Interim Meeting Agenda of the Committee on Specifications and Tolerances

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Reference
Key Number

300 Introduction

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

The recommendations are statements of proposals and are not necessarily those of the Committee. Suggested revisions to the handbook are shown in **bold face print** by ~~crossing out~~ what is to be deleted, and underlining what is to be added. Requirements that are proposed to be nonretroactive are printed in *italics*. Entirely new paragraphs or sections proposed for addition to the handbook are designated as such and shown in **bold face type**.

Note: The policy of the National Institute of Standards and Technology is to use metric units of measurement in all of its publications; however, recommendations received by the NCWM technical committees have been printed in this publication as they were submitted and may, therefore, contain references to inch-pound units.

Table A
Index to Reference Key Items

Table B
Appendices

Appendix	Title of Item	Reference Key Number	Page
A	Pharmacy Scales-Counting Feature Test and Other Procedures	360-3	52
B	Developing Issues-Scales Item 1 N.1.3.4.1. Weight Carts Item 2 T.N.3.X. Vehicle Scales Equipped Only With Weighbeam and Used to Weigh Aggregate	360-3	61
C	Developing Issues-Vehicle-Tank Meters Item 1 N.4.2. Special Tests, N.4.5. Product Depletion Test, and T.5. Product Depletion Test	360-3	62
D	Developing Issues-Other Items Item 1 Update NCWM Publication 3, National Conference on Weights and Measures Policy, Interpretations, and Guidelines; Taximeters vs. Odometers Used for Transporting Fare Paying Passengers	360-3	63

Details of all Items
(In order by Reference Key Number)

310 General Code

310-1 G-S.1. Identification; Software Based Devices, and Appendix D; Definition of Built-for-Purpose Device

Source: Carryover Item 310-1. (This item was developed by the National Type Evaluation Technical Committee (NTETC) Measuring Sector and first appeared on the Committee's 2002 agenda.)

Recommendation: Amend G-S.1. Identification (d) as follows:

G-S.1. Identification. - All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect, shall be clearly and permanently marked for the purposes of identification with the following information:

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

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

(c) the model designation shall be prefaced by the term "Model," "Type," or "Pattern." These terms may be followed by the term "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."
[Nonretroactive January 1, 2003]
(Added 2000) (Amended 2001)

[Note: Prefix lettering may be initial capitals, all capitals or all lower case.]

(d) except for equipment with no moving or electronic component parts and software-based not built-for-purpose devices, a nonrepetitive serial number;
[Nonretroactive as of January 1, 1968]

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

(f) the serial number shall be prefaced by the words "Serial Number" or an abbreviation of that term. 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]

(g) For devices that have an NTEP Certificate of Conformance (CC) Number or a corresponding CC addendum number, the NTEP CC shall be prefaced by the terms "NTEP CC," "CC," or "Approval." These terms may be followed by the term "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 and 2000)

Add new paragraph G-S.1.1. and renumber existing paragraph G-S.1.1. as follows:

G-S.1.1. Software-Based, Not Built–For–Purpose Devices. - For software based, not built–for–purpose devices, the following shall apply:

(a) the manufacturer or distributor and the model designation may be continuously displayed or marked on the device*, or

(b) the Certificate of Conformance (CC) Number may be continuously displayed or marked on the device*, or

(c) all required information in G-S.1. Identification. (a), (b), (c), (g), and the software version designation may be continuously displayed. Alternatively, a clearly identified System Identification, G-S.1. Identification, or Weights and Measures Identification may be accessible through the "Help" menu. Required information includes that information necessary to identify that the software in the device is the same type that was evaluated.

****Clear instructions for accessing the remaining required information shall be listed on the CC. Required information includes that information necessary to identify that the software in the device is the same type that was evaluated.***

[Nonretroactive as of January 1, 200X]

G-S.1.~~1~~2. Remanufactured Devices and Remanufactured Main Elements. - All remanufactured devices and remanufactured main elements shall be clearly and permanently marked for the purpose of identification with the following information:

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

(b) the remanufacturer's or distributor's model designation if different than the original model designation.
[Nonretroactive as of January 1, 2002]

Add a new definition for "built-for-purpose" devices as follows:

built-for-purpose device. Any main device or element which was manufactured with the intent that it be used as, or part of, a weighing or measuring device or system.

Background/Discussion: **At the 2002 NCWM Interim and Annual Meetings, the S&T Committee reviewed and received comments on two proposals to address marking requirements for software based not built-for-purpose devices. One proposal was developed and submitted by the NTETC Measuring Sector. The other proposal was developed and submitted by the NTETC Weighing Sector. The Committee asked that the NTETC Measuring and Weighing Sectors review both proposals and attempt to agree on a single proposal that is acceptable to all parties.**

At its September 2002 Meeting, the NTETC Weighing Sector developed a new proposal based on both of the proposals submitted last year. That proposal was forwarded to the NTETC Measuring Sector for review and comment.

At its October 2002 Meeting, the NTETC Measuring Sector reviewed the proposal developed by the Weighing Sector and concurred with the intent of the proposal. The Measuring Sector recommended some changes to the proposal and agreed to forward it to the NCWM S&T Committee for consideration. The modified proposal was

also sent to the Weighing Sector members along with a ballot requesting approval of the modifications. The results of the ballot will be available prior to the 2003 NCWM Interim Meeting.

At its October 2002 Annual Meeting, the SWMA supported the direction of the NTETC Measuring Sector on this item and encourages a unified position of both the NTETC Measuring and Weighing Sectors.

For more background information, refer to the 2002 S&T Final Report.

320 Scales

320-1 S.1.12. Manual Gross Weight Entries and UR.3.9. Use of Manual Gross Weight Entries

Source: Carryover Item 320-4. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 2002 agenda.)

Recommendation: Modify paragraph S.1.12. as follows:

> ***S.1.12. Manual ~~Gross~~ Weight Entries. – A device shall accept an entry of a manual ~~gross~~ weight value only when the scale is at gross load zero and the scale gross or net weight indication is at zero ~~in the gross weights display mode~~. Recorded manual weight entries~~.~~:***
>
> ***(a) except those on labels generated for packages of standard weights, shall identify the weight value as a manual weight entry by one of the following terms: "Manual Weight," "Manual Wt," ~~or~~ "MAN WT~~.~~" or "Manual Tare," or MAN Tare." The use of a symbol to identity multiple manual weight entries on a single document is permitted, provided that the symbol is defined on the same page on which the manual weight entries appear and the definition of the symbol is automatically printed by the recording element as part of the document.***
>
> ***(b) on recorded representations containing gross, tare, and net weight values at least two of the values shall be identified.***
>
> ***[Nonretroactive as of January 1, ~~1993~~ 200X.]***

During the September 2002 WWMA Technical Conference, the WWMA recommended modifying paragraph UR.3.9. as follows:

> **UR.3.9. Use of Manual ~~Gross~~ Weight Entries. – Manual ~~gross~~ weight entries are permitted for use in the following applications only: (1) when credit is given for a weighed item on point-of-sale systems interfaced with scales, or when an item is pre-weighed and marked with the correct net weight; (2) when a device or system is generating labels for standard weight packages; (3) when postal scales or weight classifiers are generating manifests for packages to be picked up at a later time; and (4) on livestock scale and vehicle scale systems generate weight tickets to correct erroneous tickets.**

During its 2002 Interim Meeting, the Northeastern Weights and Measures Association (NEWMA) agreed to support the WWMA's alternate proposal to modify paragraph UR.3.9. shown above.

Discussion: The proposal was developed to address concerns about practices for using manual weight entries on point-of-sale (POS) systems. One national grocery company manually enters weights into its POS system when an item (e.g., watermelons, turkeys, roasts, etc.) exceeds the capacity of the POS scale system or when the scanner system cannot read the Universal Product Code (UPC) on a random weight package, but the weight and price per pound are legible. These applications are not specifically addressed in NIST Handbook 44 for use of manual weight entries.

Several restrictions are placed on the use of manual weight entries in Handbook 44 to deter fraudulent use of the feature and to ensure that entries are properly identified. Paragraph UR.3.9. permits use of manual weight entries in applications where a credit is given on a POS system, to generate labels for standard weight packages, for postal weight manifests when packages are picked up at a later time, or to correct erroneous tickets generated by livestock or vehicle scales. Paragraph S.1.12. permits manual weight entries only when the scale is at gross load zero and the scale indication is zero. Paragraph S.1.12. also specifies that manual weight entries must be identified with specific terminology on labels (except standard weight packages) or tickets. The Committee had concerns that adding more applications to the list of acceptable weighing operations, where manual entries are permitted, might not adequately recognize all weighing installations where manual weight entries are appropriate.

The Committee recommended a more complete assessment of the field use of manual weight entries since not all involve gross weights. The Committee reviewed several proposals to modify paragraph UR.3.9. to address specific manual weight entry applications encountered by each submitter. The Committee agreed that the use of manual weight entries occurs with both gross and net weight packages, therefore, the proposals to modify paragraph UR.3.9., as worded, did not address all instances where manual weight entries occur. The Committee agreed to consider an alternate proposal to modify paragraph S.1.12. as shown in the recommendation above that more adequately addresses the various manual weight entries that occur nationally in weighing operations.

The Committee recommended that changes were also necessary to paragraph UR.3.9. to ensure that the requirement is consistent with the proposed modifications to paragraph S.1.12. The Committee agreed to consider recommendations to modify paragraph UR.3.9. because corresponding changes are needed for device operators that use manual weight entries.

The WWMA indicated that it is acceptable to manually enter weight and price information and use the POS system as a calculator. In 2002, the Committee heard support from the WWMA to modify paragraph UR.3.9. as shown in the recommendation above. The WWMA removed all references to the term "gross" from paragraph UR.3.9. to correspond with the changes recommended for paragraph S.1.12.

For more background information, refer to the 2002 S&T Final Report.

320-2 Table S.6.3.b. Note 13; Counting Feature

Source: Western Weights and Measures Association (WWMA). (This item originated from the Southern Weights and Measures Association and first appeared on the Committee's 2002 agenda as Developing Item 360-3, Appendix A. The submitter of the item, the WWMA, believes the proposal is ready for national review.)

Recommendation: Modify Note 13 in Table S.6.3.b. as follows:

> ***13. A scale designed for a special application rather than general use shall be conspicuously marked with suitable words visible to the operator and customer restricting its use to that application, e.g., postal scale, prepack scale, weight classifier, etc.* When a scale is installed with an operational counting feature, the scale shall be marked on both the operator and customer side with the statement "The counting feature is not legal for trade."***
> ***[*Nonretroactive as of January 1, 1986]***
> ***Note: The "not legal for trade" marking is not required on a prescription scale for which an NTEP Certificate of Conformance has been issued. The Certificate must specifically include a counting feature that has been evaluated and approved.***

Discussion: The WWMA proposes that the counting by weight feature on pharmacy scales should be recognized by NIST Handbook 44. The WWMA worked to develop a proposal based on the following input from pharmacy scale manufacturers: (1) there is a high level of regulatory oversight by the U.S. Food and Drug Administration (FDA) to ensure that prescription drug dosages are uniform, unlike other commodities sold by weight, (2) pharmacists are trained professionals in search of an accurate method to dispense pills, and (3) device technology provides greater accuracy for filling containers when counting by weight rather than by hand. The WWMA recommends this application only for pharmacy scales because of the controls in place for pill dosages. The WWMA recognizes that Handbook 44 must be modified to permit this application for pharmacy scales and further work is needed to ensure appropriate test procedures

are available. The WWMA indicates that the counting feature is suitable only for pharmacy scale applications when the device and the counting feature are covered on an NTEP Certificate of Conformance. The WWMA received documents from Stan Jankowski (McKesson Automated Prescription Systems) that contain the following (1) establishing piece weight data with reference weight, (2) expanding the reference weight data (optional algorithm for pharmacy scale program, (3) Recommended Characteristics for a Pharmacy Scale, (4) Accuracy Test for Pharmacy Scale Counting Feature, and (5) Two Methods for Verifying Counting Accuracy (See Appendix A). The WWMA encourages the submitter of the proposal to work with parties such as NTEP, NIST, and the States to make any changes necessary to the proposed test procedures so that they adequately address Handbook 44 requirements.
The Southern Weights and Measures Association (SWMA) reviewed the proposal in the recommendation above, but due to time constraints was not able to study the corresponding documents prepared by Mr. Jankowski. The SWMA recommends the type evaluation and field test procedures developed by Mr. Jankowski need to include tolerances and require further development. The SWMA recommends the proposal move forward as an information item until all work is complete on the procedures.

Past discussions about the counting feature focused on variability in the size of individual items, compliance with device performance tolerances, and the count weight unit having a higher resolution than the displayed scale division. The proposal includes language to eliminate labeling requirements for the counting feature on pharmacy scales and preliminary test procedures, but does not include language for accuracy requirements or modifying the notes section to specify test procedures. These issues and others such as the appropriate standards and influence factors must be considered when examining new test procedures.

320-3 S.6.4. Railway Track Scales

Source: Central Weights and Measures Association (CWMA)

Recommendation: Modify paragraph S.6.4. in the Scales Code 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 marked nominal capacity shall not exceed the sectional capacity (SC) multiplied by the number of sections (N) of the scale minus 0.5 sections. The formula is stated as Nominal Capacity = SC x (N - 0.5).**
> ***[Nonretroactive as of January 1, 2002]***

Discussion: In 2001, paragraph S.6.4. was modified to specify that the maximum nominal capacity for railway track scales with more than two sections must not exceed twice the section capacity and the nominal capacity for railway track scales with two sections must not exceed the section capacity. The CWMA finds that the marked nominal capacity required in paragraph S.6.4. is exceeded when railcars are pushed and placed on the scale for weighing. Systems monitor and record all weighments, which includes all instances where the nominal capacity exceeds the marked nominal capacity. The proposal permits a greater nominal capacity that is based on the section capacity multiplied by the number of sections minus 0.5 sections, which is consistent with the nominal capacity specifications for vehicle scales with similar modular designs.

Systems Associates indicates that railway track scales are designed to meet American Railway Engineering Maintenance of Way Association and Cooper E-80 specifications as specified by the servicing railroad. System Associates indicates that modular railway track scales based on Cooper E-80 specifications can withstand loads far greater than the marked nominal capacity limits in paragraph S.6.4. The length of scales fabricated from multiple modules is restricted because of nominal capacity limitations specified in current paragraph S.6.4.

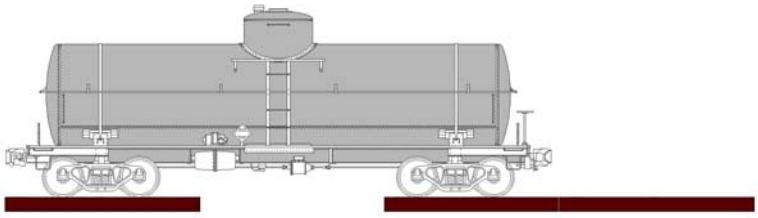
Systems Associates Inc. provided the examples below to demonstrate railway track scale loading, where railcar loads exceed nominal scale capacity limits specified in paragraph S.6.4. The modular railway track scales typically use 100 000 lb load cells and has a 170 000 lb section capacity. A change to load cell capacity to meet the weight of coupled railcars might require modifications to the scale design and require re-evaluation by NTEP. Railcars are uncoupled at

both ends to obtain a true net weight and ensure there is no coupler interaction or weight transfer. The definitions for terms used in Examples A-C that are not defined in Handbook 44 are listed below:

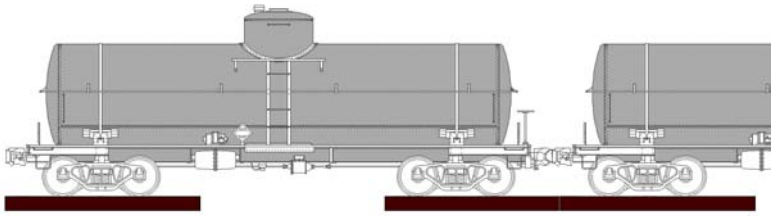
single scale – A single module having a 12 ft span that is designed to support three 80 000 lb axles on five foot centers.
double scale – A single module having a 25 ft to 26 ft span that is designed to support four 80 000 lb axles on five foot centers.
truck – swiveling framework of wheels located at each end of the railcar.

Examples of Railway Track Scale Loading

A - A Short Railcar on Single-Double scale

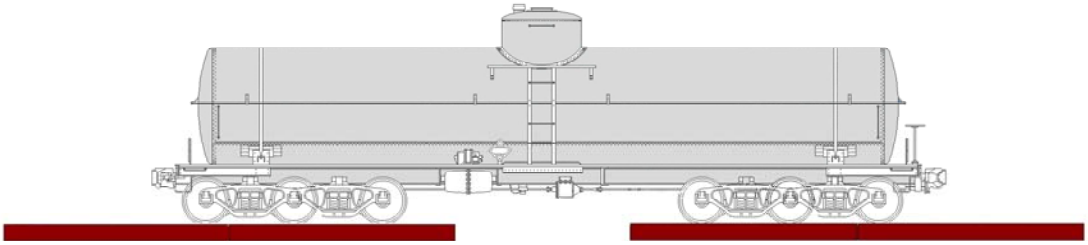


- A short railcar is spotted or placed into position for weighing on a single-double combination scale
- Each truck weighs 131 500 lb for a gross railcar weight of 263 000 lb
- The gross railcar weight does not exceed the nominal capacity of 340 000 lb



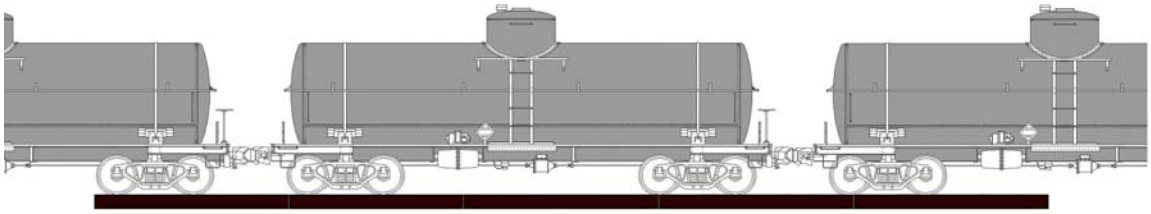
- The next car recouples to push the weighed railcar off the scale
- Each of the three trucks weighs 131 500 lb for a gross weight of 394 500 lb
- With 340 000 lb capacity, the scale is 54 500 lb overloaded under normal traffic
- The design load capacity (per railroad requirements) of this scale is 560 000 lb
- A nominal capacity of 400 000 lb would be acceptable in most applications

B - Six Axle Car on a Double-Double Scale



- Six axle railcar is spotted for weighing on a double-double combination scale
- Each truck weighs 192 000 lb for a gross weight of 384 000 lb
- With a 340 000 lb nominal capacity, this scale is overloaded by 44 000 lb
- The design load capacity of this scale (per railroad requirements) is 640 000 lb
- A nominal capacity of 600 000 lb would be acceptable in most applications

C - Railcars Moving on a 93-ft Modular Scale



- Railcars are moving across a 93 foot scale with seven 12 foot modules
- Each truck weighs 131 500 lb for a gross weight of 526 000 lb
- With a 340 000 lb nominal capacity, this scale is overloaded by 186 000 lb
- The design load capacity of this scale (per railroad requirements) is 1 044 000 lb
- A nominal capacity of 600 000 lb would be acceptable in most applications

320-4 N.1.3.1. Bench or Counter Scales, N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers, and Appendix D; Definition of Counter Scale

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

Recommendation: Amend paragraphs N.1.3.1. and N.1.3.8. and the definition of "counter scale" as follows:

N.1.3.1. Bench or Counter Scales. – For bench and counter scales with a single platform support, a ~~A~~ shift test shall be conducted with a half-capacity test load centered successively at four points equidistant between the center and the front, left, back, and right edges of the load-receiving element. For bench and counter scales with four platform supports, a shift test shall be conducted with a half-capacity test load centered, as nearly as possible, successively at the center of each quarter of the load receiving element, or with a quarter-capacity test load centered, as nearly as possible, successively over each main load support.

