide weights and measures officials a verifiable and quantifiable means to determine the accuracy of natural gas dispensers; and
3. How to meet these requirements with a uniform, national standard.

NCWM considered three proposals for the method of sale of CNG:

1. joules, the unit of energy measurement in SI units
2. mass
3. the Gasoline Gallon Equivalent (GGE)

The Natural Gas Vehicle Coalition (now NGVAmerica) recommended that the Gasoline Gallon Equivalent be adopted as the method of sale for CNG, and that it be based on the energy equivalent of a gallon of gasoline. The use of the GGE was recommended primarily for the convenience of the retail customer comparing the cost and fuel economy of a natural gas vehicle to a comparable gasoline vehicle. During the discussion, a proposal was made to eliminate the reference to energy content of CNG and replace it with a fixed conversion factor based on mass, with the fixed mass of CNG being equal to a gallon of gasoline. Measurement of mass in the retail dispenser and verification by W&M officials is easier and less costly than measurement of energy content.

Since the energy content of a unit measure of CNG (standard cubic foot - scf) and gasoline (gallon) vary widely depending on the sample of fuel measured, the reference

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* *Report of the 78th National Conference on Weights and measures, 1993*, NIST Special Publication 854, pp 322-326.
Report of the 79th National Conference on Weights and Measures, 1994, NIST Special Publication 870, pp 213-217.
Program and Committee Reports for the National Conference on Weights and Measures, 79th Annual Meeting, July 17-21, 1994, NCWM Publication 16, pp 89-92.

gallon of gasoline was determined to be Indolene, the gasoline used by EPA to certify emissions and fuel economy, with an energy content (lower heating value) of 114,118 BTU/gal. Work conducted by the Institute of Gas Technology and the Gas Research Institute (now combined into the Gas Technology Institute) surveyed 6811 samples of natural gas nationwide and concluded that the "average" natural gas in the US had an energy content (lower heating value) of 923.7 BTU/scf, and a density of 0.0458172 lbs/cubic foot. This translates 20,160.551 BTU/lb. Dividing gasoline's 114.118 BTU/gal by natural gas's 20,160.551 BTU/lb gives 5.660 lbs of natural gas = 1 GGE. Similar calculations determined that a gasoline liter equivalent of natural gas equals 0.678 kg of natural gas.

At its 79th annual meeting in July of 1994, NCWM adopted resolutions that:

> "All natural gas kept, offered or exposed for sale or sold at retail as a vehicle fuel shall be in terms of the gasoline liter equivalent (GLE) or gasoline gallon equivalent (GGE), and
>
> All retail natural gas dispensers shall be labeled with the conversion factor in terms of kilograms or pounds. The label shall be permanently and conspicuously displayed on the face of the dispenser and shall have either the statement "1 Gasoline Liter Equivalent (GLE) is equal to 0.678 kg of Natural Gas" or "1 Gasoline Gallon Equivalent (GGE) is equal to 5.660 lbs of Natural Gas" according to the method of sale used."

These statements can be found in NIST Handbook 130*, along with the definition of "natural gas" which seems to apply only to Compressed Natural Gas, not to Liquefied Natural Gas. Handbook 130, §§3.11 and 3.12 (Engine Fuels, Petroleum Products, and Automotive Lubricants Regulations) confirm that these requirements are for CNG, rather than LNG. Similar requirements and definitions are found in Handbook 44.

During the discussions it was recognized that, although diesel and gasoline are both sold in gallon units, a gallon of diesel fuel has substantially more energy content than a gallon of gasoline. While it is convenient to use the Gasoline Gallon Equivalent unit when comparing the cost and fuel economy of gasoline-powered light-duty vehicles to equivalent natural gas vehicles, a Diesel Gallon Equivalent unit would be more useful for operators of medium and heavy-duty (usually diesel powered) vehicles. However, in 1994, the NCWM working group "agreed to defer development of a "Diesel Gallon Equivalent" until the issues related to the 'Gasoline Gallon Equivalent' were decided by the NCWM and agreed to meet again if additional work is necessary."** The issue of the formal definition a Diesel Gallon Equivalent (DGE) unit has not come before NCWM from that time until today, although the DGE is often used in the industry, defined as 6.31 lbs of natural gas.

