Specifications and Tolerances (S&T) Committee
2019 Interim Meeting Agenda

Ms. Rachelle Miller, Committee Chair
Wisconsin

INTRODUCTION

The S&T Committee will address the following items in Table A during the Interim Meeting. Table A identifies the agenda items by reference key, title of item, page number and the appendices by appendix designations. The headings and subjects apply to *NIST Handbook 44 Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices, 2018 Edition*. The first four digits of an item's reference key are assigned from the Subject Series List. The acronyms for organizations and technical terms used throughout the agenda are identified in Table B. In some cases, background information will be provided for an item. The fact that an item appears on the agenda does not mean it will be presented to National Conference on Weights and Measures (NCWM) for a vote. The Committee will review its agenda and may withdraw some items, present some items for information meant for additional study, issue interpretations, or make specific recommendations for change to the publications identified which will be presented for a vote at the Annual Meeting. The Committee may also take up routine or miscellaneous items brought to its attention after the preparation of this document. The Committee may decide to accept items for discussion that are not listed in this document, providing they meet the criteria for exceptions as presented in NCWM Policy 3.1.4. Handbooks, *Procedures to Modify Handbooks*. The Committee has not determined whether the items presented will be Voting or Informational in nature; these determinations will result from their deliberations at the Interim Meeting.

An "Item under Consideration" is a statement of proposal and not necessarily a recommendation of the Committee. Suggested revisions are shown in **bold face print** by **~~striking out~~** information to be deleted and **<u>underlining</u>** information to be added. Requirements that are proposed to be nonretroactive are printed in ***bold faced italics***.

In some cases, there may be proposed changes affecting multiple codes that share the same purpose or proposed changes to one code may be dependent on the adoption of proposed changes to another. The Committee may group such items into "Blocks" to facilitate efficient handling for open hearings and voting. These blocks are identified in Committee's agenda.

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

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

Subject Series List

Table A
Table of Contents

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
ABWS	Automatic Bulk Weighing System	NEWMA	Northeastern Weights and Measures Association
AAR	Association of American Railroads	NIST	National Institute of Standards and Technology
API	American Petroleum Institute	NTEP	National Type Evaluation Program
CNG	Compressed Natural Gas	OIML	International Organization of Legal Metrology
CWMA	Central Weights and Measures Association	OWM	Office of Weights and Measures
EPO	Examination Procedure Outline	RMFD	Retail Motor Fuel Dispenser
FHWA	Federal Highway Administration	S&T	Specifications and Tolerances
GMM	Grain Moisture Meter	SD	Secure Digital
GPS	Global Positioning System	SI	International System of Units
HB	Handbook	SMA	Scale Manufactures Association
LMD	Liquid Measuring Devices	SWMA	Southern Weights and Measures Association
LNG	Liquefied Natural Gas	TC	Technical Committee
LPG	Liquefied Petroleum Gas	USNWG	U.S. National Work Group
MMA	Meter Manufacturers Association	VTM	Vehicle Tank Meter
MDMD	Multiple Dimension Measuring Device	WIM	Weigh-in-Motion
NCWM	National Conference on Weights and Measures	WWMA	Western Weights and Measures Association

Table C
Summary of Voting Results

Reference Key Number	*House of State Representatives*		*House of Delegates*		*Results*
	Yeas	*Nays*	*Yeas*	*Nays*	
Consent Calendar: LPG-1, CLM-3, WTR-2, CDL-3, TXI-1	41	0	56	0	Adopted
SCL-6	34	6	50	6	Adopted
ABW-4	28	12	39	13	Adopted
LMD-2	38	2	49	6	Adopted
VTM-1	41	0	54	1	Adopted
To Accept the Report	Voice Vote				Adopted

Details of All Items
(In order by Reference Key)

GEN – GENERAL CODE

GEN-1 A G-A.1. Commercial and Law-Enforcement Equipment. and G-S.2. Facilitation of Fraud.

Source:
Arizona, Florida, Maine, Michigan and Cambridge, Massachusetts (2018)

Purpose:
To prevent access and tampering by unauthorized persons to any area of the device where electronic financial transactions occur, credit card information is obtained, and or personal information is stored or transmitted.