N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers. – For all scales with four platform supports, a ~~A~~ shift test shall be conducted with a half-capacity test load centered, as nearly as possible, successively at the center of each quarter of the load-receiving element, or with a quarter-capacity test load centered, as nearly as possible, successively over each main load support. For scales with a single platform support, a shift test shall be conducted with a half-capacity test load centered successively at four points equidistant between the center and the front, left, back, and right edges of the load-receiving element.

counter scale. ~~One~~ A scale that, by reason of its size, arrangement of parts, and ~~moderate~~ nominal capacity no greater than 100 kg, ~~is adapted for use on a counter or bench~~. Sometimes called "bench scale."

Discussion: There is some question about whether or not to classify certain scales as bench/counter scales or classify them as floor scales. This confusion has lead officials to perform different shift tests on the same device. In some instances, the shift tests were based on the requirements in NIST Handbook 44 paragraph N.1.3.1., which describes test load positions for bench/counter. In other instances, paragraph N.1.3.8. which addresses test load positions for other (platform) scales was applied to the same device model when it was classified as a floor scale.

Currently, Handbook 44 requires that bench/counter scale shift tests are conducted with a half capacity test load centered successively at four points equidistant between the center and the front, left, back and the right edges of the load-receiving element (see paragraph N.1.3.1.). Shift tests on other types of platform scales are conducted with one-half capacity test load centered, as nearly as possible, successively at the center of each quadrant. (See paragraph N.1.3.8.) Several

manufacturers have indicated that it is an unfair test to place one-quarter scale capacity on the corners of a single load cell scale when compared to placing one-quarter scale capacity in the corners of a scale with four load supports.

Additionally, Handbook 44 prescribes different requirements for the maximum loads that can be rezeroed in paragraph S.2.1.3. Scales Equipped with an Automatic Zero-Setting Mechanism for bench/counter scales (0.6 scale division) and for all other scales (1.0 scale division). The Weighing Sector believes that the capacity limitation on bench and counter scales clarifies that the AZSM limit (0.6 scale division) specified in paragraph S.2.1.3.applies to those devices.

The NTETC Weighing Sector agreed that the bench/counter scale and floor scales applications can be distinguished in two ways based on the number of platform supports and the device's nominal capacity rating.

The Weighing Sector recommends a capacity limit of 100 kg for bench/counter scales since many shipping scales have a nominal capacity of 100 lb to 200 lb are in commercial use on business counters or elevated conveyors and 100 kg (220 lb) is consistent with capacity limits set by Measurement Canada.

The Southern Weights and Measures Association (SWMA) agreed with limiting the capacity of a bench scale to 100 kg (220 lb); however, the SWMA does not concur with the proposed changes to paragraphs N.1.3.1. and N.1.3.8.

320-5 N.1.3.4. Vehicle Scales, Axle-Load Scales, and Livestock Scales With More Than Two Sections, N.1.3.4.1. Vehicle Scales, Axle-Load Scales, and Combination Vehicle/Livestock Scales, N.1.3.4.2. Prescribed Test Pattern and Test Loads for Livestock Scales and Combination Vehicle/Livestock Scales With More Than Two Sections and N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers

(Carryover Item 320-1B was separated into two parts, Items 320-5 and 320-9, after the 2002 NCWM Annual Meeting to facilitate review of the issues.)

Source: Carryover Item 320-1B. (This item originated from the National Type Evaluation Technical Committee (NTETC) Weighing Sector and first appeared on the Committee's Agenda in 2001 as Item 320-4.)

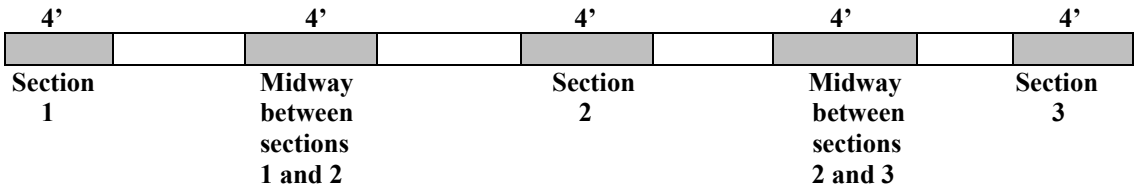
Recommendation: Modify paragraphs N.1.3.4. and N.1.3.4.1. as follows:

N.1.3.4. Vehicle Scales, Axle-Load Scales, and Livestock Scales ~~With More Than Two Sections~~

N.1.3.4.1. Vehicle Scales, Axle-Load Scales, and Combination Vehicle/Livestock Scales –

(a) Minimum Shift Test. At least one shift test shall be conducted with a minimum test load of 12.5% of scale capacity and may be performed anywhere on the load-receiving element using the prescribed test patterns and maximum test loads specified below. ~~(Two-section livestock scales shall be tested consistent with N.1.3.8.)~~ (Combination Vehicle/Livestock scales shall also be tested consistent with N.1.3.4.2.)

~~(a~~b) Prescribed Test Pattern and Loading for Vehicle and Axle-Load Scales and Combination Vehicle/Livestock Scales. The normal prescribed test pattern shall be an area of 1.2 m (4 ft) in length and 3.0 m (10 ft) in width or the width of the scale platform, whichever is less. Multiple test patterns may be utilized when loaded in accordance with Paragraph (~~b~~) (c), (d), or (e) as applicable.



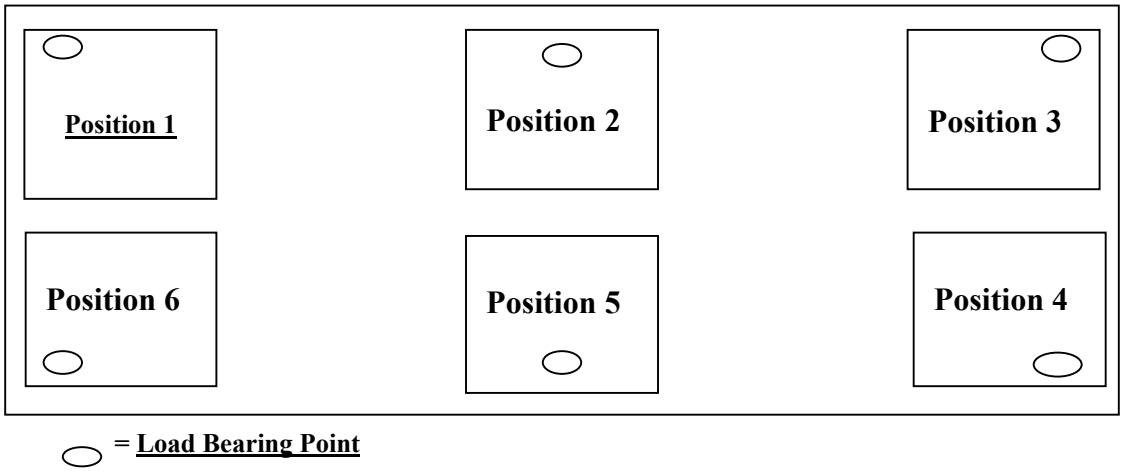
(~~b~~c) ~~Maximum~~ Loading Precautions *for Vehicle, Axle-Load Scale, and Combination Vehicle/Livestock Scales*. When loading the scale for testing, one side of the test pattern shall be loaded to no more than half of the concentrated load capacity or test load before loading the other side. The area covered by the test load may be less than 1.2 m (4 ft) *x 3.0 m (10 ft) or* the width of the scale *platform whichever is less*; for test patterns less than 1.2 m (4 ft) in length the maximum loading shall meet the formula: [(wheel base of test cart or length of test load divided by 48 in) x 0.9 x CLC]. The maximum test load applied to each test pattern shall not exceed the concentrated load capacity of the scale. When the test pattern exceeds 1.2 m (4 ft), the maximum test load applied shall not exceed the concentrated load capacity times the largest "r" factor in Table UR.3.2.1. for the length of the area covered by the test load. For weighing elements installed prior to January 1, 1989, the rated section capacity may be substituted for concentrated load capacity to determine maximum loading. An example of a possible test pattern is shown ~~below~~ above.

(~~c~~d) Multiple Pattern Loading. To test the nominal capacity, multiple patterns may be simultaneously loaded in a manner consistent with the method of use.

(~~d~~e) Other Designs. Special design scales and those that are wider than 3.7 m (12 ft) shall be tested in a manner consistent with the method of use but following the principles described above.

Add a new paragraph N.1.3.4.2 as follows:

N.1.3.4.2. Prescribed Test Pattern and Test Loads for Livestock Scales and Combination Vehicle/Livestock Scales with More Than Two Sections. - Test load is one-quarter nominal capacity not to exceed one-half of the rated section capacity, centered as nearly as possible, successively over each main load support as shown in the diagram below. For livestock scales manufactured between January 1, 1989 and January 1, 2003, the required loading shall be no greater than one-half CLC. (Two-section livestock scales shall be tested consistent with N.1.3.8.)



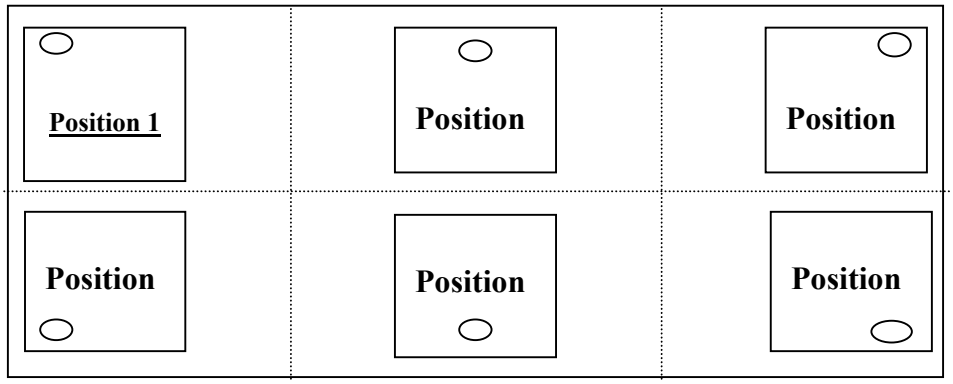
= Load Bearing Point

The Central Weights and Measures Association (CWMA) recommends alternate new paragraph N.1.3.4.2. that corresponds to the diagram as follows:

> **N.1.3.4.2. Prescribed Test Pattern and Test Loads for Livestock Scales and Combination Vehicle/Livestock Scales with More Than Two Sections. Minimum test load of is 12.5 percent of device capacity not to exceed one-half of the rated section centered as nearly as possible, successively over each main load support as shown in the diagram below. For livestock scales manufactured between January 1, 1989, and January 1, 2003, the required loading shall be no greater than one-half CLC. (Two-section livestock scales shall be tested consistent with N.1.3.8.)**

The NTETC Weighing Sector recommends an alternate new paragraph N.1.3.4.2. and associated diagram as follows:

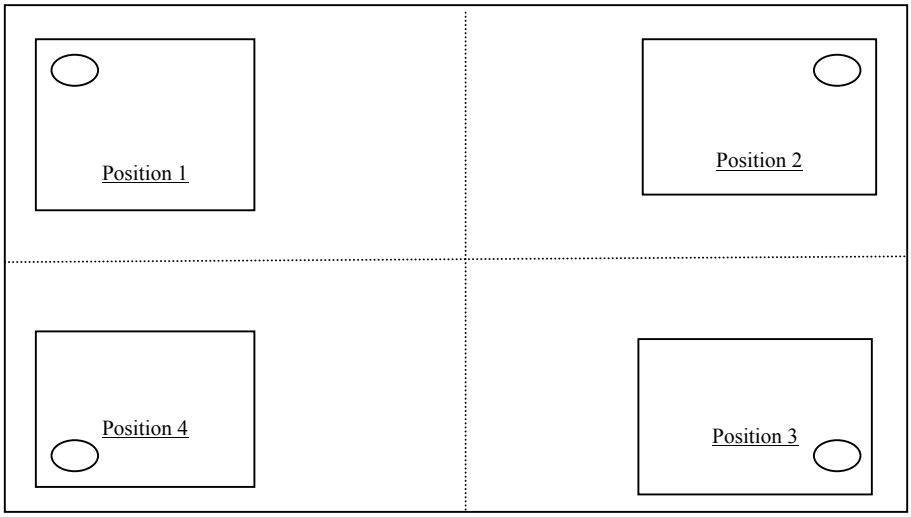
> **N.1.3.4.2. Prescribed Test Pattern and Test Loads for Livestock Scales with More Than Two Sections and Combination Vehicle/Livestock Scales. A minimum test load of 5000 kg (10 000 lb) or one-half of the rated section capacity, whichever is less, shall be placed, as nearly as possible, successively over each main load support as shown in the diagram below. For livestock scales manufactured between January 1, 1989, and January 1, 2003, the required loading shall be no greater than one-half CLC. (Two-section livestock scales shall be tested consistent with N.1.3.8.)**



Modify paragraph N.1.3.8. as follows:

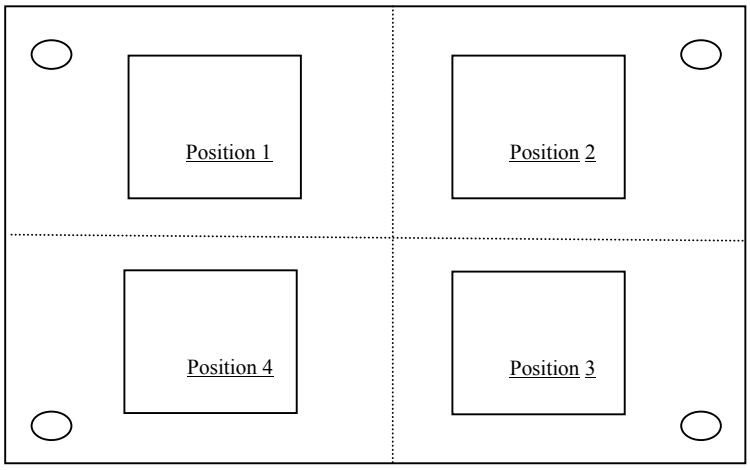
> **N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers. – A shift test shall be conducted using the following prescribed test loads and test patterns. ~~with a half-capacity test load centered, as nearly as possible, successively at the center of each quarter of the load-receiving element, or with a quarter-capacity test load centered, as nearly as possible, successively over each main load support.~~ For livestock scales the shift test load shall not exceed one-half the rated section capacity.**

(a) A shift test load shall be conducted using a one-quarter nominal capacity test load centered as nearly as possible, successively over each main load support as shown in the diagram below, or



= **Load Bearing Point**

(b) A shift test load shall be conducted using a one-half nominal capacity test load centered as nearly as possible, successively at the center of each quarter of the load-receiving element as shown in the diagram below.



= **Load Bearing Point**

The Western Weights and Measures Association (WWMA) received input from the Scale Manufacturers Association that the proposal requires extensive additional NTEP testing, if the declared section capacity is equal to the CLC for livestock/vehicle scales. Consequently, the WWMA recommends modifying Table S.6.3.a. Marking Requirements Note 22 as follows:

22. Combination vehicle/livestock scales must be marked with both the CLC for vehicle weighing and the section capacity for livestock weighing. All other requirements relative to these markings will apply.
[Nonretroactive January 1, 2003.]
Note: The marked section capacity for livestock weighing may be less than the marked CLC for vehicle weighing.

Discussion: In 2001, the Committee considered language that prescribes the appropriate test load patterns, the maximum test load, and capacity ratings for safe and adequate test of a device's performance in vehicle and livestock scale applications. The 2001 proposal also included language to modify the definition of concentrated load capacity (CLC). In 2002, the Committee agreed that the proposal in the recommendation above documents shift tests and test load patterns currently in use when testing livestock and vehicle scales; however, the proposal did not receive the majority vote necessary to modify requirements in Handbook 44. The proposal was returned to the Committee. The proposal to modify the definition of concentrated load capacity to eliminate any reference to livestock scales now appears as agenda item 320-9 to facilitate review of both issues. The Committee still believes the proposal provides clear procedures for the test of vehicle and livestock scales.

The Scale Manufacturers Association (SMA) distributed a letter dated September 20, 2002 documenting their concerns about the proposal for test load patterns and maximum test loads. More specifically, the letter stated that the test loads were too large and that test patterns were undefined. The SMA also believes that the shift test pattern for livestock scales should be more simply defined as it was prior to 1988, for example:

> N.1.3.4.2. Livestock Scales With More Than Two Sections. – A shift test equal to one-half the rated sectional capacity shall be conducted with test loads distributed over each section of the scale. (Two section livestock scales shall be tested consistent with N.1.3.8.)

The Northeastern Weights and Measures Association recommends that the proposal remain informational to allow sufficient time to address the concerns expressed by the SMA.

At its 2002 meeting, the Weighing Sector agreed to support a separate proposal to make the definition for concentrated load capacity a separate agenda item from the item to establish test patterns and test loads for livestock scales. The Weighing Sector agreed with the Central Weights and Measures Association recommendation that an adequate test of a main load support consist of a test load of 12.5 percent of scale capacity, not to exceed one-half section capacity. The Sector noted that the test load of 12.5 percent of scale capacity provides an adequate test of the performance of the load support and also addresses safety concerns that might arise when stacking weights. The Weighing Sector proposes an alternate new paragraph N.1.3.4.2. and associated diagram shown in the recommendation above that specifies a minimum test load of 10 000 lb to facilitate the safe application of test weights while applying a load that more closely simulates the potential concentration of livestock in the corner of the scale. The language in the Weighing Sector proposal is intended to permit weights and measures officials and NTEP laboratories to conduct a shift test up to 12.5 percent of scale capacity.

The Weighing Sector reviewed the SMA proposal, but believes that testing over main load supports more accurately reflects the actual usage of livestock scales. The Weighing Sector added broken lines to the test pattern diagram in paragraph N.1.3.4.2. to indicate that test loads should not be centered over the main load bearing points.

For additional background on this item, refer to the 2001 and 2002 S&T Final Reports.

320-6 N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers, T.N.3.4. Crane and Hopper (Other than Grain Hopper) Scales, Table 3 Parameters for Accuracy Classes; Footnote 3, Table 7a. Typical Class or Type of Device for Weighing Operations, and Appendix D; Definition of Crane Scale and Hanging Scale

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

Recommendation: Modify paragraphs N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers and T.N.3.4. Crane and Hopper (Other than Grain Hopper) Scales as follows:

N.1.3.8. All Other Scales Except ~~Crane Scales~~, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers. – A shift test shall be conducted with a half-capacity test load centered, as nearly as possible, successively at the center of each quarter of the load-receiving element, or with a quarter-capacity test load centered, as nearly as possible, successively over each main load support.

