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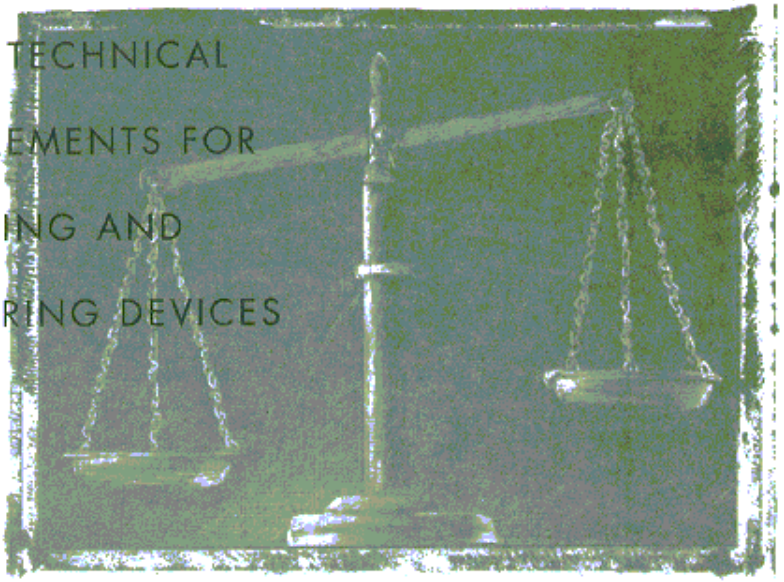
NIST
National Institute of Standards and Technology
Technology Administration
U.S. Department of Commerce

SPECIFICATIONS, TOLERANCES, AND OTHER TECHNICAL REQUIREMENTS FOR WEIGHING AND MEASURING DEVICES



as adopted by the 85th
National Conference on
Weights and Measures 2000

NIST CENTENNIAL 1901-2001

NIST Handbook 44

2004

310 General Code

310-1 V 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 NIST Handbook 44, General Code 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 as of 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 <u>and software-based not built-for-purpose devices</u>, a nonrepetitive serial number;
[Nonretroactive as of January 1, 1968]

(e) <u>for software-based not built-for-purpose devices the current software version designation;</u>

<u>(f)</u>~~(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]

<u>(g)</u>~~(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]

<u>(h)</u>~~(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 be continuously displayed or marked on the device*, or

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

(c) all required information in G-S.1. Identification. (a), (b), (c), (e), and (h) be continuously displayed. Alternatively, a clearly identified System Identification, G-S.1. Identification, or Weights and Measures Identification shall 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 result of the ballot was 9 affirmative votes, 1 negative vote, and 3 members abstained.

weighing operations, where manual entries are permitted, might not adequately recognize all weighing installations where manual weight entries are appropriate.

At the July 2002 NCWM Annual Meeting, 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 also discussed a proposal, developed by the Committee at the 2002 NCWM Interim Meeting, to address the various manual weight entries that occur nationally in weighing operations. The proposal modified paragraph S.1.12. to recognize manual weight entries for both gross and net weight packages and to require the system to identify and print manual tare entries.

The Committee agreed 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.

In September 2002, the Committee heard support from the WWMA to modify paragraph UR.3.9. to recognize manual weight entries on POS systems for marking the correct weight on preweighed item. The WWMA indicated that it is acceptable to manually enter weight and price information and use the POS system as a calculator. The WWMA also removed all references to the term "gross" from paragraph UR.3.9. to correspond with the changes recommended for paragraph S.1.12.

During the 2003 NCWM Interim Meeting, scale manufacturers indicated it would be too costly to require devices to print manual tare values. Scale manufacturers supported an alternate proposal to modify paragraph S.1.12. to specify that only "direct sale" devices accept manual weight entries.

The Committee was not certain that the WWMA proposal as written in paragraph UR.3.9. clearly identified which applications are permitted to use manual weight entries. Additionally, the Committee was not certain that the proposal permits manual weight entries for random weight packages. The Committee agreed the proposed language in paragraph S.1.12. may be misleading as to whether or not the device must print the value for each keyboard-, stored-, push-button- or digitally entered tare. Consequently, the Committee deleted any requirement to identify and print manual tare values on labels or recorded representation from paragraph S.1.12. The Committee also modified the proposal to clarify what are acceptable manual weight entries for point-of-sale systems and that the application in paragraph S.1.12. is effective on January 1, 2004 for manual net weight entries. However, the Committee may wish to consider keeping the original effective date of January 1, 1993 for simplicity since manual gross and net weight entries already occur and both entries would now be acceptable. The Committee believes these modifications provide the flexibility grocers need to make manual weight entries while there are sufficient safeguards to prevent fraudulent use of the feature.