Item Under Consideration:
Amend NIST Handbook 44 General Code as follows**:**

G-A.1. Commercial and Law-Enforcement Equipment. – These specifications, tolerances, and other technical requirements apply as follows:

(a) To commercial weighing and measuring equipment; that is, to weights and measures and weighing and measuring devices commercially used or employed in establishing the size, quantity, extent, area, composition (limited to meat and poultry), constituent values (limited to grain), or measurement of quantities,
things, produce, or articles for distribution or consumption, purchased, offered, or submitted for sale, hire, or
award, or in computing any basic charge or payment for services rendered on the basis of weight or measure.
(Amended 2008)

(b) To any accessory attached to or used in connection with a commercial weighing or measuring device when
such accessory is so designed that its operation affects the accuracy **or can be used to defraud or collect unauthorized personal or financial information from the user** of the device.

(c) To weighing and measuring equipment in official use for the enforcement of law or for the collection of statistical information by government agencies.

G-S.2. Facilitation of Fraud. – All equipment and all mechanisms, software, and devices attached to or used in conjunction therewith shall be so designed, constructed, assembled, and installed for use such that they do not facilitate the perpetration of fraud. **Any device capable of customer initiated electronic financial transactions shall incorporate an event counter that records date and time of access and must be of such design and construction to substantially restrict access and tampering by unauthorized persons to any area of the device where financial transactions occur, credit card information is obtained, and or personal information is stored or transmitted. Restriction of access and tampering may be accomplished by;**

(a) Electronic alarming or disabling of the equipment if unauthorized access is gained or,

(b) Physical means that cannot be breached without causing visible damage to the exterior of the device. Such physical means shall not include the use of a universal key, master key or security device that can be manipulated with universal tools.

(Amended 2007 **and 20XX**)

Background/Discussion: See Appendix A, Page S&T-A289.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

GEN-3 G-T.5. Tolerances on Tests When Transfer Standards are Used., Appendix D – Definitions: standards, field., ~~transfer standard.~~ and standard, transfer.

Source:
Seraphin Test Measure Company (2019)

Purpose:

(a) Add a definition for field standard that identifies the critical characteristics for field standards to comply with the Fundamental Considerations of Handbook 44 (specifically, a standard that has long-term stability and meets the one-third requirement for accuracy and uncertainty over the range of environmental and operational variables in which commercial measuring devices are used); and

(b) To add a generalized definition for transfer standards in Handbook 44 to clearly include the transfer standards already referenced in various codes; T and

(c) To specify that when a transfer standard is used, the basic tolerances specified in Handbook 44 be increased the amount of the estimated uncertainty associated with the transfer standard.

Item Under Consideration:
Amend NIST Handbook 44 General Code as follows**:**

G-T.5. Tolerances on Tests When Transfer Standards Are Used. – To the basic tolerance values that would otherwise be applied, there shall be added an amount equal to two times the standard deviation of the applicable transfer standard when compared to a basic reference standard.

The codes 5.56.(a) Grain Moisture Meters, 5.56.(b) Grain Moisture Meters, and 5.57. Near-Infrared Grain Analyzers are exempt from this requirement, because NIST Handbook 159 has requirements for monitoring and retesting grain samples to ensure adequate stability and the tolerances for the devices under test already incorporate the uncertainty associated with the use of grain samples as transfer standards. The code 2.21. Belt-Conveyor Scale Systems is also exempt, because relative and absolute tolerances are included in the code.

And amend Handbook 44 Appendix D – Definitions as follows:

Standard, Field. – A physical standard that (a) is stable (accurate and repeatable) over an extended period of time (typically one year) and (b) meets the specifications and tolerances in NIST Handbook 105- series standards (or other suitable and designated standards) over the range of environmental and operational parameters in which the commercial measuring devices are used and is traceable to the reference or working standards through comparisons, using acceptable laboratory procedures, and used in conjunction with commercial weighing and measuring equipment. "Other suitable and designated standards" must show that the field standards have been tested over the range of environmental and operational parameters in which the commercial measuring devices under test are used and prove that the performance of the field standard meets the requirements of the fundamental considerations.