T.N.3.4. ~~Crane~~ Class III L Hanging and Hopper (Other than Grain Hopper) Scales. – The maintenance and acceptance tolerances shall be as specified in T.N.3.1. and T.N.3.2. for Class III L, except that the tolerance for ~~crane~~ Class III L hanging and construction materials hopper scales shall not be less than 1d or 0.1 percent of the scale capacity, whichever is less.

Modify Table 3 Parameters for Accuracy Classes Footnote 3 as follows:

[3] The value of a scale division for ~~crane~~ Class III L hanging and hopper (other than grain hopper) scales shall be not less than 0.2 kg (0.5 lb). The minimum number of scale divisions shall be not less than 1 000.

Modify Table 7a. Typical Class or Type of Device for Weighing Operations, and Table 7b. Applicable to Devices not Marked with a Class Designation as follows:

Table 7a.
Typical Class or Type of Device for Weighing Operations

Class	Weighing Application or Scale Type
I	Precision laboratory weighing
II	Laboratory weighing, precious metals and gem weighing, grain test scales
III	All commercial weighing not otherwise specified, grain test scales, retail precious metals and semi-precious gem weighing, animal scales, postal scales, scales used to determine laundry charges, hanging, and vehicle on-board weighing systems
III L	Vehicle, axle-load, livestock, railway track scales, ~~crane~~ hanging, hopper (other than grain hopper) scales, and vehicle on-board weighing systems
IIII	Wheel-load weighers and portable axle-load weighers used for highway weight enforcement

Note: A scale with a higher accuracy class than that specified as "typical" may be used.

Table 7b. Applicable to Devices not Marked with a Class Designation	
Scale Type or Design	**Maximum Value of d**
Retail Food Scales, capacity less than or equal to 50 lb	**1 ounce**
Animal Scales	**1 pound**
Grain Hopper Scales **Capacity up to and incl. 50 000 lb** **Capacity over 50 000 lb**	 **10 pounds (not greater than 0.05 % of capacity)** **20 pounds**
~~Crane~~ Hanging Scales – Capacity 5000 lb and over	**Not greater than 0.2 % of capacity**
Vehicle and Axle-Load Scales Used in Combination **Capacity up to and including 200 000 lb** **Capacity over 200 000 lb**	 **20 pounds** **50 pounds**
Railway Track Scales **With weighbeams** **Automatic indicating**	 **20 pounds** **100 pounds**
Scales with capacities greater than 500 lb except otherwise specified	**0.1 % capacity (but not greater than 50 lb)**
Wheel-Load Weighers	**0.25 % capacity (but not greater than 50 lb)**
Note: For scales not specified in this table, G-UR.1.1. and UR.1. apply.	

Delete the Appendix D; Definition of Crane Scale as follows:

> **~~crane scale. One with a nominal capacity of 5000 pounds or more designed to weigh loads while they are suspended freely from an overhead, track-mounted crane.~~**

Add the following new definition of "hanging scale" to Appendix D as follows:

> **hanging scale. A scale designed to weigh loads while they are suspended from a hook on the scale or loads resting on a platter or platform that is suspended from the scale. Hanging scales may be any capacity and may be Class III or III L, whichever is appropriate for the intended use, as long as all parameters for the intended class are met. Sometimes called "crane scale."**

Discussion: Existing criteria for determining hanging scale applications from crane scale applications are not clear and are inconsistent. Currently, the term "hanging scale" is not defined in NIST Handbook 44 although the term is cited in several requirements in the Scales Code.

Handbook 44 Scales Code Table 3 Parameters for Accuracy Classes, Footnote 3 specifies that the minimum permissible capacity for a crane scale is 500 lb; however, the existing Handbook 44 definition states that a crane scale has a nominal capacity of 5000 lb or more. The Weighing Sector also noted there are also inconsistencies in the use of the term crane scale in Handbook 44 and NTEP Certificates of Conformance (CC). Several CCs were issued to families of electronic scales with capacities that range from 1000 lb to 50 000 lb, with hanging and crane scale designations.

The only difference in the installation of a hanging scales and a crane scales appears to be that hanging scales are suspended from fixed supports while crane scales are suspended from overhead, track-mounted cranes. However, some overhead, track-mounted scales might easily be suspended from other types of cranes or supporting structures. The Weighing Sector believes that the design of a scale's support structure (overhead crane, fixed support, etc.) should not be the factor that determines device type.

The Southern Weights and Measures Association recommends further study on how the proposals will impact existing devices.

320-7 T.N.8.3.1.(a) Power Supply, Voltage and Frequency

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

Recommendation: Modify paragraph T.N.8.3.1.(a) as follows:

T.N.8.3.1.(a) Power Supply, Voltage and Frequency.

(a) Weighing devices that operate using alternating current must perform within the conditions defined in paragraphs T.N. 3. through T. N. 7., inclusive, over the line voltage range as marked ~~of 100 V to 130 V or 200 V to 250 V rms as appropriate, and over the frequency range of 59.5 Hz to~~ at 60~~..5~~ Hz.

The Southern Weights and Measures Association (SWMA) recommends alternative changes to paragraph T.N.8.3.1.(a) as follows:

T.N.8.3.1.(a) Power Supply, Voltage and Frequency.

(a) Weighing devices that operate from a main power supply must perform within the conditions defined in paragraphs T.N.3. through T.N.7., inclusive if the power supply varies in voltage from – 15 percent to + 10 percent of the value marked on the device. If a range of voltage is marked, the device shall operate within the conditions defined in paragraphs T.N.3. through T.N. 7., inclusive at a voltage of + 10 percent of the maximum voltage marked on the device and at a voltage of –15 percent of the minimum voltage marked on the device ~~using alternating current must perform within the conditions defined in paragraphs T.N.3. through T.N.7., inclusive, over the line voltage range of 100 V to 130 V or 200 V to 250 V rms as appropriate, and over the frequency range of 59.5 Hz to 60.5 Hz.~~

Discussion: NTEP Participating Laboratories report an increase in the number of devices submitted for type evaluation with voltage ranges wider than the voltages listed in NIST Handbook 44 paragraph T.N.8.3.1. For example, a device might be marked with a voltage range of 80 V to 170 V. The Participating Laboratories believe that testing over the entire voltage range is not supported by language in paragraph T.N.8.3.1.

The NTETC Weighing Sector reviewed the Canadian and OIML voltage requirements. In the Canadian requirements for maximum and minimum specified voltage, devices may be marked with a nominal voltage of 117 V or 225 V or other voltage. When a device is marked with a voltage range the midpoint is taken as the nominal voltage. The device is tested at –15 percent and +10 percent of the marked nominal voltage. Devices marked with a range are tested to the *greater* of –15 percent and +10 percent of the midpoint nominal voltage or the maximum and minimum indicated voltage range values. OIML R 76-1, Nonautomatic Weighing Instruments, Part 1: Metrological and Technical Requirements – Tests (Edition 1992 E) requires test of the device at –15 percent of the maximum marked voltage and +10 percent of the minimum marked voltage.

The Weighing Sector developed a proposal to modify paragraph T.N.8.3.1.(a) that require tests over the marked voltage range rather than a specified voltage range. Performance tests would be conducted at the device's marked maximum voltage, minimum voltage, and nominal voltage (voltage value at the midpoint of the range).

The SWMA agreed to alternate changes to paragraph T.N.8.3.1.(a) as shown in the recommendation above. The SWMA believes its alternate language provides a requirement that harmonizes with OIML requirements.

The Weighing Sector also questions whether performance tests during variations in frequency are appropriate. Currently, NTEP does not test for a change in line frequency of + 0.5 Hz because the test equipment is very expensive. Manufacturers indicate that today's weighing devices are capable of performing over a much larger voltage and frequency range than specified in Handbook 44 because devices are equipped with one version of power supply that is suitable for the worldwide marketplace.

320-8 UR.1.6. Average Net Load; Class III Scales

Source: Carryover Item 320-3. (This item originated in the Central Weights and Measures Association (CWMA) and first appeared on the Committee's 2002 agenda.)

Recommendation: Add new paragraph UR.1.6. Average Net Load – Class III Scales and Table as follows:

UR.1.6. Average Net Load – Class III Scales. – To be suitable for its application, a Class III scale shall have a division such that the requirements of the following table are satisfied for the minimum and average loads weighed on the scale.

Range of Scale Capacities	*Average Net Load **
Capacities up to and including 1000 kg (2500 lb)	*Average net load ≥ 100d*
Capacities greater than 1000 kg (2500 lb)	*Average net load ≥ 500d*

[Nonretroactive as of January 1, 2003]

**** See Table 8 for recommended minimum load.***

Background/Discussion: Device suitability for particular commercial applications is a recurrent issue on the S&T Agenda and generates many questions in the weights and measures community. This proposal is intended to incorporate guidelines into NIST Handbook 44 requirements to assist business owners in the purchase of suitable equipment and to provide industry and weights and measures officials with a uniform method for assessing the suitability of a device in an application. The Committee has discussed factors such as the size of the purchase, the size of the scale division, and the commodity price and how these factors affect the magnitude of scale error.

In 1992, the Committee considered a proposal from the CWMA to express the suitability requirements for scales as two separate formulae. Scales marked with an accuracy class would be required to satisfy a formula for the minimum net load and a formula for the average net load. Scales not marked with an accuracy class must comply with Table 7b which specifies a maximum value of d for a particular scale type or design. The scale division value was dependent on the scale capacity. The value of d for scales with capacities from 5 lb to 2 500 lb, inclusive, were allowed to be a larger percentage of the minimum net load and average net load than scales with capacities less than 5 lb and greater than 2 500 lb.

In 1994, the NCWM adopted guidelines to determine the average net load of purchases on Class III scales. The average net load information was still necessary to evaluate the suitability of a scale for an application. However, the guidelines were not included in NIST Handbook 44 requirements, hence weights and measures officials find it difficult to enforce suitability requirements. Inconsistencies in the determination of a minimum load requirement for a device continue to be a concern to industry and weights and measures officials.

Regional weights and measures associations agreed that better criteria are needed to determine the suitability of a device. Several regional associations recommend making the proposal a developing item to allow time to develop criteria. The CWMA believes that weights and measures can obtain information about average net loads from the retailer. In instances where the retailer and weights and measures officials do not agree on the average net load, the burden of proof lies with the retailer. The CWMA also provided the following list of examples submitted by Nebraska which demonstrates how to determine the suitability of Class III scales used in specific applications.

CWMA Suitability Examples for Average Net Load (ANL)

d – scale division
*NIST Handbook 44 specifies scale division "d" must be expressed in units of 1,2, or 5

	Typical Application	Example	Formula
1	Supermarket Checkstand	•Most transactions involve produce that weighs from 0.5 lb to 5 lb, with infrequent weighments above and below that range •The average net load is approximately 2 lb •Using the formula for a scale with a capacity up to 2500 lb: A division of 0.02 lb or less is suitable	$d \leq 1\ \% \times ANL$ $d \leq 0.01 \times 2\ lb$ $d \leq 0.02\ lb$
2	Supermarket Deli Scale	•Most transactions involve weighments between 0.25 lb to 3 lb •The average net load is approximately 1 lb •Using the formula for a scale with a capacity up to 2500 lb: A division of 0.01 lb or less is suitable	$d \leq 1\ \% \times ANL$ $d \leq 0.01 \times 1\ lb$ $d \leq 0.01\ lb$
3	Specialty Shop Scale – Shopping Mall (30 lb x 0.01 lb electronic scale)	•Most transactions involve weighments of coffee, tea, tobacco, spices, or chocolates between 0.12 lb (2 oz) to 1 lb •The average net load is approximately 0.5 lb •Using the formula for a scale with a capacity up to 2500 lb: A division of 0.005 lb or less is suitable, the scale in use is not suitable for this application	$d \leq 1\ \% \times ANL$ $d \leq 0.01 \times 0.5\ lb$ $d \leq 0.005\ lb$
4	Hopper Scale	•The average net load is approximately 9500 lb •Using the formula for a scale with a capacity above 2500 lb: A division of 10 lb or less is suitable	$d \leq 2\ \% \times ANL$ $d \leq 0.02 \times 9500\ lb$ $d \leq 19\ lb$ * d is 10 lb
5	Platform Scale (500 lb x 4 oz scale for buying aluminum cans-new business)	•Weights and measures informs a business a device is suitable for weighments above 25 lb •However the average net load is approximately 5 lb •Using the formula for a scale with a capacity up to 2500 lb: A division of 0.05 lb or less is suitable	$d \leq 1\ \% \times ANL$ $d \leq 0.01 \times 5\ lb$ $d \leq 0.05\ lb$
6	Grain Scale	•Most weighments are used for a moisture test •The average net load is 250 g	$d \leq 2\ \% \times ANL$ $d \leq 0.02 \times 250\ g$

CWMA Suitability Examples for
Average Net Load (ANL)

d – scale division
*NIST Handbook 44 specifies scale division "d" must be expressed in units of 1,2, or 5

	Typical Application	Example	Formula
		•Using the formula for a scale with a capacity up to 2500 lb: A division of 0.1 g is suitable, in fact a d ≤ 5 g is suitable	d ≤ 5 g
7	Other Scale	•Most weighments are of hog heads or sheep •The average net load is 200 lb •Using the formula for a scale with a capacity up to 2500 lb: A division of 2 lb or is suitable	d ≤ 1 % x ANL d ≤ 0.01 x 200 lb d ≤ 2 lb
8	Monorail Scale (packing house)	•Most weighments are of carcasses •The average net load is 180 lb •Using the formula for a scale with a capacity up to 2500 lb: A division of 1 lb or less is suitable	d ≤ 1 % x ANL d ≤ 0.01 x 180 lb d ≤ 1.8 lb

For more background information, refer to the 1992 and 2002 S&T Final Reports.

320-9 Appendix D; Definition for Concentrated Load Capacity (CLC); Dual Tandem Axle Capacity

(Carryover Item 320-1B was separated into two parts, Items 320-5 and 320-9, after the 2002 NCWM Annual Meeting to facilitate review of the issues.)

Source: Carryover Item 320-1B. (This item originated from the National Type Evaluation Technical Committee (NTETC) Weighing Sector and first appeared on the Committee's Agenda in 2001 as Item 320-4.)

Recommendation: Modify the definition of Concentrated Load Capacity in Appendix D as follows:

> **concentrated load capacity (CLC). A capacity rating of a vehicle~~,~~ or axle-load ~~or livestock~~ scale, specified by the manufacturer, defining the maximum load ~~concentration~~ applied by a group of two axles with a centerline spaced 4 feet apart and an axle width of 8 feet for which the weighbridge is designed. ~~In the case of vehicle and axle-load scales, it is the maximum axle-load concentration (for a group of two axles with a centerline spaced 4 feet apart and an axle width of 8 feet) for which the weighbridge is designed as specified by the manufacturer.~~ The concentrated load capacity rating is for both test and use. [2.20]**

The Western and Southern Weights and Measures Associations recommend an alternate definition of concentrated load capacity as follows:

> **concentrated load capacity (CLC) (also referred to as Dual Tandem Axle Capacity (DTAC)). A capacity rating of a vehicle~~,~~ or axle-load ~~or livestock~~ scale, specified by the manufacturer, defining the maximum load ~~concentration~~ applied by a group of two axles with a centerline spaced 4 feet apart and an axle width of 8 feet for which the weighbridge is designed. ~~In the case of vehicle and axle-load scales, it is the maximum axle-load concentration (for a group of~~**

~~**two axles with a centerline spaced 4 feet apart and an axle width of 8 feet) for which the weighbridge is designed as specified by the manufacturer.**~~ **The concentrated load capacity rating is for both test and use. [2.20]**

Discussion: In July 2002, the NCWM considered language that prescribes the appropriate test load patterns, maximum test load, and capacity ratings for safe and adequate test of a device's performance in vehicle and livestock scale applications. The NCWM adopted requirements for the nominal capacity of livestock scales based on section capacity rather than concentrated load capacity. The NCWM also considered as part of the 2002 proposal, language to modify the definition of concentrated load capacity (CLC) to eliminate any reference to livestock scales since CLC was intended to address the maximum load rating for a weighbridge based on a typical tandem axle vehicle's footprint rather than livestock loading patterns. The proposal to modify the definition of CLC did not receive the majority vote necessary to make changes to NIST Handbook 44. The item was returned to the Committee and now appears as two separate issues, Item 320-5 and Item 320-9.

The Western and Southern Weights and Measures Associations agreed to support an alternate proposal to change the definition of CLC as shown in the recommendation above. The regional associations noted that weighbridges are designed for a load applied by a group of two axles with a centerline spaced 4 feet apart and an axle width of 8 feet. The two (dual) axles are routinely referred to as a tandem axle. Industry representatives report that dual tandem axle capacity (DTAC) is cited in equipment literature rather than CLC because users are not familiar with CLC. However, some manufacturers declare a CLC based on the amount of test weight applied during a shift test which exceeds the weighbridge design load. The regional associations are concerned that manufacturers who declare different CLC and DTAC ratings do not recognize that CLC refers to dual axles or that the ratings might be misleading the buyer.

For more background information, refer to the 2001 and 2002 S&T Final Reports.

320-10 Appendix D; Definition of Substitution Test and Substitution Test Load

Source: Carryover Item 320-8 (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 2000 agenda as Item 320-6.)

Recommendation: The Committee recommends that the following definitions for "substitution test" and "substitution test load" be added to NIST Handbook 44:

substitution test. A scale testing process used to quantify the weight of unknown material or objects for use as a known test load. In the process, the unknown material or objects are substituted for known test weights, or a combination of known test weights and previously quantified material or objects, using the scale under test as a comparator. Additional test weights or other known test loads may be added to this known test load to evaluate higher weight ranges on the scale. Tolerances are applied to the scale based on the entire known test load.

substitution test load. The sum of the combination of field standard test weights and any other applied load used in the conduct of a test using substitution test methods.

The Central Weights and Measures Association recommends splitting the proposal into three separate items to include alternate definitions for substitution test and substitution test load, and to address new tolerances, and new test procedures as follows:

320-10(a) Appendix D; Definition of Substitution Test and Substitution Test Load

substitution test. - A scale testing process used to quantify the weight of unknown material or objects for use as a known test load.

substitution test load. - The sum of the combination of field standard test weights and any other applied load used in the conduct of a test using substitution.

320-10(b) N.1.X. Substitution Test and T.X. Tolerances for Substitution Test

N.1.X. Substitution Test. - In the process, the unknown material or objects are substituted for known test weights, or a combination of known test weights and previously quantified material or objects, using the scale under test as a comparator. Additional test weights or other known test loads may be added to this known test load to evaluate higher weight ranges on the scale.

T.X. Tolerances for Substitution Test. - Tolerances are applied to the scale based on the entire known test load.

320-10(c) N.1.X. Strain-Load Test and T.X. Tolerances for Strain-Load Test

N.1.X. Strain-Load Test. - In this procedure, unknown material or objects are used to establish a reference load or tare to which known test weights are added.