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* "Method of Sale Regulation," §2.27
** *Report of the 79th National Conference on Weights and Measures, 1994*, NIST Special Publication 870, p 214

Need for a Definition of a "Diesel Gallon Equivalent" Unit

Today there are an increasing number of commercial vehicles using natural gas as a fuel, to lower emissions and Greenhouse Gases, decrease America's use of petroleum, and lower fuel costs (U.S. DOE Clean Cities Alternative Fuel Price Report for April 2012 shows in Table 2 'Overall Average Fuel Price on Energy-Equivalent Basis' that diesel is priced at $4.12/gal and CNG at $2.32/gal http://www.afdc.energy.gov/afdc/pdfs/afpr_apr_12.pdf).

Since the NCWM's working group deferred development of a DGE unit in 1994, there has been little call by the natural gas vehicle industry for the formalization of that unit in the sale of **Compressed** Natural Gas. However the use of **Liquefied** Natural Gas (LNG) as a motor fuel has been growing and there is significant interest in using the DGE as a unit for the sale of that fuel.

LNG as a motor fuel is used almost exclusively by commercial vehicles, most of which view diesel as the conventional alternative. Using the same logic as was used for the development of the GGE unit, the convenience of the retail customer comparing the cost and fuel economy of a natural gas vehicle to a comparable conventional vehicle, it makes sense for NCWM to now "officially" define the DGE.

Other than §3.12. Liquefied Natural Gas, in the Engine Fuels and Automotive Lubricants Regulation section of Handbook 130, we find no specific provisions in either Handbook 44 or Handbook 130 for the retail sale of LNG as a motor fuel. However LNG is sold in California and other states on a mass basis (by the pound), which allows for easy confirmation by weights and measures authorities. An "official" definition of the DGE as a specific mass of natural gas would allow states to easily move from retail sale by pound to retail sale by DGE, simplifying the sale process for the retail customer used to dealing with "gallons of diesel" as a fuel measure.

Therefore, at this time we are asking for a definition of the Diesel Gallon Equivalent (and Diesel Liter Equivalent) units by NCWM.

Justification of the Definition of a DGE as 6.312 Pounds of Natural Gas

Handbook 130 contains the following definitions of natural Gas as a vehicle fuel[*]:

Gasoline liter equivalent (GLE). – Gasoline liter equivalent (GLE) means 0.678 kg of natural gas.

Gasoline gallon equivalent (GGE). – Gasoline gallon equivalent (GGE) means 2.567 kg (5.660 lb) of natural gas.

[*] NIST handbook 130, 2006, Method of State Regulation, §§2.27.1.2 and 2.227.1.3; also Engine Fuels, Petroleum Products, and Automotive Lubricants Regulation, §§1.25 and 1.26.

As the NCWM working group recognized during its deliberations in 1993 on the Gasoline Gallon Equivalent unit, both gasoline and natural gas can vary in their BTU content from sample to sample. The working group determined the gasoline gallon (energy) equivalent based on a gallon of Indolene (114,118 BTU/gal – lower heating value) and a survey of 6811 natural gas samples nationwide with an average of 923.7 BTU/scf (lower heating value) and a density of 0.0458172 lbs/cubic foot. This equates to 20,160.551 BTU/lb. Dividing gasoline's 114.118 BTU/gal by natural gas's 20,160.551 BTU/lb gives 5.660 lbs of natural gas = 1 GGE. Similar calculations determined that a gasoline liter equivalent of natural gas equals 0.678 kg of natural gas.

Starting with 5.660 lbs of natural gas = 1 GGE and 0.678 kg of natural gas = 1 GLE, we can calculate the mass of natural gas necessary to make a DGE and a DLE by comparing the amount of energy in a gallon of diesel fuel to the amount of energy in a gallon of gasoline fuel and apply that ratio to scale up the masses of natural gas calculated for the GGE and GLE units.

Unfortunately it is no easier today than it was in 1993 to set one energy value as representative of a unit for all gasoline, (or diesel) fuel. EPA's certification fuel has likely changed in energy content since 1993, as both gasoline and diesel fuels have been modified for improved emissions.