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

320-2 V S.1.2.3. Prescription Scale with a Counting Feature, Table S.6.3.b. Note 13, S.6.6. Counting Feature Minimum Piece Weight and Number of Pieces, S.2.5.3. Class I and Class II Prescription Scales with a Counting Feature, Table 3 Parameters for Accuracy Classes Footnote 2, N.1.10. Counting Feature Test, T.N.3.10. Prescription Scales with a Counting Feature,UR.3.11. Recommended Minimum Count, UR.3.5. Special Designs, and Footnote 5

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: McKesson Automated Prescription Systems along with NIST Weights and Measures Division and the S&T Committee developed an alternate proposal. Add new paragraphs S.1.2.3. Prescription Scale with a Counting Feature, S.6.6 Counting Feature Minimum Piece Weight, S.2.5.3. Class I and Class II Prescription Scales with a

Counting Feature, N.1.10. Counting Feature Test, T.N.3.10. Prescription Scales with a Counting Feature, and UR.3.11. Recommended Minimum Count as follows:

S.1.2.3. Prescription Scale with a Counting Feature. - A Class I or Class II prescription scale with an operational counting feature shall not calculate a piece weight or total count unless the following conditions are met:

(a) minimum individual piece weight is greater than or equal to 3 e,
(b) minimum sample weight is greater than or equal to 20 e, and
(c) minimum sample size is greater than or equal 10 pieces

S.2.5.3. Class I and Class II Prescription Scales with a Counting Feature. – A prescription scale, Class I or Class II, shall indicate to the operator when the piece weight computation is complete by a stable display of the quantity placed on the load receiving element.

S.6.6. Counting Feature Minimum Piece Weight and Number of Pieces. – A Class I or Class II prescription scale with an operational counting feature shall be marked with the minimum piece weight and minimum number of pieces used to establish an individual piece count.

N.1.10. Counting Feature Test. – A test of the counting function shall be conducted on all Class I and Class II prescription scales having an active counting feature. The test should verify that the scale will not accept a sample with less than either the minimum sample piece count or the minimum sample weight. Counting feature accuracy should be verified at a minimum of two test loads. Verification of the count calculations shall be based upon the weight indication of the test load.

T.N.3.10. Prescription Scales with a Counting Feature. – In addition to Table 6 Maintenance Tolerances (for weight), the indicated piece count value computed by a Class I or Class II prescription scale counting feature shall comply to within the tolerances in Table T.N.3.10. Maintenance and acceptance tolerances are the same.

Table T.N.3.10. Maintenance and Acceptance Tolerances in Excess and in Deficiency for Count	
Indication of Count	**Tolerance (piece count)**
0 to 100	**0**
101 to 200	**1**
201 or more	**0.5 %**

UR.3.11. Recommended Minimum Count. – A prescription scale with an operational counting feature shall be used to count a quantity of 10 (at a minimum of 30 e) or more pieces.

Modify Table S.6.3.b. Note 13, Table 3 Parameters for Accuracy Classes Footnote 2, paragraph UR.3.5. Special Designs, and Footnote 5 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." <u>Note: The "not legal for trade" marking is not required on a Class I or Class II prescription scale for which an NTEP Certificate of Conformance has been issue. The Certificate must</u>

specifically include a counting feature that has been evaluated and approved. (See paragraph UR.3.5 and Footnote 5.)
[*Nonretroactive as of January 1, 1986]

Table 3 Parameters for Accuracy Classes
[2] A scale marked For prescription weighing only may have a verification scale division (e) not less than 0.01 g.

UR.3.5. Special Designs. - A scale designed and marked for a special application (such as a prepackaging scale or prescription scale with a counting feature) shall not be used for other than its intended purpose[5].

[5]Prepackaging scales and prescription scales with a counting feature (and other commercial devices) used for putting up packages in advance of sale are acceptable for use in commerce if all appropriate provisions of Handbook 44 are met. Users of such devices must be alert to the legal requirements relating to the declaration of quantity on a package. Such requirements are to the effect that, on the average, the contents of the individual packages of a particular commodity comprising a lot, shipment, or delivery must contain at least the quantity declared on the label. The fact that a prepackaging scale may overregister, but within established tolerances, and is approved for commercial service is not a legal justification for packages to contain, on the average, less than the labeled quantity.

Discussion: The WWMA proposed that the counting by weight feature on prescription scales should be recognized by NIST Handbook 44. The WWMA worked to develop a proposal based on the following input from prescription 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 count based on 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 recommended this application only for prescription scales because of the controls in place for pill dosages. The WWMA recognized that Handbook 44 must be modified to permit a counting feature for prescription scales and further work is needed to ensure appropriate test procedures are available. The WWMA indicated that the counting feature is suitable only for prescription 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 prescription scale program), (3) Recommended Characteristics for a Prescription Scale, (4) Accuracy Test for Prescription Scale Counting Feature, and (5) Two Methods for Verifying Counting Accuracy (see Appendix A for the documents provided by McKesson's representative). The WWMA encouraged 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 WWMA proposal to remove the requirement to label operational counting features not legal for trade for NTEP approved prescription scales, but due to time constraints was not able to study the corresponding documents prepared by Mr. Jankowski. The SWMA recommended the type evaluation and field test procedures developed by Mr. Jankowski need to include tolerances and require further development. The SWMA recommended the proposal move forward as an information item until all work is complete on the procedures.

Past NCWM discussions about the counting feature focused on variability in the size of individual items, compliance with device performance tolerances, and the individual piece weight unit having a higher resolution than the displayed scale division (d). The initial WWMA proposal included language to eliminate labeling requirements for the counting feature on prescription scales from Table S.6.3.b Note 13 and preliminary test procedures, but did 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.