~~**transfer standard. A measurement system designed for use in proving and testing cryogenic liquid-measuring devices. [3.38]**~~

Standard, Transfer.- A physical artifact, static or dynamic measurement device or a reference material that is stable (accurate and repeatable) for a short time period under the limited environmental and operational conditions during which the transfer standard is used. A transfer standard may be used as a temporary measurement reference to check the accuracy of a commercial measuring instrument, but the transfer standard does not satisfy the NIST Handbook 44 Fundamental Consideration that its correction and uncertainty are less than one-third of the smallest tolerance applied to the commercial measuring instrument under test, either over a long time period or a wide range of environmental or operating parameters. Transfer standards are called by different terms in different Handbook 44 codes and include terms such as master meter, fifth wheel, material, reference weight [railroad] cars, test vehicles and reference vehicle.

Background/Discussion: See Appendix A, Page S&T-A292.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

SCL – SCALES

SCL-1 S.1.1.1. Digital Indicating Elements. and UR.2.10. Primary Indicating Elements Provided by the User.

Source:
City of Cambridge, MA and Towns of Wellesley and Sharon, MA (2019)

Purpose:
Harmonize with OIML R-76 by providing a minimum height of customer indications, regardless of the size of the indicating screen.

Item Under Consideration:
Amend NIST Handbook 44, Scales Code as follows:

S.1.1.1. Digital Indicating Elements.

(a) A digital zero indication shall represent a balance condition that is within ± ½ the value of the scale division.

(b) A digital indicating device shall either automatically maintain a "center-of-zero" condition to ± ¼ scale division or less, or have an auxiliary or supplemental "center-of-zero" indicator that defines a zero-balance condition to ± ¼ of a scale division or less. A "center-of-zero" indication may operate when zero is indicated for gross and/or net mode(s).
[Nonretroactive as of January 1, 1993]

(c) Except for electronic cash registers (ECRs) and point of sale systems (POS systems) on direct sale digital devices that display primary indications the numerical figures of the primary indications on the customer side must be at least 9.5 mm(0.4in.) in height. These indications must be NON-SCALABLE in font size.
[retroactive as of January 1, 20XX]

(d) For electronic cash registers (ECRs) and point of sale systems (POS systems) the display of measurement units must be at least 9.5 mm(0.4in.) in height. These indications must be NON-SCALABLE in font size.

[retroactive as of January 1, 20XX]

(Amended 1992 and 2008)

And

UR.2.10. Primary Indicating Elements Provided by the User. – Primary indicating elements that are not the same as the primary indicating elements provided by the original equipment manufacturer (e.g. video display monitors) shall comply with the following:

(a) On digital devices that display primary indications during direct sales to the customer, the numerical figures displayed to the customer shall be at least 9.5 mm (0.4 in) high.

Background/Discussion: See Appendix A, Page S&T-A295.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

SCL-2 A S.1.8.5. Recorded Representations, Point of Sale Systems

Source:
Kansas and Minnesota (2017)

Purpose:
Provide consumers the same opportunity, to be able to easily verify whether or not tare is taken on items weighed at a checkout stand using a POS system, which is currently afforded them when witnessing items being weighed and priced in their presence using other scales in the store.

Item Under Consideration:
Amend NIST Handbook 44, Scales Code as follows:

S.1.8.5. Recorded Representations, Point-of-Sale Systems. – The sales information recorded by cash registers when interfaced with a weighing element shall contain the following information for items weighed at the checkout stand:

(a) the net weight;[1]

(b) the unit price;[1]

(c) the total price; and

(d) the product class or, in a system equipped with price look-up capability, the product name or code number.

(e) ***the tare weight[1]***

[Non-retroactive January 1, 2022]

(Amended 20XX)

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[1] For devices interfaced with scales indicating in metric units, the unit price may be expressed in price per 100 grams. Weight values shall be identified by kilograms, kg, grams, g, ounces, oz, pounds, or lb. *The "#" symbol is not acceptable.*
[Nonretroactive as of January 1, 2006]
(Amended 1995 and 2005)

Background/Discussion: See Appendix A, Page S&T-A296.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

SCL-3 A Sections Throughout the Code to Include Provisions for Commercial Weigh-in-Motion Vehicle Scale Systems

Source:
Rinstrum, Inc. and Right Weigh Innovations (2016)

Purpose:
Recognize commercial Weigh-in-Motion vehicle scale systems.

Item Under Consideration:
Amend NIST Handbook 44 Scales Code as follows:

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

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S.1.1.1. Digital Indicating Elements.