We recommend using the most recent Department of Energy *Transportation Energy Data Book*[*], as an authoritative reference for both gasoline and diesel fuel energy values. Taking further surveys or basing our calculations on today's EPA certification fuel only delays our action, substantially increases costs, and, in the end, provides a limited potential increase in accuracy based on one point in time. Table B.4 of the *Transportation Energy Data Book,* on the heat content of fuels http://cta.ornl.gov/data/tedb30/Edition30_Full_Doc.pdf lists the net energy of gasoline as 115,400 BTU/Gal, and diesel as 128,700 BTU/Gal.

Therefore a Diesel Gallon Equivalent of natural gas is:

(128,700/115,400) X 5.660 = 6.312 lb (2.863 kg)

and a Diesel Liter Equivalent of natural gas is:

(128,700/115,400 X 0.678 = 0.756 kg

Prepared by:
Clean Vehicle Education Foundation
http://www.cleanvehicle.org

[*] Stacy C. Davis and Susan W. Diegel, Oak Ridge National Laboratory, *Transportation Energy Data Book*, Edition 30, 2011, ORNL-6978, or http://cta.ornl.gov/data/index.shtml

Appendix B

Item 360-4 Draft Tentative Code Applicable to Weigh-In-Motion Systems Used for Vehicle Enforcement Screening

Section 2.25. Weigh-In-Motion Systems used for Vehicle Enforcement Screening – Draft Code

A. Application

A.1. General. – This code applies to systems used to weigh vehicles, while in motion, for the purpose of screening and sorting the vehicles based on the vehicle weight to determine if a static weighment is necessary.

A.2. The code does not apply to weighing systems intended for the collection of statistical traffic data.

A.3. The code is intended for field enforcement use only.

A.4. Additional Code Requirements. – In addition to the requirements of this code, Weigh-In-Motion Screening Systems shall meet the requirements of Section 1.10. General Code.

S. Specifications

S.1. Design of Indicating and Recording Elements and of Recorded Representations.

S.1.1. Ready Indication. – The system shall provide a means of verifying that the system is operational and ready for use.

S.1.2. Value of System Division Units. – The value of a system 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.

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

S.1.2.1. Units of Measure. – The system shall indicate weight values using only a single unit of measure.

S.1.3. Value of Other Units of Measure.

S.1.3.1. Speed. – Vehicle speeds shall be measured in miles per hour or kilometers per hour.

S.1.3.2. Axle-Spacing (Length). – The center-to-center distance between any two successive axles shall be measured in feet and/or inches, or meters.

S.1.3.3. Vehicle Length. – If the system is capable of measuring the overall length of the vehicle, the length of the vehicle shall be measured in feet and/or inches, or meters.

S.1.4. Capacity Indication. – An indicating or recording element shall not display nor record any values greater than 105% of the specified capacity of the load receiving element.

S.1.5. Identification of a Fault. – Fault conditions shall be presented to the operator in a clear and unambiguous means. The following fault conditions shall be identified:

(a) Vehicle speed is below the minimum or above the maximum speed as specified.
(b) The maximum number of vehicle axles as specified has been exceeded.
(c) A change in vehicle speed greater than that specified has been detected.

S.1.6. Recorded Representations.

S.1.6.1. Values to be Recorded. – At a minimum, the following values shall be printed and/or stored electronically for each vehicle weighment:

(a) transaction identification number
(b) lane identification (required if more than one lane at the site has the ability to weigh a vehicle in-motion)
(c) vehicle speed
(d) number of axles
(e) weight of each axle
(f) identification and weight of axles groups
(g) axle spacing
(h) total vehicle weight
(i) all fault conditions that occurred during the weighing of the vehicle
(j) violations, as identified in paragraph S.2.1., that occurred during the weighing of the vehicle.
(k) time & date

S.1.7. Value of the Indicated and Recorded System Division. – The value of the system's division size as recorded shall be the same as the division value indicated.

S.2. System Design Requirements.

S.2.1. Violation Parameters. – The instrument shall be capable of accepting user entered violation parameters for the following items:

(a) single axle weight limit
(b) axle group weight limit
(c) gross vehicle weight
(d) bridge formula load

The instrument shall display and or record violation conditions when these parameters have been exceeded.

S.3. Design of Weighing Elements.