The Committee agreed that the information provided by the WWMA on prescription scales with a counting feature (see Appendix A) is a good start at recognizing that feature. The proposed procedures were supported as metrologically sound The NTETC Weighing Sector recommended a proposal to modify paragraphs N.1.3.1. and N.1.3.8. and revise the current definition of counter scale to distinguish bench/counter scale from floor scale applications based on the number of platform supports and the device's nominal capacity rating. The Weighing Sector recommended a capacity limit of 100 kg for bench/counter scales since many shipping scales in commercial use on business counters or elevated conveyors

have a nominal capacity of 100 lb to 200 lb 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 did not concur with the proposed changes to paragraphs N.1.3.1. and N.1.3.8.

The Scale Manufacturers Association (SMA) supported a recommendation to modify the definition of "counter scale." However, the SMA could support only limited changes to paragraphs N.1.3.1. and N.1.3.8. to specify the conditions for shift tests on multiple platform supports of bench and counter scales and test loads placed on multiple points for all other scales with a single platform support.

The Committee recognizes that the Weighing Sector's proposal was intended to align the U.S. and Measurement Canada's shift test procedure that are based on the number of load supports. The Committee agreed with comments from industry and weights and measures officials that paragraphs N.1.3.1. Bench or Counter Scales and N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers adequately address shift test procedures and any change would create confusion. The Committee concurs with comments that the definition of counter scale needs to be modified. However, the Committee decided to amend the definition for clarity only and to include a 100 kg limit on the nominal capacity of counter scale.

320-5 V 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.)

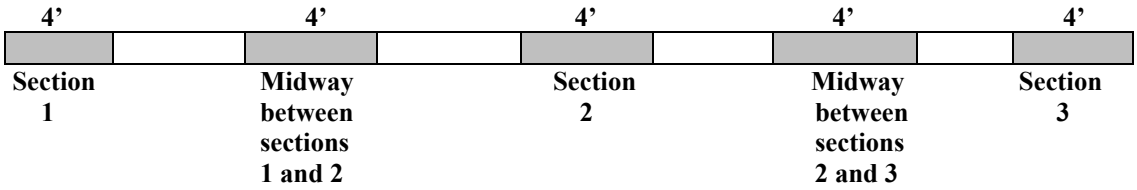
Recommendation: Modify paragraphs N.1.3.4. and N.1.3.4.1. as follows:

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

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

<u>(a)</u> <u>Minimum Shift Test.</u> 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.)~~ <u>(Combination Vehicle/Livestock scales shall also be tested consistent with N.1.3.4.2.)</u>

~~(a~~<u>b</u>) Prescribed Test Pattern <u>and Loading for Vehicle and Axle-Load Scales and Combination Vehicle/Livestock Scales</u>. 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~~) <u>(c), (d), or (e) as applicable</u>.



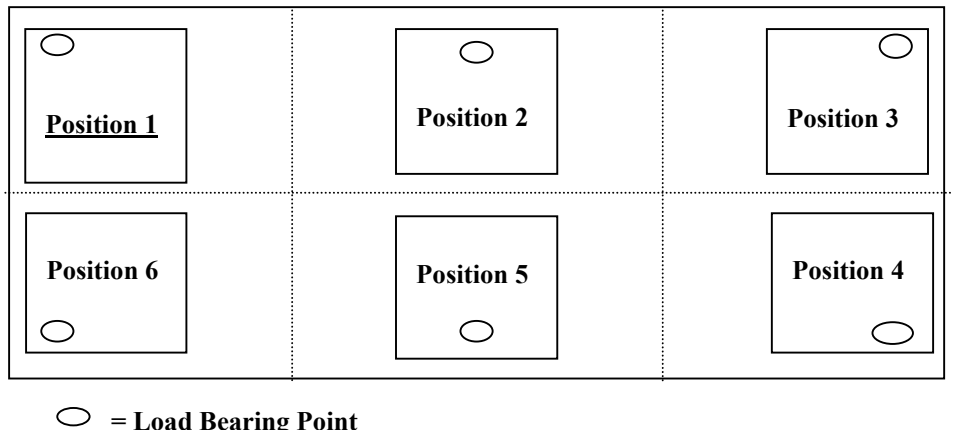
(~~b~~c)~~Maximum~~ Loading Precautions *for Vehicle, Axle-Load Scale, and Combination Vehicle/Livestock Scales*. When loading the scale for testing, one side of the test pattern shall be loaded to no more than half of the concentrated load capacity or test load before loading the other side. The area 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 new paragraph N.1.3.4.2. and associated diagram as follows:

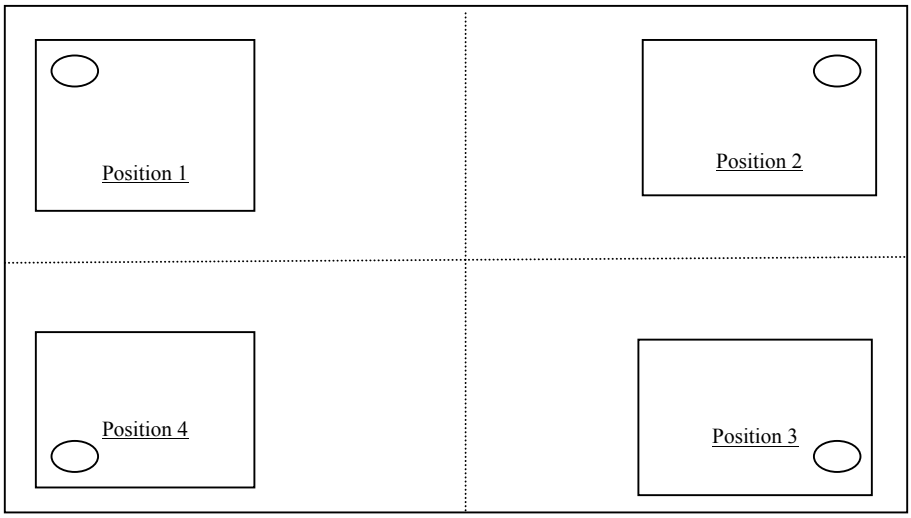
N.1.3.4.2. Prescribed Test Pattern and Test Loads for Livestock Scales with More Than Two Sections and Combination Vehicle/Livestock Scales. A minimum test load of 5000 kg (10 000 lb) or one-half of the rated section capacity, whichever is less, shall be placed, as nearly as possible, successively over 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:

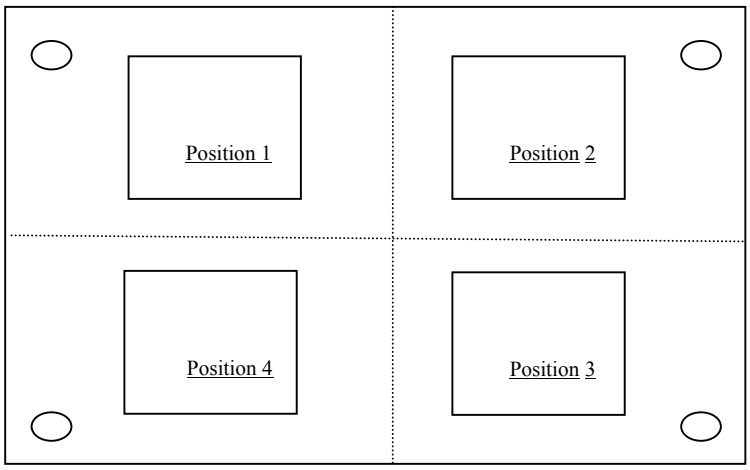
N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers. – A shift test shall be conducted using the following prescribed test loads and test patterns. ~~with a half-capacity test load centered, as nearly as possible, successively 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**

Modify 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 as of January 1, 2003.]***
>
> ***<u>Note: The marked section capacity for livestock weighing may be less than the marked CLC for vehicle weighing.</u>***

Discussion: In 2001, the Committee considered language that prescribed 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 to a recommendation that places in Handbook 44 the shift tests and test load patterns currently in use when testing livestock and vehicle scales. The 2002 proposal did not receive the majority vote necessary to modify requirements in NIST 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.

At its 2002 Interim Meeting, the Northeastern Weights and Measures Association recommended that the proposal remain informational to allow sufficient time to address the concerns expressed by the SMA.

The Scale Manufacturers Association (SMA) supported the proposal to add new paragraph N.1.3.4.2. and modify Table S.6.3.b. Note 22 shown in the recommendation above.

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 a test load of 12.5 percent of scale capacity, not to exceed one-half section capacity, is more than adequate to test a main load support. 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 proposed alternate language for the new paragraph N.1.3.4.2. and included the 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 shift tests up to 12.5 percent of scale capacity.

The Weighing Sector believes that testing of 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.

The Committee believes the recommendations above includes language that addresses the 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 Committee decided that the Weighing Sector's proposal for new paragraph N.1.3.4.2. and associated diagram shown in the recommendation above were more appropriate guidelines for the test load and test pattern for livestock scales with more than two sections and combination vehicle/livestock scales. The Committee also agreed with the WWMA's recommendation to add a note to Table S.6.3.a Note 22 as shown in the recommendation above.

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

The Scale Manufacturers Association (SMA) supports reducing the number of categories of weighing devices. However, the SMA opposes removing the term crane scale from the Scales Code without further discussion.

The Committee discussed the Weighing Sector's concern about the large list of terms used to identify various scale types and designs. The Committee questioned the existence of Class II hanging scales that may not be included in the proposed definition for hanging scale. The Committee believes that the Weighing Sector should explore other options to consolidate the terminology used to describe scale types and designs.

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

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

Recommendation: Amend T.N.8.3.1.(a) Power Supply, Voltage and Frequency as follows:

> **(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 <u>nominal</u> line voltage <u>with the tolerance –15 percent to +10 percent of the nominal, or the</u> range <u>as marked by the manufacturer. (Range takes precedence)</u> ~~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~~ <u>at</u> 60~~..5~~ Hz.**

Discussion: NTEP Participating Laboratories reported 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, 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 of the 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's proposal to modify paragraph T.N.8.3.1.(a) required 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 Weighing Sector also questioned 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 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.

The SWMA believed its alternate language provided a requirement that harmonizes with OIML requirements.

The Committee reviewed the following alternate proposals to modify paragraph T.N.8.3.1.(a) submitted by the Weighing Sector and Southern Weights and Measures Association (SWMA), respectively.