(a) A digital zero indication shall represent a balance condition that is within ± ½ the value of the scale division.

(b) A digital indicating device shall either automatically maintain a "center-of-zero" condition to ± ¼ scale division or less, or have an auxiliary or supplemental "center-of-zero" indicator that defines a zero-balance condition to ± ¼ of a scale division or less. A "center-of-zero" indication may operate when zero is indicated for gross and/or net mode(s).
[Nonretroactive as of January 1, 1993]

(a) Weigh-in-Motion Vehicle Scales Zero or Ready Indication.

(1) Provision shall be made to indicate or record either a zero or ready condition.

A zero or ready condition may be indicated by other than a continuous digital zero indication, provided that an effective automatic means is provided to inhibit a measuring operation when the device is in an out-of-zero or non-ready condition.

(Amended 1992 ~~and~~ 2008**, and 20XX**)

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S.1.8. Computing Scales.

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S.1.8.6. Values to be Recorded, Weigh-In-Motion Vehicle Scales. – At a minimum, the following values shall be printed and/or stored electronically for each vehicle weighment:

(a) lane identification (required if more than one lane at the site has the ability to weigh a vehicle in motion);

(b) weight and sequence of each axle;

(c) total vehicle weight;

(d) time and date.

(Added 20XX)

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S.1.14. Weigh-In-Motion Vehicle Scale: Operational Limitation. - A weigh-in-motion vehicle scale shall not provide a weight indication or recorded representation if any operational limitation is exceeded.

(Added 20XX)

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

S.2.1. Zero-Load Adjustment.

S.2.1.1. General. – A scale shall be equipped with means by which the zero-load balance may be adjusted. Any loose material used for this purpose shall be enclosed so that it cannot shift in position and alter the balance condition of the scale.

Except for an initial zero-setting mechanism, an automatic zero adjustment outside the limits specified in S.2.1.3. Scales Equipped with an Automatic Zero-Tracking Mechanism is prohibited.
(Amended 2010)

S.2.1.2. Scales used in Direct Sales. – A manual zero-setting mechanism (except on a digital scale with an analog zero-adjustment mechanism with a range of not greater than one scale division) shall be operable or accessible only by a tool outside of and entirely separate from this mechanism, or it shall be enclosed in a cabinet. Except on Class I or II scales, a balance ball shall either meet this requirement or not itself be rotatable.

A semiautomatic zero-setting mechanism shall be operable or accessible only by a tool outside of and separate from this mechanism or it shall be enclosed in a cabinet, or it shall be operable only when the indication is stable within plus or minus:

(a) 3.0 scale divisions for scales of more than 2000 kg (5000 lb) capacity in service prior to January 1, 1981, and for all axle load, railway track, **weigh-in-motion vehicle systems**, and vehicle scales; or
(Amended 20XX)

(b) 1.0 scale division for all other scales.

S.2.1.3. Scales Equipped with an Automatic Zero-Tracking Mechanism.

S.2.1.3.1. Automatic Zero-Tracking Mechanism for Scales Manufactured Between January 1, 1981, and January 1, 2007. – The maximum load that can be "rezeroed," when either placed on or removed from the platform all at once under normal operating conditions, shall be for:

(a) bench, counter, and livestock scales: 0.6 scale division;

(b) vehicle, **weigh-in-motion vehicle systems**, axle load, and railway track scales: 3.0 scale divisions; and
(Amended 20XX)

(c) all other scales: 1.0 scale division.

(Amended 2005)

S.2.1.3.2. Automatic Zero-Tracking Mechanism for Scales Manufactured on or after January 1, 2007. – The maximum load that can be "rezeroed," when either placed on or removed from the platform all at once under normal operating conditions, shall be:

(a) for vehicle, **weigh-in-motion vehicle systems**, axle load, and railway track scales: 3.0 scale divisions; and

(b) for all other scales: 0.5 scale division.

(Added 2005)

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S.2.5. Damping Means. – An automatic-indicating scale and a balance indicator shall be equipped with effective means to damp oscillations and to bring the indicating elements quickly to rest.