T.X. Tolerances for Strain-Load Test. - The tolerances to be applied to the change in indication of the unknown load, to the sum of the indications for total unknown load, and known test weights are based on the known test weights.

Discussion/Background: The substitution test procedures were developed in 1965 prior to the widespread use of electronic scales. Since 1999, the lack of a definition for the term "substitution test" has created much discussion and confusion about the meaning of the term "substitution load" and other related terms such as "strain load test," "build-up test," and "step test." Many discussions about "substitution tests" have focused on (1) uncertainties associated with repeating the procedure, (2) the effects of the environment on uncertainties, (3) the ability to bring the amount of materials to the exact amount of known weights, (4) the need to address operational differences in technology (mechanical vs. electronic) and device types in test procedures, and (5) keeping test procedures separate from definitions.

The Committee agreed that the definition of substitution test developed by Ross Andersen (New York Bureau of Weights and Measures) shown in the recommendation above adequately describes the test load and test procedure and relevant tolerances without being too restrictive or documenting the details of field procedures. The Committee also agreed with New York's proposed definition of test load which clarifies that the term applies to the substitution process.

OWM recommended a modified version of the current definition of "strain-load test" that is more consistent with the current recommendation above to modify "substitution test" as follows:

strain-load test. ~~The test of a scale beginning with the scale under load and applying known test weights to determine accuracy over a portion of the weighing range. The scale errors for a strain-load test are the errors observed for the known test loads only.~~ A scale testing procedure that uses a quantity of unknown material or objects in addition to known test weights in order to test a scale with a load greater than the known test weights. In this procedure, unknown material or objects are used to establish a reference load or tare to which known test weights are added. The tolerances to be applied to the change in indication of the unknown load to the sum of the indications for total unknown load and known test weights are based on the known test weights ~~load used for each error that is determined~~. Substitution test loads can be used in lieu of known test weights.

The proposal was kept an information item to determine if there are acceptable limits for the variation between the scale indications for known test weight and the substitution load and to eliminate any test procedures from the definition in favor of including the information in an examination procedure outline.

The Western Weights and Measures Association (WWMA) supports the definitions for substitution test, substitution test load, and strain load. The WWMA recommends that appropriate procedures be developed for using the substitution test

method for mechanical and electronic devices and that information be included in an examination procedure outline (EPO)**.**

The CWMA recommends alternate definitions shown in the recommendation above that were simplified by eliminating all procedural language. The CWMA also proposes to eliminate any confusion between the terms substitution test and strain-load test by creating separate procedures for both tests.

For additional background information on this item, refer to the 2000 and 2001 S&T Final Reports.

322 Automatic Bulk Weighing Systems

322-1 Tolerances

Source: Carryover Item 322-1. This item originated from the Northeastern Weights and Measures Association (NEWMA) and first appeared on the Committee's 2002 agenda.)

Recommendation: Delete paragraphs T.1.4., T.2., T.2.1, T.3.2. and T.3.3.; renumber paragraphs T.3. and T.3.1.; add new paragraphs T.2.2, T.2.3., and T.2.3.1. and Table 1 and Table 2; and add a new footnote to Section 2.20 Scales Table 1.1.1. as follows:

~~**T.1.4. To Tests Involving Digital Indications or Representations. - To the tolerances that would otherwise be applied, there shall be added an amount equal to one-half the value of the scale division. This does not apply to digital indications or recorded representations that have been corrected for rounding using error weights.**~~

~~**T.2. Minimum Tolerance Values. - The minimum tolerance value shall not be less than half the value of the scale division.**~~

~~**T.2.1. For Systems used to Weigh Construction Materials. - The minimum maintenance and acceptance tolerance shall be 0.1 percent of the weighing capacity of the system, or the value of the scale division, whichever is less .**~~

~~**T.3.2. For Systems used to Weigh Grain. - The basic maintenance tolerance shall be 0.1 percent of test load.**~~

~~**T.3.3. For all Other Systems. - The basic maintenance tolerance shall be 0.2 percent of test load.**~~

Renumber paragraphs T.3. and T.3.1. as follows:

T.~~3~~.2. Basic Tolerance Values.

T.~~3~~.2.1. Acceptance Tolerance. -The basic acceptance tolerance shall be one-half the basic maintenance tolerance but never less than 1 division.

Add new paragraphs T.2.2, T.2.3., and T.2.3.1. and Table 1 and Table 2 as follows:

T.2.2. General. - The tolerance applicable to devices not marked with an accuracy class shall have the tolerances applied as specified in Table 1. below.

Table 1. Tolerance for Unmarked Scales			
Type of Device	**Tolerance**	**Decreasing Load Multiplier**	**Other applicable Requirements**
Grain Hoppers	**Class III, T.2.3 (table 2)**	**1.0**	**T.2.1., T.2.3.1**
Other Systems	**Class III L, T.2.3 (table 2)**	**1.0**	**T.2.1., T.2.3.1**

T.2.3. Tolerances Applicable to Devices Marked III or III L.

T.2.3.1. Maintenance Tolerance Values - The maintenance tolerance values are specified in Table 2 below.

Table 2. Maintenance Tolerance for Marked Scales (All values in this table are in scale divisions) Tolerance in scale divisions				
	1	2	3	5
Class	Test Load			
III	0 - 500	501 - 2000	2001 - 4000	4001 +
III L	0 - 500	501 - 1000	(Add 1d for each additional 500d or fraction thereof)	

Add a new footnote to Section 2.20 Scales Code Table 1.1.1. Tolerances for Unmarked Scales as follows:

[X]Automatic bulk weighing systems see Section 2.22 for specifications and tolerances.

Discussion: NEWMA recommends changing the prescribed tolerances for automatic bulk weighing systems from a percentage basis to division values which are based on the device's accuracy class. NEWMA believes this change will align tolerances in the Automatic Bulk Weighing Systems Code and Scales Code. Additionally, NEWMA believes a footnote should be added to the Scales Code Table T.1.1. to avoid any confusion about devices that can be classified as automatic bulk weighing systems.

The Committee recognizes there is confusion over which weighing systems fall under the Automatic Bulk Weighing Systems Code. The Committee had encouraged the Technical Advisors to develop materials on automatic bulk weighing systems in time for presentations to the fall regional weights and measures association meetings. Consequently, the Committee kept this an information item.

The Western Weights and Measures Association agrees with the USDA, Grain Inspection Packers and Stockyard Administration (GIPSA) concerns about the proposed tolerances permitting additional inaccuracies in automatic bulk weighing systems. Consequently, the WWMA recommends the NCWM S&T Committee withdraw this item from the agenda.

NEWMA reports that New York supports returning the item to voting status. New York believes the changes to the tolerances are necessary to align the code with other scale codes. New York provided GIPSA with charts and tables to demonstrate that the proposed tolerances, based on scale divisions, only minimally change the current tolerances. The charts will be available at the 2003 NCWM Interim Meeting.

For more background information, refer to the 2002 S&T Final Report.

324 Automatic Weighing Systems

324-1 Tentative Status of the Automatic Weighing Systems Code

Source: Carryover Item 324-1. (This item originated from the Southern Weights and Measures Association (SWMA) and first appeared on the Committee's 2002 agenda.)

Recommendation: Change the status of the Automatic Weighing Systems Code from tentative to permanent

Discussion: The Automatic Weighing Systems Code was added to the 1996 edition of NIST Handbook 44 as a Tentative Code. In 2002, the adoption of the code as permanent code in Handbook 44 was delayed to resolve issues with several NTEP test criteria which are based on code requirements. On October 2-3, 2002, in Annapolis, Maryland, a work group met to review any remaining code issues. The Work Group discussed Handbook 44 requirements that limit a device to operating in a single unit of measure. The Work Group questioned the need for NTEP laboratories to perform line frequency and barometric pressure test. The Work Group noted that there are inconsistencies in the titles of several requirements. Manufacturers indicated great concern because devices that meet Handbook 44 tolerances are producing packages that do not comply with NIST Handbook 133 requirements. The Work Group plans to provide the Committee with proposals for changes to Handbook 44 at the 2003 NCWM Interim Meeting.

For more background information, refer to the 2002 S&T Final Report.

330 Liquid-Measuring Devices

330-1 S.2.1. Multiple Measuring Elements With a Single Provision for Sealing

Source: National Type Evaluation Technical Committee Measuring Sector

Recommendation: Add new paragraph to NIST NIST Handbook 44, Section 3.30. Liquid-Measuring Devices S.2.2.1. Multiple Measuring Elements with a Single Provision for Sealing as follows:

> **S.2.2.1. Multiple Measuring Elements with a Single Provision for Sealing. - A change to the adjustment of any measuring element within any multi-product dispenser with a single provision for sealing multiple measuring elements must be identified.**

Background/Discussion: At the June 2002 NTEP Laboratory Meeting, one of the participating laboratories indicated that field officials in their jurisdiction are having difficulty with multi-product dispensers that have only one sealing mechanism for two or more measuring elements. If field officials reject a meter for not meeting performance requirements, they have no way of determining which measuring elements have been recalibrated when they return to reinspect the dispenser after a service agency has made adjustments or repairs on the rejected device. During the performance of a subsequent inspection following adjustment or repair of the device, the field official may be required to test all grades and blends offered through the rejected dispenser to determine that only the correct measuring element was adjusted.

At its October 2002 meeting, the NTETC Measuring Sector developed a proposal to address the concern with retail motor-fuel dispensers that have only one sealing mechanism that provides the adjustment security for multiple measuring elements. The Sector agreed to forward the proposal to the S&T Committee for consideration.

At its October 2002 Annual Meeting the SWMA recommended that the proposal to add a new paragraph to NIST Handbook 44, Section 3.30. Liquid-Measuring Devices S.2.2.1. be forwarded to the NCWM S&T Committee as an information item.

330-2 S.4.4.1. Discharge Rates

Source: National Type Evaluation Technical Committee Measuring Sector

Recommendation: Modify NIST Handbook 44, Section 3.30. Liquid-Measuring Devices S.4.4.1. as follows:

> ***S.4.4.1. Discharge Rates. - On a retail device with a designed maximum discharge rate of 115 L (30 gal) per minute or greater, the maximum and minimum discharge rates shall be marked ~~on an exterior surface of the device and shall be visible after installation~~ in accordance with S.4.4.2. The minimum discharge rate shall not exceed 20 percent of the maximum discharge rate.***

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

Background/Discussion: During its 2002 Annual Meeting, the NCWM agreed to amend NIST Handbook 44 LMD Code paragraph S.4.4. Retail Devices by adding a new paragraph, S.4.4.2. *Location of Marking Information; Retail Motor-Fuel Dispenser* that requires that markings for G-S.1. Identification be located within a specified range of heights on a dispenser. The markings are also allowed to be located inside the dispenser. During the 2002 Measuring Sector meeting, it was noted the marking requirements for discharge rates are required to be located on an external surface of the device without any reference to being located within a specified height range. The Sector indicated that it is also appropriate to include the markings for discharge rates required in paragraph S.4.4.1. with the other markings in accordance with the requirements of paragraph S.4.4.2. Some weights and measures officials have incorrectly interpreted paragraph S.4.4.1. to mean that a flow rate greater than or less than 20 percent of the maximum discharge is not acceptable. The Sector agreed to forward to the S&T Committee through the SWMA a proposal to modify S.4.4.1. that includes an example of how the requirement should be applied.

At its October 2002 Annual Meeting the SWMA supported the proposed modification to S.4.4.1. and the accompanying example and recommended it be forwarded to the NCWM S&T Committee as a voting item.

330-3 UR.1.2. Nozzle Requirements

Source: Carryover Item 330-4. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 2002 agenda.)

Recommendation: Add a new paragraph to NIST NIST Handbook 44, Section 3.30. as follows:

UR.1.2. Nozzle Requirements for Diesel. Any hose from which diesel fuel is sold shall have a nozzle with an outside diameter of not less than 23.6 mm (0.93 in).

Background/Discussion: At the August 2001 WWMA Technical Conference, Idaho Weights and Measures reported receiving complaints from consumers who accidentally put diesel fuel into a gasoline-powered vehicle. All complaints were investigated and inspectors found that the pumps were properly labeled, but people still accidentally selected the wrong product. The proposed user requirement would help prevent this unfortunate mix-up. Idaho Weights and Measures reported that retail motor-fuel dispenser manufacturers follow the minimum size specification in the Society of Automotive Engineers (SAE) Recommended Practice, #J285, revised September 1992. The 1992 date for J285 indicates that automotive manufacturers have recommended for some time that fueling components meet this specification.

At the 2002 NCWM Annual Meeting, this item did not pass or fail; therefore, it was returned to the Committee for further consideration.

At its September 2002 Interim Meeting, the CWMA recommended that this item be withdrawn from the S&T Committee Agenda and a similar item be added to the L&R Committee Agenda.

At its September 2002 Annual Meeting, the WWMA received documentation that the SAE standard was reaffirmed in 1999. The WWMA recommends that the proposal be modified to include an effective date of January 1, 2005.

At its October 2002 Interim Meeting, the NEWMA recommended that this item be withdrawn from the agenda.

At its October 2002 Annual Meeting, the SWMA was provided information to demonstrate that this proposal would cause no economic hardship for device owners and continues to support this item.

For more background information, refer to the NCWM 2002 S&T Final Report.

330-4 UR.2.5. Product Identification

Source: National Type Evaluation Technical Committee Measuring Sector

Recommendation: Modify NIST Handbook 44, Section 3.30. Liquid-Measuring Devices UR.2.5. as follows:

UR.2.5. Product ~~Storage~~ Identification.

UR.2.5.1. Measuring Element Identification.

(a) The measuring elements seal of any multi-product dispenser with a single provision for sealing shall be plainly and visibly identified as to product being measured.

(b) When the measuring elements of any multi-product dispenser is marked by means of a color code, the color code key shall be conspicuously displayed at the place of business.

(Added 200X)

UR.2.5.2. Product Storage Identification.

(a) The fill connection for any petroleum product storage tank or vessel supplying motor-fuel devices shall be permanently, plainly, and visibly marked as to product contained.

(b) When the fill connection device is marked by means of a color code, the color code key shall be conspicuously displayed at the place of business.

(Added 1975 and Amended 1976 and renumbered 200X)

Background/Discussion: At the June 2002 NTEP Laboratory Meeting, one of the participating laboratories indicated that field officials in their jurisdiction are sometimes not able to determine which measuring element is associated with a particular grade or blend of fuel on multi-product dispensers. During a field examination of a multi-product dispenser if one grade or blend is rejected for not meeting performance requirements, the official does not know which measuring element to mark or tag as rejected. During the performance of a subsequent inspection following adjustment or repair of the device, the field official may be required to test all grades and blends offered through the rejected dispenser to determine that only the correct measuring element was adjusted.

At its October 2002 meeting, the NTETC Measuring Sector developed a proposal that requires a measuring element with an individual physical seal within any multi-product dispenser be plainly and visibly identified as to the product being measured. The Sector agreed to forward the proposal to the S&T Committee through the SWMA.

At its October 2002 Annual Meeting, the SWMA recommended that the proposed modification to NIST Handbook 44, Section 3.30. Liquid-Measuring Devices paragraph UR.2.5. be forwarded to the NCWM S&T Committee as a voting item.

330-5 UR.3.6.1.1. Temperature Compensation Wholesale – When to be Used

Source: Southern Weights and Measures Association (SWMA)

Recommendation: Revise NIST Handbook 44 Section 3.30. paragraph UR.3.6.1.2. to add a requirement that would require the buyer and seller of products measured or calculated using temperature compensation to do so for a twelve-month period, unless mutually agreed to do otherwise. The revision would be stated as follows:

UR.3.6.1.2. Invoices.

(a) A written invoice based on a reading of a device that is equipped with an automatic temperature compensator shall show that the volume delivered has been adjusted to the volume at 15 EC (60 EF).

(b) The invoice issued from an electronic wholesale device equipped with an automatic temperature compensating system shall also indicate: (1) the API gravity, specific gravity or coefficient of expansion for the product; (2) product temperature; and (3) gross reading. (Amended 1987)

(c) When fuel is bought or sold on a temperature-compensated basis, it shall be done over at least a consecutive 12-month period, unless otherwise agreed to by the buyer and the seller. (Added 200X)

Background/Discussion: At the October 2002 SWMA Annual Meeting, a weights and measures office expressed concern that temperature compensation is being selectively used during different times of the year. Depending on the temperature during the measurement the buyer or the seller may have an advantage. If a company uses temperature compensation, it must be to used for a consecutive 12-month period giving neither the buyer or the seller an advantage during a delivery. The SWMA agreed that the issue has merit and recommended it be forwarded to the NCWM S&T Committee as an information item.

330-6 Appendix D; Definition of Retail Device

Source: Carryover Item 330-7 (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 1999 agenda as Item 330-5.)

Recommendation: Modify the definition of retail devices as follows:

retail device. A liquid-measuring device primarily used for non-resale use.

~~**single deliveries of less than 378 L (100 gal),**~~

~~**retail deliveries of motor fuels to individual highway vehicles, or**~~

~~**single deliveries of liquefied petroleum gas for domestic use and liquefied petroleum gas or liquefied anhydrous ammonia for nonresale use.**~~
[3.30, 3.31, 3.32, 3.37]

Background/Discussion: **During the 2001 NCWM Annual Meeting, the Committee considered several proposals that define retail devices as those that deliver product to the final user. The Committee agreed that these proposals change devices, previously classified as wholesale devices, to retail devices that are held to a lesser tolerance.**

At the 2002 NCWM Interim Meeting, the Committee agreed that if Items 330-3A, 330-3B, and 331-3 were adopted, changes to the definition would be unnecessary and this item could be withdrawn from its agenda.

At the 2002 NCWM Annual Meeting, no comments were received on this item.

At its September 2002 Interim Meeting, the CWMA agreed that the word "primarily" is ambiguous and should be removed from the proposal.

At its September 2002 Annual Meeting, the WWMA supported the item as proposed.

At its October 2002 Interim Meeting, the NEWMA agreed that this item is unnecessary if accuracy classes are adopted for Section 3.32. through Section 3.36. and Section 3.38.

For more background information, refer to the 1999 through 2002 S&T Final Report.

331 Vehicle-Tank Meters

331-1 Recognition of Temperature Compensation

Source: Carryover Item 331-1 (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 2000 agenda as Item 331-1.)

Recommendation: Modify the Vehicle-Tank Meters Code (VTM) by adding the following paragraphs to recognize temperature compensation as follows:

S.2.4. Automatic Temperature Compensation for Refined Petroleum Products.

S.2.4.1. Automatic Temperature Compensation for Refined Petroleum Products. - A device may be equipped with an automatic means for adjusting the indication and registration of the measured volume of product to the volume at 15 °C (60 °F), where not prohibited by State Law.

S.2.4.2. Provision for Deactivating. - On a device equipped with an automatic temperature-compensating mechanism that will indicate or record only in terms of liters (gallons) compensated to 15 °C (60 °F), provision shall be made for deactivating the automatic temperature-compensating mechanism so that the meter can indicate and record, if it is equipped to record, in terms of the uncompensated volume.

S.2.4.2.X. Gross and Net Indications – A device equipped with automatic temperature compensation shall indicate and record, if equipped to record, both the gross (uncompensated) and net (compensated) volume for testing purposes. If both values cannot be displayed or recorded for the same test draft, means shall be provided to select either the gross or net indication for each test draft.