> 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

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*
6	Grain Scale	•Most weighments are used for a moisture test •The average net load is 250 g •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 ≤ 2 % x ANL d ≤ 0.02 x 250 g 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

The Committee considered the CWMA's proposal to add new paragraph UR.1.6. Average Net Load – Class III Scales and Table to the Scales Code. The Committee acknowledges that guidelines to assist the scale user, service company, and weights and measures official in determining the suitability of a device for a weighing application are needed and long overdue. The Committee recommends that submitters of future proposals for such guidelines review Measurement Canada's table for minimum net loads. The Canadian table includes guidelines for the minimum net load for weighing applications based on the type of materials weighed. Each application has a minimum net load expressed as a multiple of the verification scale interval (e). The Committee finds that the proposal cannot be uniformly applied to all weighing applications it is intended to cover. Industry opposes the proposal citing that the concept is good, but the guidelines are unenforceable and subjective. Consequently, the Committee withdraws this item from its agenda.

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

320-9 V 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) (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 prescribed 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 developed by the Weighing Sector. The Weighing Sector's proposal was intended 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 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 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.

The Committee agreed to recommend the Western (WWMA) and Southern (SWMA) Weights and Measures Associations alternate definition of concentrated load capacity for adoption at the 2003 NCWM Annual Meeting. The alternate definition of CLC addresses concerns about the appropriate use of the term DTAC in reference to scale's rating as well as removes any reference to livestock scale applications. The Committee discussed that dual tandem axle vehicles are configured with two wheels on the end of the axle for a total of eight tires although it is possible for tandem axles with one wheel on each axle. However, dual tandem axle capacity and CLC are the same and to state any difference is misleading. CLC ratings allow the device user to compare the capacities of each device. The load pattern and capacity for a device is the same for dual tandem axle capacity and CLC. The device user cannot ask for a larger test pattern, if declaring either capacity rating (DTAC or CLC).

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

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

(Item 320-10 was separated into three parts, Items 320-10A, 320-10B, and 320-10C to facilitate review of the issues.)

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.**
>
> **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.**

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 substituted materials to the exact amount of known test 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.

During the 2002 NCWM Interim Meeting, the Committee agreed that the definition of substitution test developed by Ross Andersen (New York Bureau of Weights and Measures) adequately described the test load and test procedure and relevant tolerances without being too restrictive or documenting the details for test procedures. The Committee also agreed with New York's proposed definition of test load which clarified that the term applies to the substitution process.

At the 2002 NCWM Annual Meeting, the Committee also reviewed a WMD recommendation to modify the current definition of "strain-load test" to be more consistent with Mr. Andersen's proposed definition of "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 developed by Mr. Andersen 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.

During its September 2002 Technical Conference, the Western Weights and Measures Association (WWMA) supported the definitions for substitution test, substitution test load, and strain load. The WWMA recommended 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)**.**

At its 2002 Interim Meeting, the CWMA developed a proposal for an alternate new definition of "substitution test" and to modify the current definition of "strain-load test" that eliminated all procedural language. The CWMA also proposed to eliminate any confusion between the terms substitution test and strain-load test by creating separate procedures and tolerances for each test method.

The Committee heard numerous comments from NCWM members who proposed alternate definitions, but were now in favor of the substitution test and substitution test load definitions, and separate test notes and tolerances for substitution test and strain-load test developed by the CWMA. The Committee found the CWMA proposal effectively separates procedural language from definitions thereby eliminating confusion on how to conduct the test procedures. The

Committee heard that Ross Andersen (New York) is also working on procedures that will allow officials to assess the uncertainty for specific scale installations and applications.

The Committee agreed to support CWMA's proposal as shown in the recommendation above. The Committee also split the proposal into three separate items, 320-10A, 320-10B, and 320-10C as recommended by the CWMA.

For additional background information on this item, refer to the 2000, 2001, and 2002 S&T Final Reports.

320-10B V N.1.X. Substitution Test and T.X. Tolerances for Substitution Test

(Item 320-10 was separated into three parts, Items 320-10A, 320-10B, and 320-10C to facilitate review of the issues.)

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: Add new paragraphs N.1.X. Substitution Test and T.X. Tolerances for Substitution Test to the NIST Handbook 44 Scales Code as follows:

> **N.1.X. Substitution Test. - In the substitution test 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 the 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.**

Discussion: Since 1999, the Committee has discussed numerous proposals to define "substitution test" and related terms such as "strain-load test" to clarify any confusion about test methods for large capacity scales.

At its 2002 Interim Meeting, the CWMA developed a proposal for an alternate new definition of "substitution test" and to modify the current definition of "strain-load test" that eliminated all procedural language. The CWMA also proposed to eliminate any confusion between the terms substitution test and strain-load test by creating separate procedures and tolerances for each test method.

The Committee heard numerous comments from NCWM members who proposed alternate definitions, but were now in favor of the substitution test and substitution test load definitions and separate test notes and tolerances for substitution test and strain-load test developed by the CWMA. The Committee found the CWMA proposal effectively separates procedural language from definitions thereby eliminating confusion on how to conduct the test procedures. The Committee heard that Ross Andersen (New York) is also working on procedures that will allow officials to assess the uncertainty for specific scale installations and applications.

The Committee agreed to support CWMA's proposal as shown in the recommendation above. The Committee also split the proposal into three separate items, 320-10A, 320-10B, and 320-10C as recommended by the CWMA.

The background and rationale for this item are outlined in Item 320-10A

320-10C V N.1.X. Strain-Load Test and T.X. Tolerances for Strain-Load Test

(Item 320-10 was separated into three parts, Items 320-10A, 320-10B, and 320-10C to facilitate review of the issues.)