S.2.5.1. Digital Indicating Elements. – **Except for weigh-in-motion vehicle systems being operated in a dynamic mode,** ~~**Digital**~~ **digital** indicating elements equipped with recording elements shall be equipped with effective means to permit the recording of weight values only when the indication is stable within plus or minus:
(Amended 20XX)

(a) 3.0 scale divisions for scales of more than 2000 kg (5000 lb) capacity in service prior to January 1, 1981, hopper (other than grain hopper) scales with a capacity exceeding 22 000 kg (50 000 lb), and for all vehicle, axle load, livestock, and railway track scales; and

(b) 1.0 scale division for all other scales.

The values recorded shall be within applicable tolerances.

(Amended 1995)

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N.7. Weigh-in-Motion Vehicle Scale.

N.7.1. Static Testing. – A Weigh-in-Motion Vehicle Scale shall be tested statically, whenever possible, using field standard weights / test loads in accordance with Table 4, uniformly distributed on the scale platform. Additionally, for scale platforms with a length of less than 4 feet a test load not greater than one half of section capacity shall be positioned between the centerline and left and right

side respectively. Scale platforms with a length of 4 feet or greater shall be tested in accordance with N.1.3.3.1. Class IIIL acceptance and maintenance tolerance as shown in Table 6. shall apply.

N.7.2. Dynamic Testing. – The Dynamic test for a Weigh-in-Motion-Vehicle Scale shall simulate the normal intended use as closely as possible i.e. test as used. The minimum test shall consist of a vehicle(s), loaded with known field standards, dynamically weighed three consecutive times. The known field standards should then be unloaded and three additional dynamic weighments of the empty vehicle(s) should be recorded. Additionally, for scale platform widths greater than 11 feet, at least one of the loaded vehicle runs and empty vehicle runs shall be made near the left edge and right edge of the scale platform respectively. Class IIIL acceptance and maintenance tolerance as shown in Table 6. shall apply to the known field test standards load minus the calculated value (loaded weight – unloaded weight = calculated value) the Table 6 tolerance values shall be based on the value of the known test load.

(Added 20XX)

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T.N.3. Tolerance Values.

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T.N.3.X. Tolerances for Weigh-in-Motion Vehicle Scales. –

T.N.3.X.1. Static Weighing. -Acceptance tolerance shall be one-half maintenance tolerance shown in Table 6. Maintenance Tolerances.

T.N.3.X.2 Dynamic Weighing. - Acceptance tolerance shall be one-half maintenance tolerance shown in Table 6. Maintenance Tolerances.
(Added 20XX)

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

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UR.1.6. Recording Element, Class III L Weigh-In-Motion Vehicle Scales. – Class III L Weigh-In-Motion Vehicle Scales must be equipped with a recording element.

(Added 20XX)

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UR.2.6. Approaches.

[1] Purchasers and users of scales such as railway track, hopper, and vehicle scales should be aware of possible additional requirements for the design and installation of such devices.

(Footnote Added 1995)

UR.2.6.1. Vehicle Scales. *– On the entrance and exit end(s) of a vehicle scale, there shall be a straight approach as follows:*

(a) the width at least the width of the platform,

(b) the length at least one-half the length of the platform but not required to be more than 12 m (40 ft), and

(c) not less than 3 m (10 ft) of any approach adjacent to the platform shall be in the same plane as the platform. Any slope in the remaining portion of the approach shall ensure (1) ease of vehicle access, (2) ease for testing purposes, and (3) drainage away from the scale.

In addition to (a), (b), and (c), scales installed in any one location for a period of six months or more shall have not less than 3 m (10 ft) of any approach adjacent to the platform constructed of concrete or similar durable material to ensure that this portion remains smooth and level and in the same plane as the platform; however, grating of sufficient strength to withstand all loads equal to the concentrated load capacity of the scale may be installed in this portion.
[Nonretroactive as of January 1, 1976]

(Amended 1977, 1983, 1993, 2006, and 2010)

UR.2.6.2. Axle-Load Scales. – At each end of an axle-load scale there shall be a straight paved approach in the same plane as the platform. The approaches shall be the same width as the platform and of sufficient length to insure the level positioning of vehicles during weight determinations.

UR.2.6.3. Weigh-in-Motion Vehicle Scales. - At each end of a Weigh-in-Motion Vehicle Scale there shall be a straight approach in the same plane as the platform. The approaches shall be the same width as the platform and of sufficient length to insure the level positioning of vehicles during weight determinations. Both approaches shall be made of concrete or similar durable material (e.g., steel).
(Added 20XX)

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UR.3.2. Maximum Load. – A scale shall not be used to weigh a load of more than the nominal capacity of the scale.