S.2.4.3. Provision for Sealing Automatic Temperature Compensating Systems. – Adequate provision shall be made for an approved means of security (e.g., data_change audit trail) or physically applying security seals in such a manner that an automatic temperature-compensating system cannot be disconnected and that no adjustment may be made to the system.

S.2.4.4. Temperature Determination with Automatic Temperature Compensation. - For test purposes, means shall be provided (e.g., thermometer well) to determine the temperature of the liquid either:

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

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

S.5.6. Temperature Compensation for Refined Petroleum Products. - If a device is equipped with an automatic temperature compensator, the primary indicating elements, recording elements, and recording representation shall be clearly and conspicuously marked to show that the volume delivered has been adjusted to the volume at 15 °C (60 °F).

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

(a) by comparing the compensated volume indicated or recorded to the actual delivered volume corrected to 15 °C (60 °F); and

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

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

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

T.2.1. Automatic Temperature-Compensating Systems. - The difference between the meter error (expressed as a percentage) for results determined with and without the automatic temperature-compensating system activated shall not exceed:

(a) 0.2 percent for mechanical automatic temperature-compensating systems; and

(b) 0.1 percent for electronic automatic temperature-compensating systems.

The delivered quantities for each test shall be approximately the same size. The results of each test shall be within the applicable acceptance or maintenance tolerance.

UR.2.5. Temperature Compensation for Refined Petroleum Products.

UR.2.5.1. Automatic.

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

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

UR.2.5.1.2. Invoices.

(a) An invoice based on a reading of a device that is equipped with an automatic temperature compensator shall show that the volume delivered has been adjusted to the volume at 15 °C (60 °F).

Discussion/Background: When this item was submitted, weights and measures officials indicated confusion about the specific meter applications that are covered by an NTEP Certificate of Conformance for a meter that includes the temperature-compensation feature. The WWMA acknowledged that there are jurisdictions that permit temperature compensated deliveries in applications that are not addressed by NIST Handbook 44. Other states do not allow the use of automatic temperature compensation for the delivery of products using a vehicle-tank meter.

At the 2002 NCWM Interim and Annual Meeting, the Committee also heard several comments supporting the item because the language does not require the use of temperature compensation. The item provides specifications, tolerances, test notes, and user requirements if a temperature compensated device is used. The Committee did hear some opposition to the proposal; however, the Committee concluded that the opposition was not supported by a technical argument. The Committee agreed to present the item for a vote at the 2002 NCWM Annual Meeting.

At the 2002 NCWM Annual Meeting, this item did not pass or fail; therefore, it was returned to the Committee for further consideration.

At its September 2002 Interim Meeting, the CWMA reaffirmed its recommendation that the L&R Committee adopt appropriate language for a method of sale requirement for temperature compensated vehicle-tank meters to promote uniformity.

At its September 2002 Annual Meeting, the WWMA supported this item as proposed and recommends that the NCWM S&T Committee move it forward as a voting item.

At its October 2002 Interim Meeting, the NEWMA recommended that the NCWM S&T Committee move this item forward as a voting item.

For additional background on this item see the NCWM 2000, 2001 and 2002 S&T Final Reports.

331-2 S.3.5. Discharge Valve

Source: Western Weights and Measures Association (WWMA)

Recommendation: Revise NIST Handbook 44 Section 3.31. by adding a sentence to S.3.5. of the Vehicle-Tank Meter Code as follows:

> **S.3.5 Discharge Valve- A discharge valve may be installed in the discharge line only if the device is of the wet-hose type *or is incorporated within an automatic pump discharge system*, in which case such valve shall be at the discharge end of the line. Any other shutoff valve on the discharge side of the meter shall be of the automatic or semiautomatic predetermined-stop type or shall be operable only:**
>
> **(a) by means of a tool (but not a pin) entirely separate from the device, or**
> **(b) by mutilation of a security seal with which the valve is sealed open.**

Discussion: Slytone Industries has put forth this proposal as part of its endeavor to have dry-hose delivery systems recognized in NIST Handbook 44. The changes proposed to Handbook 44 are necessary to allow the systems to begin the NTEP process. These systems will have to be evaluated for accuracy, repeatability and other requirements. The systems are currently in use in Germany and the United Kingdom.

At its September 2002 Annual Meeting, the WWMA recommended this item move forward as an information item.

At its October 2002 Annual Meeting, the SWMA recommended that this item move forward as an information item. The SWMA has concerns with the repeatability and performance accuracy for the described system and does not support changing NIST Handbook 44 until the manufacturer provides performance data for consideration.

331-3 S.3.2.X. Automatic Pump Discharge Unit

Source: Western Weights and Measures Association (WWMA)

Recommendation: Revise H44 Section 3.31. by adding a Specification S.3.2.X Automatic Pump Discharge Unit as follows:

S.3.2.X. Automatic Pump Discharge Unit. – On an automatic pump discharge unit the discharge hose may be of the dry-hose type with a shutoff valve at its outlet end, but only if:

(a) the pump discharge unit is completely automatic in that all openings and closing of valves incorporated within the system are controlled absolutely by the system, and

(b) a means is provided to ensure that the pump discharge system will be dry at the beginning and the end of each delivery, and

(c) a means is incorporated within the pump discharge system that detects if the hose end shutoff valve or any other valve downstream of the system is closed prematurely during the purging of the system to its dry state, thus preventing a complete delivery. In this case, means must be provided so that it will be impossible to end the delivery and print a delivery ticket. The system must provide the facility to automatically clear the discharge lines once the hose end shutoff valve has been opened or the obstruction preventing a complete delivery is removed, and

(d) in the event that a delivery is terminated before the pre-set quantity is reached or the delivery quantity is unknown at the beginning of the delivery, then means must be provided to return the product contained within the pump discharge system back to the tank truck compartment and be fully discharged so as to bring the system back to its dry state. The system must ensure that product is returned to the tank truck and that this quantity does not form part of the delivered quantity.

(e) There shall be incorporated an automatic vacuum breaker or equivalent means to prevent siphoning and to ensure the rapid and complete drainage of the automatic pump discharge unit.

Discussion: Slytone Industries has put forth this proposal as part of its endeavor to have dry hose delivery systems recognized in NIST Handbook 44. The changes proposed to Handbook 44 are necessary to allow the systems to begin the NTEP process. These systems will have to be evaluated for accuracy, repeatability and other requirements. The systems are currently in use in Germany and the United Kingdom.

At its September 2002 Annual Meeting, the WWMA recommended this item move forward as an information item.

At its October 2002 Annual Meeting, the SWMA recommended that this item move forward as an information item. The SWMA has concerns with the repeatability and performance accuracy for the described system and does not support changing NIST Handbook 44 until the manufacture provides performance data for consideration.

331-4 S.3.2.X. Flood Volume Automatic Pump Discharge Unit

Source: Western Weights and Measures Association (WWMA)

Recommendation: Revise NIST Handbook 44 Section 3.31. by adding a Specification S.3.2.X. Flood Volume Automatic Pump Discharge Unit as follows:

S.3.2.X. Flood Volume Automatic Pump Discharge Unit – When applicable, the volume of product necessary to flood the system when dry shall be clearly, conspicuously, and permanently marked on the system.

Discussion: Slytone Industries has put forth this proposal as part of its endeavor to have dry hose delivery systems recognized in NIST Handbook 44. The changes proposed to NIST Handbook 44 are necessary to allow the systems to begin the NTEP process. These systems will have to be evaluated for accuracy, repeatability and other requirements. The systems are currently in use in Germany and the United Kingdom.

At its September 2002 Annual Meeting the WWMA recommended this item move forward as an information item.

At its October 2002 Annual Meeting the SWMA recommended that this item move forward as an information item. The SWMA has concerns with the repeatability and performance accuracy for the described system and does not support changing NIST Handbook 44 until the manufacturer provides performance data for consideration.

331-5 UR.X. Test Liquid

Source: Southern Weights and Measures Association (SWMA)

Recommendation: Revise NIST Handbook 44 Section 3.31 by adding a user requirement as follows:

> **UR.1.4. Liquid Measured. – Following certification, a Vehicle-Tank Meter shall continue to be used to measure the same liquid or one with the same general physical properties as that used for calibration and certification, unless the meter is recalibrated and tested by a registered service agency.**

Discussion: At the October 2002 SWMA Annual Meeting a weights and measures office stated that N.1. Test Liquid in the Vehicle-Tank Meters Code requires that a meter test be conducted with the same liquid or one with the same general physical characteristics as the one being commercially measured. However there is no user requirement that requires the user to continue to use the product with which the meter was tested. The SWMA agreed that the issue has merit and recommended it be forwarded to the NCWM S&T Committee as an information item.

332 LPG and Anhydrous Ammonia Liquid-Measuring Devices

332-1 Tolerances, Table T.2. Accuracy Classes for Section 3.32. LPG and Anhydrous Ammonia Liquid-Measuring Devices

Source: Carryover Item 330-3B. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 1999 agenda as Item 330-1.)

Recommendation: Add a new Table T.2. to Section 3.32 LPG and Anhydrous Liquid-Measuring Devices and modify Paragraph T.2. as follows:

> **T.2. Tolerance Values. – The maintenance and acceptance tolerances for normal and special tests shall be <u>as shown in Table T.2.</u>**

	~~Acceptance Tolerance~~	~~Maintenance Tolerance~~
~~Normal Tests~~	~~0.6%~~	~~1.0%~~
~~Special Tests~~	~~1.0%~~	~~1.0%~~

Table T.2. Accuracy Classes and Tolerances for LPG and Anhydrous Ammonia Liquid-Measuring Devices				
Accuracy Class	**Application**	**Acceptance Tolerance**	**Maintenance Tolerance**	**Special Test Tolerance***
1.0	**Anhydrous ammonia, LP gas (including vehicle tank meters)**	**0.6 %**	**1.0 %**	**1.0 %**
***where applicable**				

Background/Discussion: At the 2002 NCWM Interim Meeting, the Committee made Item 330-3B informational to allow further study on the effect of the proposed tolerances for devices covered by Section 3.32. through Section 3.38.

At the 2002 NCWM Annual Meeting, the Committee received no negative comments on this item.

Item 330-1B has been divided into a separate item for each affected NIST Handbook 44 code. The tolerances shown in the proposed table are the same as the current NIST Handbook 44 tolerances. The proposed table format will facilitate the reformatting of all NIST Handbook 44 Section 3 liquid-measuring device codes.

At its September 2002 Annual Meeting, the WWMA recognized that this format will facilitate the reformatting of NIST Handbook 44 and recommends that the NCWM S&T Committee move it forward as a voting item.

At its October 2002 Interim Meeting, the NEWMA recommended that the NCWM S&T Committee move this item forward as a voting item.

For additional background on this Item see item 330-3B in the NCWM 2002 S&T Final Report.

332-2 UR.2.3. Vapor-Return Line

Source: Carryover Item 332-2. (This item was developed by the Southern Weights and Measures Association (SWMA) and first appeared on the Committee's 2002 agenda.)

Recommendation: No specific recommendation was submitted to address the use of vapor return lines during metered deliveries of liquefied petroleum gas (LPG) at loading rack and shipping (bulk) terminal locations.

Background/Discussion: At its September 2001 Annual Meeting, the SWMA heard a concern from Tennessee that vapor-return lines are commonly used at LPG loading rack terminals where large capacity transports are loaded for distribution to bulk LPG dealers. At least some of the companies operating terminals are applying industry derived factors that are used to credit customers for metered product that is returned as vapor to the sellers' storage tanks. Paragraph U.R.2.3. (a) provides an exception for abnormal conditions, such as high pressure in the receiving tank, which prevents delivery without the use of a vapor return line. The SWMA questions whether or not bulk terminal locations fall under this exemption. The terminals where vapor-return lines are being used have insufficient pumping ability to fill the large vessels that are used to distribute LPG to bulk dealer facilities; however, when pumping capacity becomes an issue the condition can be remedied by installing new pumping and metering equipment which is capable of filling the large pressure vessels without a vapor-return line. Additionally, the terminals have the option of weighing the product rather than metering it. These conditions exist at LPG terminals in all regions of the U.S., thus, this is not a unique situation only affecting the State of Tennessee.

SWMA agreed with Tennessee that the following points should be reviewed to remove any ambiguity about the appropriateness of vapor return lines in various LPG filling operations:

1. Allow loading rack terminals to use vapor-return lines and review a proposal from industry on applying the vapor factor to credit the purchaser. A mean credit value may be adequate, although it has been determined that the vapor returned is not always consistent from delivery to delivery.
2. Allow a vapor meter to be installed between the receiving vessel and the seller's tanks, then convert the vapor measurements to liquid quantities and credit the purchaser.
3. Provide a consensus opinion that bulk terminal loading-rack installations meet the exception contained in paragraph UR.2.3. (a) and no action is needed by weights and measures officials.
4. Provide a consensus opinion that the conditions do not meet the exception noted in paragraph UR.2.3. and weights and measures official should require terminals currently unable to load without vapor-return lines to take corrective action to comply with NIST NIST Handbook 44.

The SWMA recognized the concerns of the State of Tennessee and agreed to forward this item to NCWM, but recommends it remain informational to allow time for the submitter to develop specific language.

At the 2002 NCWM Interim and Annual Meetings, the Committee recognized the concerns of the SWMA and gave the item informational status to allow the submitter time to develop a specific proposal.

At its 2002 Annual Meeting, the WWMA recommended that this item remain as an information item until a specific proposal is submitted.

333 Hydrocarbon Gas Vapor-Measuring Devices

333-1 Tolerances, Table T.1. Accuracy Classes for Section 3.33. Hydrocarbon Gas Vapor-Measuring Devices

Source: Carryover Item 330-3B. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 1999 agenda as Item 330-1.)

Recommendation: Add a new Table T.1. to Section 3.32 LPG and Anhydrous Liquid-Measuring Devices and modify Paragraph T.1. as follows:

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T.1. Tolerance Values on Normal Tests and on Special Tests Other Than Low-Flame Tests. - Maintenance and acceptance tolerances <u>for normal and special tests</u> for hydrocarbon gas vapor-measuring devices shall be <u>as shown in Table T.1.</u> ~~3 percent (1.03 proof) of the test draft on underregistration and 1.5 percent (0.985 proof) of the test draft on overregistration.~~
(Amended 1981<u>and 200X</u>)

<u>Table T.1. Accuracy Classes and Tolerances or Hydrocarbon Gas Vapor-Measuring Devices</u>

<u>Accuracy Class</u>	<u>Application</u>		<u>Acceptance Tolerance</u>	<u>Maintenance Tolerance</u>
<u>3.0</u>	<u>Gases at low pressure (LP vapor)</u>	<u>Overregistration</u>	<u>1.5 %</u>	<u>1.5 %</u>
		<u>Underregistration</u>	<u>3.0 %</u>	<u>3.0 %</u>

Background/Discussion: At the 2002 NCWM Interim Meeting, the Committee made Item 330-1B informational to allow further study on the effect of the proposed tolerances for devices covered by Section 3.32. through Section 3.38.

At the 2002 NCWM Annual Meeting, the Committee received no negative comments on this item.

Item 330-3B has been divided into a separate item for each affected NIST Handbook 44 code. The tolerances shown in the proposed table are the same as the current NIST Handbook 44 tolerances. The proposed table format will facilitate the reformatting of all NIST Handbook 44 liquid-measuring device codes.

At is September 2002 Annual Meeting the WWMA recognized that this format will facilitate the reformatting of NIST Handbook 44 and recommends that the NCWM S&T Committee move it forward as a voting item.

At its October 2002 Interim Meeting the NEWMA recommended that the NCWM S&T Committee move this item forward as a voting item.

For additional background on this item see Item 330-3B in the NCWM 2002 S&T Final Report.

334 Cryogenic Liquid-Measuring Devices

334-1 Tolerances, Table T.2. Accuracy Classes for Section 3.34. Cryogenic Liquid-Measuring Devices

Source: Carryover Item 330-3B. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 1999 agenda as Item 330-1.)

Recommendation: Add a new Table T.2. to Section 3.34 Cryogenic Liquid-Measuring Devices delete paragraphs T.2.1. and T.2.2. and modify Paragraph T.2. as follows:

T.2. Tolerance Values. - The maintenance and acceptance tolerances for normal and special tests shall be as shown in Table T.2.

~~**T.2.1. On Normal Tests. - The maintenance tolerance on "normal" tests shall be two and one-half percent (2.5 %) of the indicated quantity. The acceptance tolerance shall be one and one-half percent (1.5 %) of the indicated quantity.**~~

~~T.2.2. On Special Tests. - The maintenance and acceptance tolerance on "special" tests shall be two and one-half percent (2.5 %) of the indicated quantity.~~

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

Accuracy Class	Application	Acceptance Tolerance	Maintenance Tolerance	Special Test Tolerance*
2.5	Cryogenic products; liquefied compressed gases other than LP gas	1.5 %	2.5 %	2.5 %

***where applicable**

Background/Discussion: At the 2002 NCWM Interim Meeting, the Committee made item 330-1B informational to allow further study on the effect of the proposed tolerances for devices covered by Section 3.32. through Section 3.38.

At the 2002 NCWM Annual Meeting, the Committee received no negative comments on this item.

Item 330-3B has been divided into a separate item for each affected NIST Handbook 44 code. The tolerances shown in the proposed table are the same as the current NIST Handbook 44 tolerances. The proposed table format will facilitate the reformatting of all NIST Handbook 44 liquid-measuring device codes.

At is September 2002 Annual Meeting, the WWMA recognized that this format will facilitate the reformatting of NIST Handbook 44 and recommended that the NCWM S&T Committee move it forward as a voting item.

At its October 2002 Interim Meeting, the NEWMA recommended that the NCWM S&T Committee move this item forward as a voting item.

For additional background on this item see item 330-3B in the NCWM 2002 S&T Final Report.

334-2 Definition for Cryogenic Liquid-Measuring Devices

Source: National Type Evaluation Technical Committee Measuring Sector

Recommendation: Modify the NIST NIST Handbook 44 definition for cryogenic liquid-measuring device as follows.

> **cryogenic liquid-measuring device. A system including a liquid-measuring element ~~mechanism or machine of (a) the meter of the positive displacement, turbine, or mass flow type, or (b) a weighing type of device mounted on a vehicle,~~ designed to measure and deliver cryogenic liquids in the liquid state. Means may be provided to indicate automatically, for one of a series of unit prices, the total money value of the liquid measured.[3.34]**
> **(Amended 1986, 200X)**

Background/Discussion: In 1986 paragraph A.1. of Section 3.34. Cryogenic Liquid-Measuring Devices and the definition for cryogenic liquid-measuring devices were modified to include on-board-weighing systems for measuring cryogenic liquid. In 1995 the reference to scales for measuring cryogenic liquids was removed from paragraph A.1., because vehicle on-board weighing systems were recognized in the Scales Code in 1992, but not from the definition for cryogenic liquid-measuring device.

At its October 2002 Meeting the NTETC Measuring Sector reviewed the proposal and agreed to forward it to the NCWM S&T Committee for consideration.

At its October 2002 Annual Meeting, the SWMA supported the proposal and recommended that the NCWM S&T Committee move it forward as a voting item.