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: Add new paragraphs N.1.X. Strain-Load Test and T.X. Tolerances for Strain-Load Test to NIST Handbook 44 Scales Code as follows:

> **N.1.X. Strain-Load Test. - In the strain load test procedure, unknown material or objects are used to establish a reference load or tare to which known test weights or test loads are added.**
>
> **T.X. Tolerances for Strain-Load Test. - The tolerances to be applied to the scale are based on 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: Since 1999, the Committee has discussed numerous proposals to define "substitution test" and related terms such as "strain-load test" to clarify any confusion about test methods for large capacity scales.

At its 2002 Interim Meeting, the CWMA developed a proposal to modify the current definition of "strain-load test" that eliminated all procedural language. The CWMA also proposed to eliminate any confusion between the terms substitution test and strain-load test by creating separate procedures and tolerances for each test method.

The Committee heard numerous comments from NCWM members who proposed alternate definitions, but were now in favor of the substitution test and substitution test load definitions and separate test notes and tolerances for substitution test and strain-load test developed by the CWMA. The Committee found the CWMA proposal effectively separates procedural language from definitions thereby eliminating confusion on how to conduct the test procedures. The Committee heard that Ross Andersen (New York) is also working on procedures that will allow officials to assess the uncertainty for specific scale installations and applications.

The Committee agreed to support CWMA's proposal as shown in the recommendation above. The Committee also split the proposal into three separate items, 320-10A, 320-10B, and 320-10C as recommended by the CWMA.

The background and rationale for this item are outlined in Item 320-10A

320-11 I N.1.3.4.1. Weight Carts

(This item first appeared on the Committee's 2003 agenda as Developing Item 360-3, Appendix B Item 1. The Committee changed the item's status to an information item because corresponding work to develop weight cart standards is nearing completion.)

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. Guidelines for weight carts are not recognized in any current standards document. The Committee received a report on the status of NIST Handbook 105-8, "Specifications and Tolerances for Field Standard Weight Carts," which is scheduled for publication March 2003. The Committee encourages the weights and measures community to provide comments on the Handbook. The Scale Manufacturers Association supports the proposal. Several weights and measures jurisdictions indicated concern about how their weight carts will comply with requirements in the handbook, especially the fuel tank standards. The Work Group plans a more in depth review of fuel tank requirements. The Work Group indicated its plan to define a reasonable standard that allows existing weight carts to operate. Other

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 paragraph S.2.2.1. be forwarded to the NCWM S&T Committee as an information item.

At the 2003 NCWM Interim Meeting, the Committee heard support for identifying, in a manner that is readily available to the field official, any measuring element that is adjusted and agreed that the item has merit. Device manufactures present at the meeting stated that identifying any measuring element that is adjusted is possible on dispensers that have only one sealing mechanism for two or more measuring elements. The manufacturers requested time to develop an appropriate mechanism for providing that information. The Committee gave the item informational status to provide device manufacturers the opportunity to study the issue and develop means for meeting the proposed requirements.

330-2 V 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 (LMD) 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~~ <u>in accordance with S.4.4.2</u>. The minimum discharge rate shall not exceed 20 percent of the maximum discharge rate.***
>
> **<u>Example: With a marked maximum discharge rate of 230 L/min (60 gpm), the marked minimum discharge rate shall be 45 L/min (12 gpm) or less (e.g., 40 L/min (10 gpm) is acceptable). A marked minimum discharge rate greater than 45 L/min (12 gpm) (e.g., 60 L/min (15 gpm)) is not acceptable.</u>**

Background/Discussion: During its 2002 Annual Meeting, the NCWM voted 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.

At the 2003 NCWM Interim Meeting, the Committee heard no comments on this item. The Committee agreed that adding the example clarifies the intent of the paragraph and agreed to present it for a vote at the 2003 NCWM Annual Meeting.

330-3 V 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 Handbook 44, Section 3.30. Liquid-Measuring Devices UR.1.2. as follows:

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 without 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.

At the 2003 NCWM Interim Meeting, the Committee heard support for identifying the product that any individual measuring element, of a dispenser with multiple measuring elements, is measuring. The device manufacturers present at the meeting agreed that this requirement would also assist service agencies making adjustments to a dispenser when the measuring element for only a certain product needs adjustment. The device manufacturers also agreed that, for devices currently in the market place, a user can readily identify the product that any individual measuring element, of a dispenser with multiple measuring elements, is measuring. The Committee believes it is important that a field official be able to identify what product is being measured by each measuring element and agreed to present the item for a vote at the 2003 NCWM Annual Meeting.

330-5 V 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. Liquid-Measuring Devices by adding a new paragraph UR.3.6.3. that requires the buyer and seller of products measured or calculated using temperature compensation to do so for a twelve-month period, unless mutually agreed in writing to do otherwise. The revision would be stated as follows:

UR.3.6.3. When fuel is bought or sold on an automatic or nonautomatic 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 in writing.
(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 used for a consecutive 12-month period to prevent selective use of temperature compensation. The SWMA agreed that the issue has merit and recommended it be forwarded to the NCWM S&T Committee as an information item.

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: Syltone Industries 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 were believed necessary to allow the systems to begin the NTEP process. These systems would have had 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 Southern Weights and Measures Association (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.

At the 2003 NCWM Interim Meeting the Committee agreed to withdraw this item at the request of the original submitter, Syltone Industries, and with the support of the committee representatives from the WWMA and the SWMA.