UR.3.2.1. Maximum Loading for Vehicle Scales. – A vehicle scale shall not be used to weigh loads exceeding the maximum load capacity of its span as specified in Table UR.3.2.1. Span Maximum Load.

(Added 1996)

Note: UR.3.2.1. is not applicable to Weigh-In-Motion Vehicle Scales.
(Added 20XX)

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UR.3.3. Single-Draft Vehicle Weighing. A vehicle or a coupled-vehicle combination shall be commercially weighed on a vehicle scale only as a single draft. That is, the total weight of such a vehicle or combination shall not be determined by adding together the results obtained by separately and not simultaneously weighing each end of such vehicle or individual elements of such coupled combination. However, the weight of:

(a) a coupled combination may be determined by uncoupling the various elements (tractor, semitrailer, trailer), weighing each unit separately as a single draft, and adding together the results; or

(b) a vehicle or coupled-vehicle combination may be determined by adding together the weights obtained while all individual elements are resting simultaneously on more than one scale platform.

Note: This paragraph does not apply to **weigh-in-motion vehicle scales,** highway-law-enforcement scales and scales used for the collection of statistical data.
(Added 1992) **(Amended 20XX)**

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UR.3.7. Minimum Load on a Vehicle Scale or Weigh-in-Motion Vehicle Scale. – A vehicle scale **or weigh-in-motion vehicle scale** shall not be used to weigh net loads smaller than:

(a) 10 d when weighing scrap material for recycling or weighing refuse materials at landfills and transfer stations; and

(b) 50 d for all other weighing.

As used in this paragraph, scrap materials for recycling shall be limited to ferrous metals, paper (including cardboard), textiles, plastic, and glass.
(Amended 1988, 1992, ~~and~~ 2006**, and 20XX**)

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UR.3.9. Use of Manual Weight Entries. – Manual gross or net weight entries are permitted for use in the following applications only when:

(a) a point-of-sale system interfaced with a scale is giving credit for a weighed item;

(b) an item is pre-weighed on a legal for trade scale and marked with the correct net weight;

(c) a device or system is generating labels for standard weight packages;

(d) postal scales or weight classifiers are generating manifests for packages to be picked up at a later time; or

(e) livestock and vehicle scale **or weigh-in-motion vehicle scale** systems **that** generate weight tickets to correct erroneous tickets.

(Added 1992) (Amended 2000 ~~and~~ 2004**, and 20XX**)

Background/Discussion: See Appendix A, Page S&T-A302.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

SCL-6 UR.3.11. Class II Scales

Source:
Kansas (2019)

Purpose:
To clarify that "e" must be used for commercial transactions when using a Class II scale.

Item Under Consideration:
Amend NIST Handbook 44 Scales Code as follows:

UR.3.11. Class II Scales. – When the value of d is different from the value of e, the commercial transaction must be based on e.

UR.3.~~11.~~12. Minimum Count.

UR.3.~~12.~~13. Correct Stored Piece Weight.

Background/Discussion: See Appendix A, Page S&T-A307.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

SCL-7 T.N.3.6. Coupled-In-Motion Railroad Weighing Systems., T.N.4.6. Time Dependence (Creep) for Load Cells during Type Evaluation., UR.5. Coupled-in-Motion Railroad Weighing Systems. and Appendix D – Definitions: point-based railroad weighing systems.

NOTE: This item replaces the 2018 Items, Block 1 Items: SCL-1 & SCL-2 that were designated as Developing items by the submitter, Meridian Engineers Pty LTD.

Source:
Meridian Engineers Pty Ltd. (2019)

Purpose:
Replace the 2018 Block 1 Items: SCL-1 and SCL-2 with new proposals to:

a) Increase the tolerance for dynamic weighments of unit trains,
b) Provide an exception from "creep" tolerances for point-based in-motion railroad weighing systems,
c) Require the user of coupled-in-motion railroad weighing systems to provide a static scale in close proximity for testing purposes, and
d) Add a definition for Point-Based Railroad Weighing Systems to support those proposals.