335 Milk Meters

335-1 Tolerances, Table T.X. Accuracy Classes for Section 3.35. Milk Meters

Source: Carryover Item 330-3B. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 1999 agenda as Item 330-1.)

Recommendation: The Committee recommends that the various Accuracy Classes and Tolerances in Table T.X. be added to NIST NIST Handbook 44 Sections 3.32. LPG and Anhydrous Ammonia Liquid-Measuring Devices, 3.33. Hydrocarbon Gas Vapor-Measuring Devices, 3.34. Cryogenic Liquid-Measuring Devices, 3.35. Milk Meters, 3.36. Water Meters, 3.37. Mass Flow Meters, and 3.38.Carbon Dioxide Liquid-Measuring Devices – Tentative Code as follows: As an option the entire table could be added as an appendix to these codes.

Table T.X Accuracy Classes for Liquid Measuring Devices Covered in NIST NIST Handbook 44 Sections 3.32 through 3.38					
Accuracy Class	**Application**		**Acceptance Tolerance**	**Maintenance Tolerance**	**Special Test Tolerance***
1.0	**Anhydrous ammonia, LP gas (including vehicle tank meters)**		**0.6 %**	**1.0 %**	**1.0 %**
1.5	**Water**	**Overregistration**	**1.5 %**	**1.5 %**	**1.5 %**
		Underregistration	**1.5 %**	**1.5 %**	**5.0 %**
2.0	**Compressed natural gas as a motor fuel**		**1.5 %**	**2.0 %**	**2.0 %**
2.5	**Cryogenic products; liquefied compressed gases other than LP gas**		**1.5 %**	**2.5 %**	**2.5 %**
3.0	**Gases at low pressure (LP vapor)**	**Overregistration**	**1.5 %**	**1.5 %**	
		Underregistration	**3.0 %**	**3.0 %**	
***where applicable**					

Background/Discussion: The Committee also made item 330-1B informational to allow further study on the effect of the proposed tolerances for devices covered by Section 3.32. through Section 3.38.

At the 2002 NCWM Annual Meeting, the Committee received no negative comments on this item.

Item 330-3B has been divided into a separate item for each affected NIST Handbook 44 code. The tolerances shown in the proposed table are the same as the current NIST Handbook 44 tolerances. The proposed table format will facilitate the reformatting of all NIST Handbook 44 liquid-measuring device codes.

[Technical Advisors' Note: The proposed table above does not include a specific class designation and tolerances for devices measuring milk as it does for devices measuring other commodities. When Table T.1. for Section 3.31. Vehicle-Tank Meters was adopted at the 2002 NCWM Annual Meeting, Table 2. Tolerances for Vehicle-Mounted Milk Meters was not deleted from the code. The existing Table 1.Tolerances for Milk Meters and Table 2. Tolerances for Vehicle-Mounted Milk Meters provide the same tolerances for both applications. If Table 2. Tolerances for Milk Meters is to be replaced with an accuracy class and tolerance table then a class designation and an appropriate percent tolerance need to be developed.]

At its September 2002 Annual Meeting, the WWMA agreed that the above table does not include tolerances for milk meters. No specific proposal recommending a single percentage tolerance for milk meters was available for review. The WWMA recommends that this item remain an information item until a specific proposal is submitted for consideration.

For additional background on this item see item 330-3B in the NCWM 2002 S&T Final Report.

336 Water Meters

336-1 Tolerances, Table T.X. Accuracy Classes for Section 3.36.Water Meters

Source: Carryover Item 330-3B. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 1999 agenda as Item 330-1.)

Recommendation: At the 2002 NCWM Interim Meeting, the Committee made item 330-1B informational to allow further study on the effect of the proposed tolerances for devices covered by Section 3.32. through Section 3.38.

At the 2002 NCWM Annual Meeting, the Committee received no negative comments on this item.

Item 330-3B has been divided into a separate item for each affected NIST Handbook 44 code. The tolerances shown in the proposed table are the same as the current NIST Handbook 44 tolerances. The proposed table format will facilitate the reformatting of all NIST Handbook 44 liquid-measuring device codes.

Table T.X. Accuracy Classes and Tolerances for Water Meters

Accuracy Class	Application		Acceptance Tolerance	Maintenance Tolerance	Special Test Tolerance*
1.5	Water	Overregistration	1.5 %	1.5 %	1.5 %
		Underregistration	1.5 %	1.5 %	5.0 %
*where applicable					

Background/Discussion: At the 2002 NCWM Interim Meeting, the Committee made item 330-1B informational to allow further study on the effect of the proposed tolerances for devices covered by Section 3.32. through Section 3.38.

At the 2002 NCWM Annual Meeting, the Committee received no negative comments on this item.

Item 330-3B has been divided into a separate item for each affected NIST Handbook 44 code. The tolerances shown in the proposed table are the same as the current NIST Handbook 44 tolerances. The proposed table format will facilitate the reformatting of all NIST Handbook 44 liquid-measuring device codes.

At its September 2002 Annual Meeting, the WWMA supported the concept of having accuracy classes and tolerances in a uniform table format for all liquid-measuring device codes; however, the existing Table 1 and Table 2 in the Water Meters Code include criteria for maximum, intermediate, and minimum flow rates for testing various sizes of water meters. The flow rate information in Table 1 and Table 2 needs to be retained. The WWMA recommends that this item remain as an information item until a proposal to retain the flow rate criteria to accompany the new table for accuracy class and tolerances is developed.

For additional background on this item see Item 330-3B in the NCWM 2002 S&T Final Report.

336-2 N.4.2. Special Tests, Table 2. Tolerances for Water Meters Special Tests, and Table 3. Tolerances for Multi-Jet Water Meters Special Tests

Source: Western Weights and Measure Association (WWMA)

Recommendation: Add a new paragraph S.2.3., and modify paragraph N.4.2., T.1., and Table 2. as follows:

S.2.3. Multi-Jet Meter Identification. – Multi-Jet water meters shall be identified as such on the Certificate of Conformance.

N.4.2. Special Tests. Special tests to develop the operating characteristics of meters may be made according to the rates and quantities shown in Tables 2 *or 3*.

T.1. Tolerance Values. - Maintenance and acceptance tolerances shall be as shown in Table 1, *and Table* 2, *or 3*.

Table 2. Tolerances for Water Meters *other than Multi-jet*
Special Tests

Meter size (inches)	Intermediate rate				Minimum rate				
	Rate of flow (gal/min)	Meter indication		Tolerance on over- and under-registration	Rate of flow (gal/min)	Meter indication		Tolerance	
		gal	ft^3			gal	ft^3	Under-registration	Over-registration
5/8 or less	2	10	1		1/4	5	1		
3/4	3	10	1		1/2	5	1		
1	4	10	1		3/4	5	1		
1 1/2	8	50	5	1.5 %	1 1/2	10	1	5.0 %	1.5 %
2	15	50	5		2	10	1		
3	20	50	5		4	10	1		
4	40	100	10		7	50	5		
6	60	100	10		12	50	5		

Add a new Table 3 as follows:

Table 3. Tolerances for Multi-Jet Water Meters
Special Tests

Meter size (inches)	Intermediate rate				Minimum rate				
	Rate of flow (gal/min)	Meter indication		Tolerance on over- and under-registration	Rate of flow (gal/min)	Meter indication		Tolerance	
		gal	ft^3			gal	ft^3	Under-registration	Over-registration
5/8 or less	2	10	1		1/4	5	1		
3/4	3	10	1		1/2	5	1		
1	4	10	1		3/4	5	1		
1 1/2	8	50	5	1.5 %	1 1/2	10	1	3.0 %	3.0 %
2	15	50	5		2	10	1		
3	20	50	5		4	10	1		
4	40	100	10		7	50	5		
6	60	100	10		12	50	5		

Add a new definition to Appendix D:

Multi-Jet Water Meter. A water meter in which the moving element takes the form of a multiblade rotor mounted on a vertical spindle within a cylindrical measuring chamber. The liquid enters the measuring chamber through several tangential orifices around the circumference and leaves the measuring chamber through another set of tangential orifices placed at a different level in the measuring chamber. These meters register by recording the revolutions of a rotor set in motion by the force of flowing water striking the blades. [3.36]

Discussion: Currently the water meters code does not include any test criteria or tolerances for multi-jet water meters. Multi-jet meters are widely used for metering and sub-metering water. One manufacturer of these meters indicates that the performance curve for a multi-jet meter is different than the performance curve for a positive displacement meter and believes that the tolerances for underregistration and overregistration for a multi-jet meter should be equal. The American Water Works Association (AWWA) has recognized these differences and has set up two standards C700 and C708 to allow for the different meter accuracy curve.

At its September 2002 Annual Meeting, the WWMA agreed that test criteria and tolerances for multi-jet water meters should be included in the water meters code and agreed to forward it to the NCWM S&T Committee as an information item.

338 Carbon Dioxide Liquid-Measuring Devices

338-1 Tolerances, Table T.1. Accuracy Classes for Section 3.38. Carbon Dioxide Liquid-Measuring Devices

Source: Carryover Item 330-3B. (This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 1999 agenda as Item 330-1.)

Recommendation: Add a new Table T.2. to Section 3.38 Carbon Dioxide Liquid-Measuring Devices modify Paragraph T.2. and delete paragraphs T.2.1. and T.2.2. as follows:

T.2. Tolerance Values. - The maintenance and acceptance tolerances for normal and special tests shall be as shown in Table T.2.

~~**T.2.1. On Normal Tests.** The maintenance tolerance on "normal" tests shall be two and one half percent (2.5 %) of the indicated quantity. The acceptance tolerances shall be one and one half percent (1.5 %) of the indicated quantity.~~

~~**T.2.2. On Special Tests.** The maintenance and acceptance tolerance on "special" tests shall be two and one half percent (2.5 %) of the indicated quantity.~~

Table T.2. Accuracy Classes and Tolerances for Carbon Dioxide Liquid-Measuring Devices

Accuracy Class	Application	Acceptance Tolerance	Maintenance Tolerance	Special Test Tolerance*
2.5	Cryogenic products; liquefied compressed gases other than LP gas	1.5 %	2.5 %	2.5 %

*where applicable

Background/Discussion: At the 2002 NCWM Interim Meeting, the Committee agreed with the WWMA recommendation to split item 330-1 into items 330-1A and 330-1B. The Committee also made item 330-1B informational to allow further study on the effect of the proposed tolerances for devices covered by Section 3.32.through Section 3.38. The background and rational for this item are outlined in the S&T Agenda Item 330-3A that address the proposed changes to Section 3.30 and 3.31.

At the 2002 NCWM Annual Meeting, the Committee received no negative comments on this item.

356(a) Grain Moisture Meters

356(a)-1 Recognize Indications and Recorded Representations of Test Weight per Bushel

Source: This item originated from the National Type Evaluation Technical Committee (NTETC) Grain Moisture Meter (GMM) Sector and first appeared on the S&T Committee's 2000 agenda as Developing Item 360-3, Appendix D. The submitter of the item, the GMM Sector, believes the proposal is ready for national review.)

Recommendation: Modify 5.56(a) Grain Moisture Meter Code Section in NIST Handbook 44 to recognize indications and recorded representation of test weight per bushel as follows:

Amend the following paragraphs:

A.1. – This code applies to grain moisture meters; that is, devices used to indicate directly the moisture content of cereal grain and oil seeds. The code consists of general requirements applicable to all moisture meters and specific requirements applicable only to certain types of moisture meters. Requirements cited for "test weight per bushel" indications or recorded representations are applicable only to devices incorporating an automatic test weight per bushel measuring feature.

S.1.1. Digital Indications and Recording Elements.

(c) Meters shall be equipped with a communication interface that permits interfacing with a recording element and transmitting the date, grain type, grain moisture results, test weight per bushel results and calibration version identification.

(d) A digital indicating element shall not display and a recording element shall not record any moisture content values or test weight per bushel values before the end ofthe measurement cycle.

(e) Moisture content results shall be displayed and recorded as percent moisture content, wet basis. Test weight per bushel results shall be displayed and recorded as pounds per bushel. Subdivisions of ~~this~~ these units shall be in terms of decimal subdivisions (not fractions).

(f) A meter shall not display or record any moisture content or test weight per bushel values when the moisture content of the grain sample is beyond the operating range of the device, unless the moisture and test weight representations includes a clear error indication (and recorded error message with the recorded representation).

S.1.3. Operating range. – A meter shall automatically and clearly indicate when the operating range of the meter has been exceeded. The operating range shall specify the following:

(c) Moisture Range of the Grain or Seed. The moisture range for each grain or seed for which the meter is to be used shall be specified. ~~A moisture~~ Moisture and test weight per bushel values may be displayed when the moisture range is exceeded if accompanied by a clear indication that the moisture range has been exceeded.

S.1.4. Value of Smallest Unit. – The display shall permit ~~constituent~~ moisture value determination to both 0.01 percent and 0.1 percent solution. The 0.1 percent resolution is for commercial transactions; the 0.01 percent resolution is for type evaluation and calibration purposes only, not for commercial purposes. Test weight per bushel values shall be determined to the nearest 0.1 pound per bushel.

S.2.4.1. Calibration Version. – A meter must be capable of displaying either calibration constants, a unique calibration name, or a unique calibration version number for use in verifying that the latest version of the calibration is being used to make moisture content and test weight per bushel determinations.

S.2.6. Determination of Quantity and Temperature. – The moisture meter system shall not require the operator to judge the precise volume or weight and temperature needed to make an accurate moisture determination. External grinding, weighing, and temperature measurement operations are not permitted. In addition, if the meter is capable of measuring test weight per bushel, determination of sample volume and weight for this measurement shall be fully automatic *and means shall be provided to ensure that measurements of test weight*

per bushel are not allowed to be displayed or printed when insufficient sample volume is available to provide an accurate measurement.
[Nonretroactive as of January 1, 2004]

S.4. Operating Instructions and Use Limitations. – The manufacturer shall furnish operating instructions for the device and accessories that include complete information concerning the accuracy, sensitivity, and use of accessory equipment necessary in obtaining a moisture content. Operating instructions shall include the following information:

(d) the kind or classes of grain or seed for which the device is designed to measure moisture content and test weight per bushel;

N.1.1. Transfer Standards. - Official grain samples shall be used as the official transfer standards with moisture content and test weight per bushel values assigned by the reference methods. The reference methods for moisture shall be the oven drying methods as specified by the USDA GIPSA. The test weight per bushel value assigned to a test weight transfer standard shall be the average of 10 test weight per bushel determinations using the quart kettle test weight per bushel apparatus as specified by the USDA GIPSA. Tolerances shall be applied to the average of at least three measurements on each official grain sample. Official grain samples shall be clean and naturally moist, but not tempered (i.e., water not added).

N.1.2. Minimum Test. - A minimum test of a grain moisture meter shall consist of tests:
(a) with using samples (need not exceed three) of each grain or seed type for which the device is used, and for each grain or seed type shall include the following:

(a) tests of moisture indications, (b)with using samples having at least two different moisture content values within the operating range of the device. , and if applicable,

(b) tests of test weight indications, with at least the lowest moisture samples used in (a) above.

T.3. For Test Weight Per Bushel Indications or Recorded Representations. – The maintenance and acceptance tolerances on test weight per bushel indications or recorded representations shall be 0.193 kg/hL or 0.15 lb/bu. The test methods used shall be those specified by the USDA GIPSA. as shown in Table T.3. Tolerances are (+) positive or (-) negative with respect to the value assigned to the official grain sample.

Table T.3. Acceptance and Maintenance Tolerances Test Weight per Bushel	
Type of Grain or Seed	Tolerance (pounds per bushel)
Corn, oats	0.8
All wheat classes	0.5
Soybeans, barley, rice, sunflower, sorghum	0.7

UR.1.1. Value of the Smallest Unit on Primary Indicating and Recording Elements. – The resolution of the moisture meter display shall be 0.1 percent moisture and 0.1 pounds per bushel test weight during commercial use.

UR.3.4. Printed Tickets

(b) The customer shall be given a printed ticket showing the date, grain type, grain moisture results, test weight per bushel and calibration version identification. The ticket shall be generated by the grain moisture meter system.

Discussion: This proposal was developed to provide a broader approach to the tolerances for grain moisture meters (GMM) and to establish separate requirements covering automatic test weight per bushel (TW) devices with tolerances which address the specific grain types.

The following information is excerpted from the GMM Sector summary. Knowledge of test weight per bushel (TW) is important not only in determining the price a producer receives for grain delivered to a grain elevator; it is also important to the grain elevator when grain stocks in storage are audited for quantity. Grain industry members reported that the proposed tolerances for TW are acceptable to the industry. Stressing that the grain industry urgently needs the capability to simultaneously (and easily) make TW determinations, they urged the GMM Sector to move forward on this issue. Some members were hesitant about moving forward at this time, citing concern about the unresolved issue of large negative bias in the Arkansas Phase II data. It was pointed out that even if the GMM Sector recommends moving ahead at this time, the earliest date that changes in the code would become effective was January 1, 2004.

The GMM Sector considered whether the recommended changes should be retroactive or nonretroactive. Sector discussions centered on the requirement that meters measuring TW must provide some means to ensure that measurements of TW are not allowed to be displayed or printed when insufficient sample volume has been supplied. The GMM Sector recognizes there is a general assumption that the means will include some sort of a level sensor installed in either the sample hopper or the test cell although the proposed code does not specify how this will be accomplished.

GMM Sector members in favor of making the proposed code retroactive noted that although moisture measurements are not significantly affected when samples are not of sufficient size to completely fill the measuring cell of a GMM, the TW measurement is greatly affected when the cell is not filled. Measurement of TW requires determination of two parameters; volume and mass. The vast majority of GMMs with TW capability presently in the field do not have means to assure that the measuring cell is completely full. If the cell is not filled completely, TW indications will be lower than they should be to the disadvantage of the producer selling grain. Some members in favor of making the code nonretroactive felt that GMMs with a window, through which the test cell could be seen, provide adequate means to verify that the cell is full. A grain industry member expressed the belief that compared to how test weight measurements are being made now, the worry about a sensor was trivial. It was argued that as long as the GMM could produce an accurate TW measurement when properly used, it was not important whether or not the hopper had a sensor. Some thought this was a facilitation of fraud issue and favored making the sensor requirement retroactive. Other members thought that making the code retroactive would unfairly penalize users of existing NTEP meters with TW capability.

One manufacturer indicated support for making the sensor requirement retroactive and pointed out that all existing GMMs they manufacture are covered by an NTEP CC. The GMM is hard coded to add the words “approx” or “approximate” to the display and print out TW measurements. That GMM Sector member also questioned how devices displaying “approximate” TW would be regulated if the sensor requirement was nonretroactive. Weights and measures officials were at first divided on this question. Some were of the opinion that they would permit the continued use of the device and display of “approximate” TW, if the device met the tolerance requirements, since “approximate” was added at the request of jurisdictions permitting a display of TW when tolerances did not exist as regulation. Others were concerned about what would happen in a court case when printed tickets which recorded “approximate” were used as evidence. States that presently do not permit “approximate” TW to be displayed or recorded indicated they would not change their policy.