S.3.1. Multiple Load-Receiving Elements. –An instrument with a single indicating or recording element, or a combination indicating-recording element, that is coupled to two or more load-receiving elements with independent weighing systems, shall be provided with means to prohibit the activation of any load-receiving element (or elements) not in use, and shall be provided with automatic means to indicate clearly and definitely which load-receiving element (or elements) is in use.

S.4. Design of Weighing Devices, Accuracy Class.

S.4.1. Designation of Accuracy. – WIM Systems meeting the requirements of this code shall be designated as accuracy Class A.

S.5. Marking Requirements. – In addition to the marking requirements in G-S.1. Identification (except G.S.1.(e)), G-S.4. Interchange or Reversal of Parts , G-S.6. Marking Operational Controls, Indications, and Features, G-S.7. Lettering, and G-UR.2.1.1. Visibility of Identification. The system shall be marked with the following information:

(a) Accuracy Class
(b) Value of the System Division "d"
(c) Operational Temperature Limits
(d) Number of Lanes
(e) Minimum and Maximum Vehicle Speed
(f) Maximum Number of Axles per Vehicle
(g) Maximum Change in Vehicle Speed during Weighment
(h) Minimum and Maximum Load

S.5.1. Location of Marking Information. – The marking information required in G-S.1. of the General Code and S.5. shall be visible after installation. The information shall be marked on the system or recalled from an information screen.

N. Notes

N.1. Test Procedures.

N.1.1. Selection of Test Vehicles. – All dynamic testing associated with the procedures described in each of the subparagraphs of N.1.5 shall be performed with a minimum of two test vehicles.

(a) The first test vehicle may be a two axle, six tire, single unit truck; a vehicle with two axles with the rear axle having dual wheels. The vehicle shall have a maximum Gross Vehicle Weight of 10,000 lbs.
(b) The second test vehicle shall be a five axle, single trailer truck with a maximum Gross Vehicle Weight of 80,000 lbs.

Note: Consideration should be made for testing the systems using vehicles which are typical to the systems daily operation.

N.1.1.1. Weighing of Test Vehicles. – All test vehicles shall be weighed on a reference scale before being used to conduct the dynamic tests.

N.1.2. Test Loads.

N.1.2.1. Static Test Loads. – All static test loads shall use certified test weights.

N.1.2.2. Dynamic Test Loads. – Test vehicles used for dynamic testing shall be loaded to 85 to 95% of their maximum Gross Vehicle Weight. The "load" shall be non-shifting and shall be positioned to present as close as possible, an equal side-to-side load.

N.1.3. Reference Scale. – Each reference vehicle shall be weighed on a static scale meeting NIST Handbook 44, Class III L maintenance tolerances.

N.1.3.1. Location of a Reference Scale. – The location of the Reference Scale must be considered as vehicle weights will change due to fuel consumption.

N.1.4. Test Speeds. – All dynamic tests shall be conducted within 20% below or at the posted speed limit.

N.1.5. Test Procedures.

N.1.5.1. Dynamic Load Test. – The dynamic test shall be conducted using the test vehicles defined in N.1.1. The test shall consist of a minimum of 20 runs for each test vehicle at the speed as stated in N.1.4. The tolerance for each run shall be based on the percentage values specified in Table T.3.1.

N.1.5.2. Axle Spacing Test. – The axle spacing test is a review of the displayed and/or recorded axle spacing distance of the test vehicles. The tolerance value for each distance shall be based on the tolerance value specified in T.3.2.

N.1.5.3. Position of Vehicle during Test Runs. – During the conduct of the dynamic testing the vehicle shall adjust its position along the width of the sensor from one run to the next but ensuring that the vehicle stays within the defined roadway. The test shall be conducted with 10 runs in the center, five runs on the right side, and five runs on the left side. All weighments shall be within tolerance.

T. Tolerances

T.1. Principles.

T.1.1. Design. – The tolerance for a weigh-in-motion system is a performance requirement independent of the design principle used.

T.2. Tolerance Application

T.2.1. General. – The tolerance values are positive (+) and negative (-). No more than 5% of each test shall be outside the applicable tolerances

T.3. Tolerance Values for Accuracy Class A.