331-5 V UR.X. Test Liquid

Source: Southern Weights and Measures Association (SWMA)

Recommendation: Revise NIST Handbook 44, Section 3.31 Vehicle-Tank Meters by adding a user requirement as follows:

> **UR.1.4. Liquid Measured. – 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 weights and measures approval unless the meter is recalibrated with a different product and tested by a registered service agency or a weights and measures official and approved by the weights and measures jurisdiction having statutory authority over the device.**

Discussion: At the October 2002 SWMA Annual Meeting, a weights and measures office stated that paragraph 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.

At the 2003 NCWM Interim Meeting, the Committee received comments that the proposal should be modified to include testing and approval by weights and measures officials. The Committee agreed with the comments, modified the proposal and decided to present it for a vote at the 2003 NCWM Annual Meeting as shown above.

331-6 I 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 NIST Handbook 44, Section 3.32. Vehicle-Tank Meters 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

Recommendation: 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 NIST Handbook 44, 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 was 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 Northeastern Weights and Measures Association recommended that the NCWM S&T Committee move this item forward as a voting item.

At the 2003 NCWM Interim Meeting, the Committee heard no comments on the item and agreed to present it for a vote at the 2003 NCWM Annual Meeting.

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

332-2 I 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.)

333 Hydrocarbon Gas Vapor-Measuring Devices

333-1 V 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 NIST Handbook 44, Section 3.33 Hydrocarbon Gas Vapor-Measuring Devices and modify Paragraph T.1. as follows:

T.1. Tolerance Values on Normal Tests and on Special Tests Other Than Low-Flame Tests. - Maintenance and acceptance tolerances for normal and special tests for hydrocarbon gas vapor-measuring devices shall be as shown in Table T.1. ~~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 **Table T.1. Accuracy Classes and Tolerances or Hydrocarbon Gas Vapor-Measuring Devices**

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

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 was 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 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.

At the 2003 NCWM Interim Meeting, the Committee heard no comments on this item and agreed to present it for a vote at the 2003 NCWM Annual Meeting.

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 V 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 NIST Handbook 44, 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 was 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 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 Northeastern Weights and Measures Association recommended that the NCWM S&T Committee move this item forward as a voting item.

At the 2003 NCWM Interim Meeting, the Committee heard no comments on this item and agreed to present it for a vote at the 2003 NCWM Annual Meeting.

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

334-2 V Definition for Cryogenic Liquid-Measuring Devices

Source: National Type Evaluation Technical Committee Measuring Sector

Recommendation: Modify the 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. The NTETC Measuring Sector recognized that the reference to scales for measuring cryogenic liquids was not removed from the definition for cryogenic liquid-measuring device in 1995 and recommended that the definition be modified to reflect the 1995 change to paragraph A.1.

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 Southern Weights and Measures Association supported the proposal and recommended that the NCWM S&T Committee move it forward as a voting item.

At the 2003 NCWM Interim Meeting, the Committee heard no comments on this item and agreed to present it for a vote at the 2003 NCWM Annual Meeting.

335 Milk Meters

335-1 W 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: Add the following new Table T.X. for Liquid-Measuring Devices to 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. 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 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: At the 2002 NCWM Annual Meeting, the Committee received no negative comments on item 330-1B. 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.

Item 330-3B was 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 a table providing an accuracy class and tolerances for milk meters 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.

At the 2003 NCWM Interim Meeting, the Committee agreed that the current Table 1. Tolerances for Milk Meters in the milk meters code should be retained to be consistent with the milk meter tolerances in the vehicle-tank meters code. The Committee agreed to withdraw this item from its agenda.

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

336 Water Meters

336-1 V Tolerances, Tables N.1., N.2., T.1. 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: Modify NIST Handbook 44, Section 3.36 Water Meters paragraphs N.3., N.4.1., and N.4.2.., delete existing Table 1 and Table 2., add new Tables N.1., N.2. and T.1. as shown below.

N.3. Test Drafts. - Test drafts should be equal to at least the amount delivered by the device in 2 minutes and in no case less than the amount delivered by the device in 1 minute at the actual maximum flow rate developed by the installation. The test drafts shown in Table N.1., next page, shall be followed as closely as possible.

N.4. Testing Procedures.

N.4.1. Normal Tests. The normal test of a meter shall be made at the maximum discharge rate developed by the installation. Meters with maximum gallon per minute ratings higher than Table N.1. values may be tested up to the meter rating, with meter indications no less than those shown.
(Amended 1990 and 2002)

N.4.1.1. Repeatability Tests. – Tests for repeatability should include a minimum of three consecutive test drafts of approximately the same size and be conducted under controlled conditions where variations in factors, such as temperature, pressure, and flow rate are reduced to the extent that they will not affect the results obtained.
(Added 2002)

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 Table N.2.