356(b) Grain Moisture Meters

356(b)-1 T.3. For Test Weight Per Bushel Indications or Recorded Representations

Source: Central Weights and Measures Association (CWMA)

Recommendation: Modify paragraph T.3. as follows:

> **T.3. For Test Weight Per Bushel Devices ~~Indications or Recorded Representations~~. – The maintenance and acceptance tolerances on separate test weight per bushel devices used to determine the test weight per bushel of grain samples for the purpose of making density corrections in moisture determinations ~~indications or recorded representations~~ shall be 0.193 kg/hL or 0.15 lb/bu. The test methods used shall be those specified by the USDA GIPSA using a dockage-free sample of dry hard red winter wheat.**

Discussion: Prior to its amendment in 1992, Section 5.56.(b) applied to separate test weight per bushel devices used to determine the test weight per bushel of grain samples for the purpose of making density corrections in moisture determinations. When grain moisture meters were introduced with the capability to automatically indicate and record test weight per bushel values for the grain sample under test for moisture, the paragraph was amended to cover these devices. The tolerance assigned was the tolerance used by USDA GIPSA for their quart kettle test weight per bushel apparatus when tested as specified in the USDA GIPSA procedures using samples of hard red winter wheat.

At its August 2002 meeting, after a review of test weight per bushel data collected in a field evaluation of the proposed tolerances and test methods, the Grain Moisture Meter Sector agreed to recommend that only Section 5.56.(a) of the Grain Moisture Meter Code recognize indications and recorded representations in weight per bushel for a vote at the 2003 NCWM Annual Meeting. New devices with test weight per bushel capability will be required to be fully automatic and to have means to ensure that measurements of test weight per bushel are not allowed to be displayed or printed when insufficient sample volume is available, thus providing an accurate measurement.

The GMM Sector decided that it was not appropriate for the Sector to recommend modification of Section 5.56.(b) of the Code to add tolerances for grain moisture meters with test weight per bushel capability. Non-NTEP devices with test weight per bushel capability will not be required to determine if sufficient sample volume has been provided for an accurate measurement. Section 5.56.(b) applies to non-NTEP devices which are not within the purview of the GMM Sector. Weights and Measures officials who are GMM Sector members suggested that paragraph T.3. should be revised to clarify that it applies to separate accessory devices (such as a beam balance test weight apparatus) used to determine test weight per bushel of grain samples for the purpose of making density corrections in moisture determinations.

357 Near-Infrared Grain Analyzers

357-1 S.1.1. Digital Indications and Recording Elements

Source: National Type Evaluation Technical Committee (NTETC) Near Infrared Grain Analyzer (NIR) Sector

Recommendation: Modify paragraphs S.1.1.(c) and (e) as follows:

> ***S.1.1. Digital Indications and Recording Elements.***
>
> ***(c) Analyzers shall be equipped with a communication interface that permits interfacing with a recording element and transmitting the date, grain type or class, constituent values, the moisture basis for each constituent value (except moisture), and calibration version identification. If the analyzer converts constituent results to a manually entered moisture basis, the "native" concentration and the "native" moisture basis must appear on the printed ticket in addition to the converted results and the manually entered moisture basis.***

(e) Constituent content shall be recorded and displayed as percent of total mass at the specified moisture basis. The moisture basis shall also be recorded and displayed for each constituent content result (except moisture). If a whole grain analyzer that is calibrated to display results on an "as is" moisture basis does NOT display or record a moisture value, it must clearly indicate that results are expressed on an "as is" moisture basis. Ground grain analyzers must ALWAYS display and record a moisture measurement for "as is" content results (except moisture).

Add new paragraph S.1.1.(h) as follows:

(h) If the analyzer incorporates a built-in printer or if a printer is available as an accessory to the analyzer, the information appearing on the printout shall be arranged in a consistent and unambiguous manner.

Discussion: During its August 2002 review of NCWM Publication 14 checklist to add additional grains and criteria for moisture basis, the NIR Sector considered including text, "at the specified moisture basis," to the NTEP criteria that is based on NIST Handbook 44 paragraph S.1.1.(e). Total mass is the sum of constituent mass and moisture mass. Moisture mass, in turn, depends on the specified moisture basis. Unless both percent constituent content and its associated moisture basis are known, the actual constituent concentration cannot be known with certainty. To correctly reflect that the constituent percent of total mass depends upon the specified moisture basis and to bring the code into agreement with the Publication 14 NIR Checklist, the NIR Sector agreed that S.1.1.(e) should be modified as shown in the recommendation above.

It was also noted during the review of the proposed changes to the NIR checklist that the checklist referenced paragraph UR.2.3 Printed Tickets. NIR printed ticket must record specific information such as constituent values and each constituent's associated moisture basis. The NIR Sector noted that Publication 14 criteria should be based on specifications rather than user requirements. A review of the NIR code revealed that in cases where an analyzer converts constituent results to a manually entered moisture basis, there is nothing in the specifications that requires the device to record the "native" constituent concentration and the native moisture basis along with the converted results and the manually entered moisture basis. There is also no specification that requires the printed information be arranged in a consistent and unambiguous manner.

Consequently, the NIR Sector proposes to amend paragraph S.1.1. (c) to include specification for recording the "native" constituent value and moisture value along with the converted results and the manually entered moisture basis, to amend paragraph S.1.1.(e) to recognize the need for moisture basis in determining the constituent mass and to add new paragraph S.1.1. (h) to include a specification that requires the printed information be arranged in a consistent and unambiguous manner.

357-2 S.1.2. Selecting Grain Class and Constituent

Source: Carryover Item 357-1B (This item originated from the National Type Evaluation Technical Committee (NTETC) Near Infrared Grain Analyzer (NIR) Sector and first appeared on the Committee's 2002 agenda.)

Recommendation: Modify paragraph S.1.2. as follows:

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

[Nonretroactive as of January 1, 200X]

Discussion: In 2001, the Committee indicated it was not appropriate to exempt specialty crops, an undefined commodity, from the entire NIR Code. The Committee agreed that it was more appropriate to address industry concerns about the proprietary nature of specialty crop calibrations by modifying paragraph S.1.2. The Committee proposed including language in paragraph S.1.2. that requires multiple calibrations (i.e., specialty crop calibrations) for a particular grain type be clearly distinguished from one another.

In an attempt to arrive at a definition of "specialty crop," the NIR Sector considered one member's recommendation that a specialty crop might be one in which the constituents recognized by the CC for that crop type (e.g., soybeans: protein, & oil) could not be measured accurately using the normal calibration because the specialty crop had a spectral response that differed significantly from the spectral response of normal varieties of that crop. High oleaic soybeans (soybean varieties developed specifically to yield high concentrations of oleaic acid) were cited as a good example of a specialty crop requiring special oil and protein calibrations. In contrast, "high oil" corn was not considered a good example of a specialty crop, although seed companies may market it as such. It was pointed out that although "normal" corn typically has an oil content in the 3 % to 4 % range, the GIPSA corn oil calibration contains low (3 % to 4 %), mid-range (5 % to 6 %), and high (>7 %) oil samples from three major seed companies. Sector members were in general agreement that it would be misleading to imply that this, or similar, "standard" calibrations are somehow unsuitable for use with high-oil corn samples. There was similar agreement that, from a regulatory point of view, it would not be desirable to allow the use of multiple calibrations (on the same device) for essentially the same commodity.

The NIR Sector searched for wording that would restrict the unnecessary use of multiple calibrations for the same basic grain type, but would still permit the use of proprietary calibrations where there was a legitimate need. The NIR Sector considered amending paragraph S.1.2. to include several variations of the statement "If a non-NTEP calibration is included for a given grain type, it must be clearly distinguished from other calibrations. The calibration description must clearly identify the unique end use property addressed by the calibration."

Ultimately, the NIR Sector decided the wording in the recommendation above, which was originally proposed by the S&T Committee, adequately addresses requirements for specialty crops.

358 Multiple Dimension Measuring Devices

358-1 Tentative Status of the Multiple Dimension Measuring Devices Code

Source: Carryover Item 358-1. (This item originated from the Southern Weights and Measures Association (SWMA) and first appeared on the Committee's 2002 agenda.)

Recommendation: Change the status of the Multiple Dimension Measuring Devices Code (MDMD) from tentative to permanent.

Discussion: In response to comments from weights and measures officials and industry representatives the Multiple Dimension Measuring Devices Code was considered in 2002 for permanent status. The Committee heard that the code should be harmonized with the more stringent Canadian requirements. Industry representatives cautioned that other issues may exist because the code was developed prior to some of the latest electronic technology. Therefore, the proposal was changed from a voting item to an information item pending further review.

The Northeastern and Western Weights and Measures Associations recommend the proposal remain an information item until a work group can review the code requirements.

For more background information, refer to the 2002 S&T Final Report.

360 Other Items

360-1 Revise NIST Handbook 44

Source: Carryover Item 360-1 (This item originated from the Southern Weights and Measures Association (SWMA) and first appeared on the Committee's 1999 agenda as Item 360-1.)

Discussion: The Committee is not aware of any updates on the work to revise NIST Handbook 44. The Committee recommends that all parties interested in the status of this project contact the NCWM Board of Directors (BOD).

The Northeastern and Western Weights and Measures Associations continue to support the BOD's effort and encourage the BOD to fund this project.

360-2 International Organization of Legal Metrology (OIML) Report

The OIML Report is included as part of the NCWM OIML Board of Director's 2003 Interim Agenda Item 4.

Many issues before the OIML, the Asian-Pacific Legal Metrology Forum (APLMF), and other international activities are within the purview of the S&T Committee. Additional information on OIML activities is available on the OIML web site at http://www.oiml.org/.

For more information on weighing devices, contact Steven Cook, NIST Weights and Measures Division (WMD) Legal Metrology Devices Group (LMD), by telephone at 301-975-4003 or by e-mail at steven.cook@nist.gov. For more information on taximeters, contact Juana Williams, NIST LMD, by telephone at 301-975-3989 or by e-mail at juana.williams@nist.gov. For information on measuring devices, contact Wayne Stiefel, WMD-International Legal Metrology Group (ILM), by telephone at 301-975-4011, or by e-mail at s.stiefel@nist.gov. For more information on electronic measuring devices meters, contact Dr. Ambler Thompson, WMD-ILM by telephone at 301-975-2333 or by e-mail at ambler@nist.gov. For more information on grain moisture meters, contact Diane Lee, WMD-LMD by telephone at 301-975-4405 or by e-mail at gloria.lee@nist.gov. For more information on the R 117, Measuring Systems for Liquids Other Than Water and R 105, Direct Mass Flow Measuring Systems for Quantities of Liquids, and gas meters, contact Ralph Richter by telephone at 301-975-4025 or by e-mail at ralph.richter.@nist.gov. Mr. Cook, Ms. Williams, and Ms. Lee can also be reached by postal mail at NIST, 100 Bureau Drive-STOP 2600, Gaithersburg, MD 20899-2600 or by fax at 301-926-0647. Mr. Stiefel, Mr. Richter, and Dr. Thompson can also be reached by postal mail at NIST, 100 Bureau Drive-STOP 2600, Gaithersburg, MD 20899-2600 or by fax at 301-975-5414.

360-3 Developing Issues

The NCWM established a mechanism to disseminate information about emerging issues which have merit and are of national interest. Developing issues have not received sufficient review by all parties affected by the proposals or may be insufficiently developed to warrant review by the NCWM S&T Committee. The developing issues listed are currently under review by at least one regional association or technical committee.

The developing issues are listed in the following appendices according to the specific NIST Handbook 44 Code Section under which they fall:

Appendix B – Scales
Appendix C –Vehicle-Tank Meters
Appendix D – Other Items

The S&T Committee encourages interested parties to examine the proposals included in the appendices and send their comments to the contact listed in each item.

The Committee asks that the regional weights and measures associations and NTETC Sectors continue their work to fully develop each proposal. Should an association or Sector decide to discontinue work on a developmental item, the Committee asks that it be notified.

Richard W. Wotthlie, Maryland, Chairman

Clark Cooney, Oregon
Jack Kane, Montana
Michael J. Sikula, New York
Craig Van Buren, Michigan

Ted Kingsbury, Canada, Technical Advisor
Richard Suiter, NIST, Technical Advisor
Juana Williams, NIST, Technical Advisor

Committee on Specifications and Tolerances

Appendix A (Item 320-2)
Pharmacy Scales – Counting Feature Test and Other Procedures

(Attachment A through Attachment D information was excerpted from the Final Report of S&T Committee for the Western Weights and Measures Association.)

Attachment A

How to Perform Piece Counting with Reference Weight Calculated by Pharmacy Scale

1. Tare the scale
2. Place reference (appropriate sample) number of pieces on scale pan.
3. Input reference quantity data into pharmacy scale
4. Pharmacy scale waits for the weight to become stable
5. Pharmacy scale calculates reference weight (reference weight = current weight on scale divided by selected reference quantity
6. Scale stores the calculated reference weight and reference quantity
7. Scale switches to a count display with the current quantity displayed
8. Scale is now ready to continue counting – present number of pieces = current weight divided by reference weight

Reference Weight Optimizing Program

(Optional algorithm for counting feature described above)

When you place a number of pieces on the pan, which is at least three pieces higher than the reference count of pieces, the new reference weight is being recalculated and stored together with this higher reference count. The pharmacy scale could confirm this by some type of symbol located on the display.

	Weight [g]	Calculation [pieces]	Display [pieces]	Reference-weight [g/pieces]	Reference-count [pieces]	New
Start	5.123	5	5	1.024 6	5	Yes
1. count	25.500	24.888	25	1.020 0	25	Yes
2. count	26.450	25.931	26	1.020 0	25	No
3. count	50.700	49.706	50	1.014 0	50	Yes
4. count	30.050	29.635	30	1.014 0	50	No

Attachment B

Recommended Pharmacy Scale Characteristics

- The scales should be Class I or II
- Counting mode must be evident on display
- Scale display must be able to differentiate between counting and weighing
- Scale capacity would range from 310 g to 620 g
- Suggested scale divisions of d=0.001 g, e=0.01 g
- Scale equipped with a zero count indicator
- Scales equipped with zero-count setting application
- Verification resolution 0.010 g
- Linearity +/- 0.001 5 g
- Reproducibility +/- 0.001 g

Appendix A (Item 320-2)
Attachment C

Pharmacy Counting Scale --- Accuracy Testing

Summary

The following proposal is a suggested guideline for testing potential pharmacy counting scales to ensure counting accuracy. These procedures describe the tests to be used in determining various parameters of a pharmacy counting scale.

The pharmacy counting scale test procedures determine:

a) The precision of determining mean piece weight,
b) The minimum and maximum mean piece weights,
c) The minimum weight and minimum piece count that may be used to determine mean piece weight,
d) The linearity in determining accurate mean piece weight throughout the pharmacy scale weight range,
e) The linearity and accuracy of determining mean piece weight given a range of pill quantities,
f) The percent of a pill required for indicating the next pill quantity.

Recommended Method for Determining Pharmacy Scale Accuracy During Counting Function

The following test plan should be carried out to approximate most of these values. The resolution and accuracy internal to the device cannot be determined; however, these tests may identify significance or a means to approximate the internal resolution.

Assumptions

a. Tests must be performed in a laboratory setting. (To minimize external influences) An assumption must be made that they are Class I or II balances and testing must be performed under suitable Class I scale conditions. (free from temperature fluctuations, vibration, draft, calibration, warm-up, level, free from static or other electro-magnetic sources, Class II or better calibrated weights, weight handling conditions, weight cleanliness, …)
b. Tests will be performed on at least two of each scale device. Testing on a third device will be required should significant variations be noted on any one scale of the same class.
c. Class II or better (Class I preferred during calibration) test weights will be used during testing. Clean and air dry all test weights using approved method. If unable to determine Class I/II weight cleaning procedure, assume use of Denatured Alcohol is an approved solvent for cleaning that will result in no residue on weights.
d. Perform all tests using the same test weight set.
e. Preference is for the same operator and same environmental setting be used to perform all like tests. Preference is for all like devices to be tested at the same time or as close as possible.
f. Each test defined below should be performed without interruption in time or concentration. After test is performed, the same test should be repeated on the second device immediately thereafter. If necessary, a third device should be tested. This is to ensure repeatability and under same or similar uncontrolled conditions.
g. All tests will be performed a minimum of 5 times or as stated in NTEP testing procedures if an equivalent test exists.

Appendix A (Item 320-2)
Attachment C (continued)

Pharmacy Counting Scale --- Accuracy Testing

i. All test results must be recorded when performed. All exceptions, retries or retesting, significant pauses in testing and aborted tests or scale recalibrations must be noted before, during and after test. Time should be recorded at the beginning and completion of each major test.

j. Once testing begins, **absolutely no recalibration** of the scale may occur throughout the **entire** test sequence. (Should recalibration be needed during the testing; the entire testing must be aborted and properly documented and testing restarted at the beginning.)
    i. Calibrate scale using approximately two-thirds total load of scale
    ii. Verify scale calibration conforms to Class I (+/- 0.001 g)
        1. Verify by approaching calibration weight from below and above as defined in NTEP testing procedures.
    iii. Verify linearity across entire range (per NTEP)
    iv. Verify corner load (per NTEP)
    v. Verify calibration every hour while testing. If greater than +/-0.001 g error; calibration error must be sufficiently explained before resumption of testing. All tests to last known good calibration must be repeated; with original test results also noted.
    vi. Record all results.

k. Record all results within a spreadsheet. Use formulas wherever possible. Record all significant digits. Display in fixed format. Display all calculated values to 6 significant digits. Note any formula or calculation that uses a rounded or truncated value. Test results sheets should also contain other good laboratory practices background data. (e.g., Time, date, who, SN,)

l. Before starting the tests defined below, perform the following NTEP tests. These tests must be performed daily before testing starts. Use a single test weight nearest the two-thirds total load. (or larger if required)
    i. Verify calibration using approximately two-thirds total load of scale.
    ii. Verify return to zero after each test above. Tare as needed. Do not continue testing if repeatability of zero is unreliable (e.g., must repeatedly tare for zero values greater than +/- 0.001 g.)
    iii. Verify linearity across entire range (per NTEP) accuracy and repeatability.
    iv. Verify corner load (per NTEP).

    For each test, Record the actual test weight, displayed value, note fluctuations in display as comments.