T.3.1. Tolerance Values for Dynamic Testing. – The tolerance values applicable during dynamic load testing are as specified in Table T.3.1.

Table T.3.1. – Tolerances for Accuracy Class A

Load Description	Tolerance as a Percentage of Applied Test Load
Axle Load	20%
Axle Group Load	15%
Gross Vehicle Weight	10%

T.3.2. Axle Spacing Tolerance. – The tolerance value applied to the axle spacing measurement shall be ± 0.5 feet (0.15 meter).

T.4. Influence Factors. – The following factors are applicable to tests conducted under controlled conditions only.

T.4.1. Temperature. – Systems shall satisfy the tolerance requirements under all operating temperature unless a limited operating temperature range is specified by the manufacturer.

T.5. Radio Frequency Interference (RFI) and Other Electromagnetic Interference Susceptibility. – The difference between the weight indication due to the disturbance and the

weight indication without the disturbance shall not exceed the tolerance value as stated in Table T.3.1.

UR. User Requirements

UR.1. Selection Requirements. – Equipment shall be suitable for the service in which it is used with respect to elements of its design, including but not limited to, its capacity, number of scale divisions, value of the scale division or verification scale division and minimum capacity.

UR.2. User Location Conditions and Maintenance. – The system shall be installed and maintained as defined in the manufacturer's recommendation.

UR.2.1. System Modification. – The dimensions (e.g., length, width, thickness, etc.) of the load receiving element of a system shall not be changed beyond the manufacturer's specifications, nor shall the capacity of a scale be increased beyond its design capacity by replacing or modifying the original primary indicating or recording element with one of a higher capacity, except when the modification has been approved by a competent engineering authority, preferably that of the engineering department of the manufacturer of the system, and by the weights and measures authority having jurisdiction over the system.

UR.2.2. Foundation, Supports, and Clearance. – The foundation and supports shall be such as to provide strength, rigidity, and permanence of all components.

On load-receiving elements which use moving parts for determining the load value, clearance shall be provided around all live parts to the extent that no contacts may result when the load-receiving element is empty, nor throughout the weighing range of the system.

UR.2.3. Access to Weighing Elements. – If necessary, adequate provision shall be made for inspection and maintenance of the weighing elements.

UR.3. Maximum Load. – A system shall not be used to weigh a load of more than the marked maximum load of the system.

The following are proposed definitions to be added to NIST Handbook 44, Appendix D to support the Weigh-In-Motion Systems used for Vehicle Enforcement Screening – Draft Code.

weigh-in-motion (WIM). A process of estimating a moving vehicle's gross weight and the portion of that weight that is carried by each wheel, axle, or axle group, or combination thereof, by measurement and analysis of dynamic vehicle tire forces.

axle. The axis oriented transversely to the nominal direction of vehicle motion, and extending the full width of the vehicle, about which the wheel(s) at both ends rotate.

axle-group load. The sum of all tire loads of the wheels on a group of adjacent axles; a portion of the
gross-vehicle weight.

axle load. The sum of all tire loads of the wheels on an axle; a portion of the gross-vehicle weight.

axle spacing. The distance between the centers of any two axles. When specifying axle spacing, you also need to identify the axles used.

single-axle load. The load transmitted to the road surface by the tires lying on the same longitudinal axis (that axis transverse to the movement of the vehicle and about which the wheels rotate).

tandem-axle load. The load transmitted to the road surface by the tires of two single-axles lying on the same longitudinal axis (that axis transverse to the movement of the vehicle and about which the wheels rotate).

triple-axle load. The load transmitted to the road surface by the tires of three single-axles lying on the same longitudinal axis (that axis transverse to the movement of the vehicle and about which the wheels rotate).

Weigh-in-Motion Screening Scale . A WIM system used to identify potentially overweight vehicles.

Wheel weight. The weight value of any single or set of wheels on one side of a vehicle on a single axle.

WIM System. A set of sensors and supporting instruments that measure the presence of a moving vehicle and the related dynamic tire forces at specified locations with respect to time; estimate tire loads; calculate speed, axle spacing, vehicle class according to axle arrangement, and other parameters concerning the vehicle; and process, display, store, and transmit this information. This standard applies only to highway vehicles.

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