Table N.1. Flow Rate and Draft Size for Water Meters
Normal Tests

Meter size (inches)	Rate of flow (gal/min)	Maximum Rate Meter Indication/Test Draft	
		Gal	ft^3
Less than 5/8	8	50	5
5/8	15	50	5
3/4	25	50	5
1	40	100	10
1 1/2	80	300	40
2	120	500	40
3	250	500	50
4	350	1 000	100
6	700	1 000	100

Table N.2. Flow Rate and Draft Size for Water Meters Special Tests						
Meter size (inches)	Intermediate Rate			Minimum Rate		
	Rate of flow (gal/min)	Meter indication/Test Draft		Rate of flow (gal/min)	Meter indication/Test Draft	
		gal	ft^3		gal	ft^3
Less than or equal to 5/8	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 1/2	10	1
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

Table T.1. 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 was divided into a separate item for each affected NIST Handbook 44 code. The tolerances shown in the proposed Table T.X. 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 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 test draft sizes and for maximum, intermediate, and minimum flow rates for testing various sizes of water meters. The test draft size and flow rate information in Table 1 and Table 2 needs to be retained. The WWMA recommended that this item remain informational until a proposal to retain the flow rate criteria to accompany the new table for accuracy class and tolerances is developed.

At the 2003 NCWM Interim Meeting, the Committee and the technical advisors developed new test notes and tables to replace the current Table 1 and Table 2 to retain test recommendations for flow rate and draft size. The Committee agreed to present the item for a vote at the 2003 NCWM Annual Meeting.

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

336-2 V N.4.2. Special Tests, Table 2. Tolerances for Water Meters Special Tests

Source: Western Weights and Measure Association (WWMA)

Recommendation: Add a new paragraph S.2.3 to NIST Handbook 44, Section 3.36 Water Meters, and modified Table T.1. (as proposed in item 336-1) as follows:

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

Table T.1. Accuracy Classes and Tolerances for Water Meters					
Accuracy Class	**Application**		**Acceptance Tolerance**	**Maintenance Tolerance**	**Special Test Tolerance***
1.5	**Water *other than Multi-Jet***	**Overregistration**	**1.5 %**	**1.5 %**	**1.5 %**
		Underregistration	**1.5 %**	**1.5 %**	**5.0 %**
1.5	**Water Multi-jet**	**Overregistration**	**1.5 %**	**1.5 %**	**3.0 %**
		Underregistration	**1.5 %**	**1.5 %**	**3.0 %**
***where applicable**					

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 curves.

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.

At the 2003 NCWM Interim Meeting, the Committee and the technical advisors developed a new tolerance table T.1. based on the table proposed in item 336-1 that includes tolerances for multi-jet water meters to replace the ones proposed by WWMA which do not follow the new format proposed for all liquid-measuring device codes. The Committee agreed to present the item for a vote at the 2003 NCWM Annual Meeting.

338 Carbon Dioxide Liquid-Measuring Devices

338-1 V 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 NIST Handbook 44, 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. - <u>The maintenance and acceptance tolerances for normal and special tests shall be</u> <u>as shown in Table T.2.</u>**
>
> ~~**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 330-3A and 330-3B. The Committee also 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. The background and rational for this item are outlined in the 2002 NCWM S&T Agenda Item 330-3A and 331-1 that address the proposed changes to Sections 3.30 and 3.31.

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

At the 2003 NCWM Interim Meeting, the Committee heard no comments on this item and agreed to present it for a vote at the 2003 NCWM Annual Meeting.

356(a) Grain Moisture Meters

356(a)-1 V 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 of the 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 representations).

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 an 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. Moisture content values are 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 per bushel 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, <u>test weight per bushel</u> and calibration version identification. The ticket shall be generated by the grain moisture meter system.

Discussion: This proposal was developed to provide tolerances and to establish requirements for specific grain types to address grain moisture meters with an optional automatic test weight per bushel (TW) measuring feature.

The following information is excerpted from the 2002 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 that time, citing concern about the unresolved issue of large negative bias in the Phase II data for one state. A review of the issue strongly indicates a procedural error at the field level was the cause for questionable 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 recognized 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 and are 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.

The Committee discussed concerns about how to ensure meters have sufficient sample volume. The Committee was informed that older meters are equipped with a hopper where the operator can observe the sample volume; however most new meters do not have a weight sensor. The GMM Sector agreed that the proposed changes to paragraph S.2.6. to require a means for sensing when a sample is not sufficient should be a nonretroactive requirement. The Committee agreed that all issues were resolved and the item is ready for a vote at the 2003 NCWM Annual Meeting.

356(b) Grain Moisture Meters

356(b)-1 V 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 Separate 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 (TW) 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 (GMM) 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. The Committee modified the title to clarify the tolerance applies to separate equipment other than grain moisture meters that are used to determine the TW used to make density correction in moisture determinations.

The Committee heard no unfavorable comments on this item. Therefore, the Committee is recommending the item for a vote at the 2003 NCWM Annual Meeting.

357 Near-Infrared Grain Analyzers

357-1 V 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 paragraph 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 specifications 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.

The Committee heard no unfavorable comments on this item. Therefore, the Committee is recommending the item for a vote at the 2003 NCWM Annual Meeting.

357-2 V 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. <u>If more than one calibration is included for a given grain type, the calibrations must be clearly distinguished from one another.</u>
[Nonretroactive as of January 1, 200X]

Discussion: In 2002, 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 to 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, and 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 percent to 4 percent range, the GIPSA corn oil calibration contains low (3 percent to 4 percent), mid-range (5 percent to 6 percent), and high (>7 percent) 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.

The Committee heard no unfavorable comments on this item. Therefore, the Committee is recommending the item for a vote at the 2003 NCWM Annual Meeting.

358 Multiple Dimension Measuring Devices

358-1 I 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