    Calculate error, percent error in spreadsheet
    v. Record all results.
    vi. Steps i) and ii) must be performed at the beginning and completion of each test phase to insure test reliability.

m. If a test range of values requested for N are not specified. Assume 5, 10, 30, 100, 200 or some N to match test weight specified) these represent minimum scale reference quantities and typical in-use values for reference quantities. The maximum N may need to be determined based on the test being performed and the test weight specified.

n. If a test range of values request for test weights is not specified. Assume 0.020 g, 0.030 g, 0.300 g, 0.400 g, 1.000 g and 10.000 g. These values represent the smallest drug weights, average and median drug weights and upper end and maximum drug weights)

Appendix A (Item 320-2)
Attachment C (continued)

Pharmacy Counting Scale --- Accuracy Testing

1. Scale communication interface minimum piece weight
   All tests for this section assume communication with the scale CPU from a computer or via the RS-232 interface. The recorded value should be to the highest resolution accepted by the scale. (Repeat once)
   a. What is the highest resolution value accepted by the scale? (00.123 45…9… g)
   b. What is the minimum acceptable piece weight accepted by the scale via the RS-232 interface? (in xx.xxxxx grams format)
   c. What is the maximum acceptable piece weight accepted by the scale via the RS-232 interface?
   d. What is the highest resolution value returned by the scale?
   e. What is the resolution recorded in the library? (00.123 4 g)

2. Scale calculated minimum piece weight
   All tests for this section assume the scale is performing the piece weight calculation. (e.g., An operator places N pieces on the scale and the scale calculates by total weight / N = piece weight.) Determine by using the same reference weight(s) and adjusting N. (Note: Reference weight must be greater than scale minimum weight. Preferably 2x to 5x minimum scale weight.) (Repeat once)
   a. What is the maximum resolution piece weight value returned by the scale?
   b. What is the minimum number of reference pieces accepted for determining reference weight?
   c. What is the minimum piece weight that will be calculated by the scale?
      i. Does this vary by the number of pieces? (i.e., Changes in N)
   d. What is the minimum total weight that the scale will calculate a piece weight?
      i. Does this vary by the number of pieces? (i.e., Changes in N)
   e. Record the following
      i. Actual weight used
      ii. Reference quantity set (N)
      iii. Scales calculated reference piece weight (ActPcWt)
      iv. Theoretical reference piece weight (TPcWt)
      v. Error (TPcWt – ActPcWt)
      vi. Percent error = (TPcWt – ActPcWt) / TPcWt * 100)

3. Scale accuracy in determining piece weight
   These tests are to determine the scales algorithm in piece weight calculation. Testing assumes use of test weights as a quantity. Where practical, use nearest whole test weight. Otherwise use as few weights as possible.
   a. What is the accuracy of the scale determining piece weight?
   b. Does the accuracy change by changes in N?
   c. Repeat for N = 5, 10, 30, 60, 100 and 200 using a 5.000g test weight.
   d. Does the accuracy change by changes in total weight?
   e. Repeat for approximate piece weight (after scale calculation) to be near 0.020 g, 0.030 g, 0.300 g, 0.400 g 1.000 g and 10.0 g with a count in the 60 to 180 range. (i.e., 2.000 g, 5.000 g, 20.000 g, 50.000 g, 100.000 g and 200.000 g test weights)
   f. Use single reference weight nearest 25 percent of total load capacity.
      1) Adjust N as required to achieve average pill pc.weight (0.300 g – 0.400 g). (Example 310.000 g * 0.25; locate nearest single reference weight. Nearest Single Reference Weight / 0.300 = N)
      2) Repeat for 50 percent and 90 percent of total load capacity by estimating N and then immediately finding N

Appendix A (Item 320-2)
Attachment C (continued)

Pharmacy Counting Scale --- Accuracy Testing

3) Record the following
   i) Actual weight used
   ii) Reference quantity set (N)
   iii) Scales calculated reference piece weight (ActPcWt)
   iv) Theoretical reference piece weight (T.PcWt)
   v) Error (TPcWt – ActPcWt)
   vi) Percent error = (TPcWt – ActPcWt) / TPcWt * 100)

4. Next pill tests

These tests are to determine the counting algorithm used within the devices

a. What percent of a piece weight is required to generate the next count? (i.e. N+1)
b. Does this vary by piece weight value?
c. Does this vary by count?
d. Does this vary by scale settings?
e. Perform tests at approximately 25, 50, 75 and 90 percent total load
   i. Choose nearest whole weight (W1)
f. Perform test with N = 30 and 100
g. Scale to calculate reference piece weight
h. Place test weight on scale
i. Extract and Record scales reference piece weight. (PcWt)
j. Record calculated piece weight. (W1 / N)
k. Add test weight(s) in 0.001 g increments (or using binary search procedure) until N+1 value is reached.
l. Record total weight (and individual test weights) to nearest 0.001 g (W2)
   (proper protocol must be followed in approaching the N+1 count. Follow NTEP test procedures for slowly adding test weights in a reliable, predictable fashion. If the >0.001 g added and N+1 event occurs, sufficient test weights must be removed to reliable predict weight required for N+1 threshold. Do not drop weight onto scale pan. Do not touch scale pan when placing weight on scale. Do not touch scale pan when removing weight. Do not press on scale pan when removing weight.)
m. Add test weight(s) in 0.001 g increments (or using binary search procedure) until N+2 value is reached. (W3)
n. Record total weight (and specify individual test weights used) to nearest 0.001 g
o. Calculate and Record percent of piece weight required
   ii. (W2 – W1) / PcWt * 100 %
   iii. ((W3 – ((W3-W2)/2)) / PcWt * 100 %
   Note: both values calculated in i) and ii) above should be identical
   iv. (W3-W2) = PcWt ???
p. Once weights required for N+2 and N+1 are known; start with weight for N+2 + (PcWt / 2)
   i. Remove weights in 0.001 g increments (or using binary search) until N+1threshold reached.
   ii. Record total weight (W4)
   iii. Remove weights in 0.001 g increment until N reached
   iv. Record total weight (W5)
q. Calculate and record percent of pieces required
   i. W4 – W3 = difference for N+2 event
   ii. W5 – W2 = difference for N+1 event
   iii. W5 – W4 = PcWt ???

Appendix A (Item 320-2)
Attachment C (continued)

Pharmacy Counting Scale --- Accuracy Testing

5. Counting accuracy based on known piece weight

   These tests are to determine the linearity and accuracy of counting by using known weights and programmed piece weights.

   a. Perform tests with piece weight set to 0.020g, 0.030g and 0.050 1g
   b. Test at 20x, 50x, 100x, 150x, 200x counts.
   c. Record
      i. Actual total weight required
      ii. Specific test weight(s) used,
      iii. N
      iv. Expected total weight,
      v. Error in weight
      vi. Percent error
   d. For 0.0501 gram piece weight, test using 100.000g weight (W1)
      i. Set piece weight to 0.0501 gram
      ii. Place the 100.000 gram weight on scale
      iii. Record count (N)
      iv. Add weight(s) in 0.001g increments until N+1 count reached (W2)
      v. Record
         1. Actual total weight added,
         2. Specific test weight(s) used,
         3. Error in weight
         4. Percent error ((calculated weight needed for N+1 – actual weight) / calculated weight needed for N+1)
      vi. Continue adding weight in 0.001g increments until N+2 count reached (W3)
      vii. Record
         5. Actual total weight added,
         6. specific test weight(s) used,
         7. Error in weight
         8. Percent error ((calculated weight needed for N+1 – actual weight) / calculated weight needed for N+1)
      viii. Calculate the following
         9. W4 = W2+(W3-W2)/2 (represents N+1)
   e. Repeat test above using 200.000g weight

Appendix A (Item 320-2)
Attachment D

Verifying a Counting Scale Accuracy

A counting scale calibration assumes the following parameters are available when operating in the article counting mode.

D(i)	Internal scale resolution used during counting. D(i) will be higher resolution than e and d parameters currently on the weighing scale.
PcWt(min)	Minimum mean article weight. PcWt(min) should follow Normal Distribution curves.

Appendix A (Item 320-2)
Attachment D (continued)

Verifying a Counting Scale Accuracy

Class (count) Counting accuracy class. Class (count) determines the percent accuracy of the counting feature. Ideally, Class (count) should mimic the weighing Class I, II, III.

In addition, these parameters may be needed internal to a counting scale:

PCs (min) Minimum number of pieces allowed to establish PcWt. The PCs (min) is determined by the article type being counted. To some degree, the PCs (min) are established by the Normal Distribution of the article being counted.

CNT (min) PcWt (min) / D(i) = minimum number of scale intervals (D(i)) between each article counted.

Because article counting depends directly on the weight capacity, resolution, and mathematical routines internal to an electronic digital scale, no absolute counting calibration should be necessary or possible. The counting scale will support a method of establishing an article reference weight by either calculation based on an expected quantity or by direct entry (either manually or via a computer interface). However, a means must be provided to verify counting calibration based on an article reference weight.

Counting Scale --- Verification of Counting

Two alternative methods will be available to the scale manufacturer to demonstrate counting accuracy.

Method #1 - Using a first test weight and a selected quantity to establish the article reference weight. And a second test weight to verify the count accuracy within the Class (count) tolerance.

Method #2 - Counting scale retrieves a known (and published) article reference weight and a test weight to verify the count accuracy within the Class (count) tolerance.

Both methods assume the scale weighing calibration has been performed and the article reference weight (determined or pre-programmed) is typical for the intended application. The article reference weight must also be selected to result in the use of test weights typical for the Class of scale being used. The test weight value should be an even multiple of the article reference weight to simplify verification by using a singular test weight.

Method #1 – Using a Reference Quantity to Verify Counting Accuracy

This method assumes a known (published) reference quantity and a test weight will be used to establish the article reference weight and then this established article reference weight is used to verify the count accuracy to within the specified Class (count) accuracy.

The advantage to this method is that any test weight set for the Class scale may be used to verify proper operation of the counting scale. The operator selects two test weights that are X and 10-100X values within the published scale weighing range and greater than the PcWt(min).

The counting scale may support multiple quantities for the operator to select from in establishing the individual reference weight value. These quantities allow the scale to calculate an article reference weight based on a theoretical sample size of N articles.

Determining theTest Weights Needed

1. Determine the article quantity to be used for establishing the reference weight. (N)
2. Calculate a test weight #1 (TW1) that is above the PcWt(min) and typical for the articles counted. (Example: PcWt(min) * N < test weight #1 (TW1))
3. Calculate a test weight #2 (TW2) that is 10-100X the test weight #1.

Establishing the Article Weight:

4. Place the scale in the counting mode.
5. Place the scale in the mode used to establish article reference weights for the quantity of articles (N).
6. Following the scale manufacturer's direction, place the TW1 on the scale to establish the article reference weight. (Ref.Weight = TW1 / N)
7. Wait for the scale to indicate article reference weight calculation is complete.
8. Verify the quantity displayed.

Verify the Counting Accuracy Using the Established Article Reference Weight:

9. Zero the count display.
10. Place test weight #2 (TW2) on the counting scale.
11. Verify the quantity display is 10 to 100 articles (as previously calculated) are within the Class (count) tolerance.

A scale manufacturer may choose to publish the calculated article reference weight, N, TW1, TW2 and tolerance range values and procedures to simplify the verification task. A table of calculated article reference weights, N, TW1, TW2 and tolerance range values may be published for scales with multiple weighing ranges (and therefore counting ranges and corresponding tolerances).

Calculated article reference weight	N	Test Weight #1 (TW1)	Test Weight #2 ± (TW2)	Expected Count and acceptable Tolerance
0.020	10	0.200 gram	20.000 gram	100 ± x
0.100	10	1.000 gram	100.000 gram	100 ± x
0.100	10	1.000 gram	300.000 gram	300 ± y
0.300	10	3.000 gram	300.000 gram	100 ± x

Method #2 – Using a Reference Article Weight to Verify Counting Accuracy

This method assumes a pre-programmed, known and published article reference weight will be used to verify the count accuracy to within the specified Class (count) accuracy. The pre-programmed article reference weight should be typical for the articles being counted. The operator may be able to select from a list of article reference weights or program a specific article reference weight.

Determining the Test Weight Needed

1. Calculate the test weight needed to be in the 10-100X range of the article reference weight. Pre-programmed article reference weight * 100 = test weight #1 (TW1).

Verify the Counting Accuracy Using the Established Article Reference Weight

2. Zero the count display.
3. Place test weight #1 (TW1) on the counting scale.
4. Verify the quantity display is 10 to 100 articles (as previously calculated) are within the Class (count) tolerance.

Appendix A (Item 320-2)
Attachment D (continued)

Verifying a Counting Scale Accuracy

A scale manufacturer may choose to publish the article reference weight, TW1 and tolerance range values and procedures to simplify the verification task. A table of article reference weights, TW1 and tolerance range values may be published for scales with multiple weighing ranges (and therefore counting ranges and corresponding tolerances).

Article Reference weight	Test Weight #1 (TW1)	Expected Count and acceptable Tolerance
0.020	20.000 gram	100 ± x
0.100	100.000 gram	100 ± x
0.100	300.000 gram	300 ± y
0.300	300.000 gram	100 ± x

Appendix B (Item 360-3)
Developing Issues - Scales

Item 1 N.1.3.4.1. Weight Carts

Source: Northeastern Weights and Measures Association (NEWMA)

Recommendation: Add new paragraph N.1.3.4.1. to the Scales Code as follows:

> **N.1.3.4.1. Weight Carts. – Weight carts may be included as part of the minimum required test load required in N.1.3.4. provided that the mass value of the weight cart has been determined by weights and measures and is clearly marked thereon. Further, a certificate of calibration issued by the weights and measures jurisdiction that issued the weight certificate must be available at all times. Said certificate shall contain at a minimum the following information: date of calibration, name, model, and serial number of the weight cart, the minimum graduation of the scale used in the calibration of the weight cart, and the name of the jurisdiction and inspector or metrologist who determined the mass value.**

Discussion: This proposal is intended to modify the NIST Handbook 44 Scales Code to recognize the use of weight carts during a shift test. To provide input on this proposal contact NEWMA.

Item 2 T.N.3.X. Vehicle Scales Equipped Only With Weighbeam and Used to Weigh Aggregate

Source: Central Weights and Measures Association (CWMA)

Recommendation: Add new paragraph T.N.3.X. to the Scales Code as follows:

> **T.N.3.X. Vehicle Scales Equipped Only With Weighbeam and Used to Weigh Aggregate. – The minimum tolerance applied to vehicle scales equipped only with a weighbeam and used solely to weigh aggregate products shall be 100 lb.**

Discussion: The Central Weights and Measures Association would like input on this proposal to increase the tolerances for vehicle scales equipped with only a weighbeam and used to weigh aggregate.

To provide input of this proposal contact Constantine Cotsoradis (Kansas Department of Agriculture/Weights and Measures) by telephone at 785-862-2415, by fax at 785-862-2460, or by email at ccotsora@kda.state.ks.us.

Appendix C (Item 360-3)
Developing Issues – Vehicle-Tank Meters

Item 1 N.4.2. Special Tests (Except Milk-Measuring Systems), N.4.5. Product Depletion Test, and T.5. Product Depletion Test

Source: Northeastern Weights and Measures Association (NEWMA)

Recommendation: Modify paragraph N.4.2. Special Tests (Except Milk-Measuring Systems) as follows:

> **N.4.2. Special Tests (Except Milk-Measuring Systems). "Special" tests shall be made to develop the operating characteristics of a measuring system and any special elements and accessories attached to or associated with the device. Any test except as set forth in N.4.1. or N.4.5. shall be considered a special test. Special test of a measuring system shall be made as follows:**
>
> **(a) at a minimum discharge rate of 20 percent of the marked maximum discharge rate or at the minimum discharge rate marked on the device whichever is less;**
>
> **(b) to develop operating characteristics of the measuring system ~~during a split compartment delivery~~.**

Add new paragraphs N.4.5. Product Depletion Test and T.5. Product Depletion Test to the Vehicle-Tank Meters Code as follows:

> **N.4.5. Product Depletion Test. – The effectiveness of the vapor eliminator shall be tested by depleting the product supply and continuing until the lack of fluid causes the meter register to stop absolutely. The test shall be completed by switching to another compartment with sufficient product on a multi-compartment vehicle, or by adding sufficient product to a single compartment vehicle. When adding product to a single compartment vehicle, allow appropriate time for any entrapped vapor to disperse before continuing the test.**
>
> **T.5. Product Depletion Test. – The difference between the results of the normal test and the product depletion test shall not exceed 0.5 percent of the equivalent of one minute of flow at the maximum rated flow rate for the system.**

Discussion: The proposal intends to recognize that the vapor measured when product is depleted during the vehicle-tank meter split compartment test as a system problem that is not related to the prover size. The proposal requires a split compartment test for single compartment vehicles to verify the performance of the air elimination mechanism.

To provide input on this proposal contact Ross Andersen (New York Bureau of Weights and Measures) by telephone at 518-457-3146, by fax at 518-457-5693, or by email at ross.andersen@agmkt.state.ny.us or Stephen Martin (New York Bureau of Weights and Measures) by telephone at 315-487-2250, by fax at 315-487-2408, or by email at weighsyr@agmkt.state.ny.us.

Appendix D (Item 360-3)
Developing Issues – Other Items

Item 1 Update NCWM Publication 3, National Conference on Weights and Measures Policy, Interpretations, and Guidelines; Taximeters vs. Odometers Used for Transporting Fare Paying Passengers

Source: Southern Weights and Measures Association (SWMA) (This item first appeared on the Committee's 2001 Agenda as Developing Item 360-4, Appendix E.)

Recommendation: Add the following interpretation to NCWM Publication 3, Section 3 – Specifications, Tolerances, and Device Inspection, Subsection 5 – Linear Measuring and Other Devices:

3.5.X Taximeters vs. Odometers Used for Transporting Fare Paying Passengers

Interpretation

Taximeters are required for use in transporting passengers and charging on a "distance traveled" basis. Vehicle odometers are not suitable equipment for such use. Odometers are suitable for use in charging "distance traveled" rates in rental vehicles in which customers pay on a "per-mile" basis for the right to operate the vehicle.

NIST Handbook 44 requires that devices must be suitable for their application with regard to their operating abilities, including their capacity, smallest division size, readability, performance, and design.

Handbook 44 General Code, which applies to all devices, requires in paragraph *G-UR. 3.3. Position of Equipment* that a device or system "*used in direct sales shall be so positioned that its indications may be accurately read and the weighing or measuring operation may be observed from some reasonable "customer and operator position."* Reasonable customer positions in taxicabs or other vehicles in which a driver transports passengers includes all passenger seats in a vehicle, both front and back. A properly installed taximeter's indications are easily readable from any position in the vehicle, both in darkness and light. An odometer cannot be read accurately from most positions in a vehicle other than the drivers' seat.

Handbook 44 General Code also requires specific markings on devices including manufacturer's name or trademark, model designation, and a nonrepetitive serial number. All markings must be located so that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device. The code also requires electronic devices to have provisions for applying security seals that must be broken before any changes that affect the accuracy of the device can be made. While taximeters meet these requirements, most odometers do not.

Further supporting the requirement for taximeters over odometers are the tolerances for the two devices prescribed in Handbook 44. Transporting passengers for hire normally involves shorter distances at higher cost-per-distance charges than for rental vehicles. The tolerances for taximeters in the Taximeters Code are *1 % for overregistration* (error in favor of the cab) and *4 % for underregistration plus 100 feet* (in favor of the customer). The tolerances for odometers in the Odometers Code are *4% for overregistration and underregistration*, allowing 4 times as much error in favor of the operator. As taxi fares are usually much higher than rental car costs on a per mile basis, this allows for unreasonable and unacceptable errors that could be financially injurious to the customer.

It should be noted that no taximeter is required in cases where the charges are based on zones or flat rates, providing that such methods are in compliance with local ordinances and are

conspicuously posted and understandable to customers. When taximeters are used, the rates for distances traveled and any extras must be posted as well.

Background: The SWMA asks the NCWM to consider a proposal to modify NCWM Publication 3 "Policy, Interpretations, and Guidelines" to include an interpretation in Section 3, Subsection 5 specifying that odometers are not suitable equipment for use in transporting passengers and charging on a "distance traveled" basis.

To provide input on this proposal, contact SWMA at the SWMA web site: www.swma.org.