Item Under Consideration:
Amend NIST Handbook 44, Appendix D. Definitions as follows:

T.N.3.6. Coupled-In-Motion Railroad Weighing Systems. – The maintenance and acceptance tolerance values for the group of weight values appropriate to the application must satisfy the following conditions: (Amended 1990 and 1992)

T.N.3.6.1. – For any group of weight values, the difference in the sum of the individual in-motion car weights of the group as compared to the sum of the individual static weights shall not exceed**: ~~0.2 %.~~**

(a) 0.2 % for weighing systems used for both static and dynamic weighing.

(b) 0.5 % for weighing systems used only for dynamic weighing of unit trains. (See UR. 5.) In addition, the static test requirements of dynamic only weighing systems required in H44 need not apply.

(Amended 1990 **and 2019)**

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T.N.4.6. Time Dependence (Creep) for Load Cells during Type Evaluation. Except for Load Cells used exclusively in Point-Based In-Motion Railroad Weighing Systems, a~~A~~ load cell (force transducer) marked with an accuracy class shall meet the following requirements at constant test conditions:

(a) Permissible Variations of Readings. – With a constant maximum load for the measuring range (Dmax) between 90 % and 100 % of maximum capacity (Emax), applied to the load cell, the difference between the initial reading and any reading obtained during the next 30 minutes shall not exceed the absolute value of the maximum permissible error (mpe) for the applied load (see Table T.N.4.6. Maximum Permissible Error (mpe) for Load Cells During Type Evaluation). The difference between the reading obtained at 20 minutes and the reading obtained at 30 minutes shall not exceed 0.15 times the absolute value of the mpe (see Table T.N.4.6. Maximum Permissible Error (mpe) for Load Cells During Type Evaluation).

(b) Apportionment Factors. – The mpe for creep shall be determined from Table T.N.4.6. Maximum Permissible Error (mpe) for Load Cells During Type Evaluation using the following apportionment factors (pLC):

pLC = 0.7 for load cells marked with S (single load cell applications),
pLC = 1.0 for load cells marked with M (multiple load cell applications), and
pLC = 0.5 for Class III L load cells marked with S or M.

(Added 2005, Amended 2006 **and 2019)**

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UR.5. Coupled-in-Motion Railroad Weighing Systems. –

(a) A coupled-in-motion weighing system placed in service on or after January 1, 1991, should be tested in the manner in which it is operated, with the locomotive either pushing or pulling the cars at the designed speed and in the proper direction. The cars used in the test train should represent the range of gross weights that will be used during the normal operation of the weighing system. Except as provided in N.4.2. Weighing Systems Placed in Service Prior to January 1, 1991, and Used to Weigh Trains of Ten or More Cars and N.4.3.(a) Weighing Systems Placed in Service on or After January 1, 1991, and Used to Weigh Trains of Ten or More Cars, normal operating procedures should be simulated as nearly as practical. Approach conditions for a train length in each direction of the scale site are more critical for a weighing system used for individual car weights than for a unit-train-weights-only facility and should be considered prior to installation.

(b) For weighing systems used only for dynamic weighing, the user provide an appropriate alternate certified scale. The alternate scale to be used as a reference scale shall be suitable in terms of size, capacity, minimum division, performance requirements, and located in close proximity to the scale under evaluation. The reference cars may then be used for calibration and annual inspection by the jurisdiction with statutory authority for the system.

(Added 1990) (Amended 1992 **and 2019**)

And add the following definition to Appendix D – Definitions:

Point-based railroad weighing systems. – An In-Motion-Railroad Weighing System designed to weigh wheel(s) of a railway car when centered on the load sensor within a weighing zone typically of 2 inches or less. The weight of the wheels are added to obtain the total weight of the cars and train which are used for any transaction.

Background/Discussion: See Appendix A, Page S&T-A308.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

BCS – BELT-CONVEYOR SCALE

BCS-1 S.1.3. Value of the Scale Division., S.1.9. Zero-Ready Indicator., S.4.Accuracy Class., S.45. Marking Requirements., N.1. General., N.2. Conditions of Test., T.1. Tolerance Values., T.2. Tolerance Values. and UR.3. Maintenance Requirements – Scale and Conveyor Maintenance.

Source:
NIST OWM (2019)

Purpose:
(1) Clarify the application of tolerances when comparing multiple test runs during material tests on a dynamic weighing system; and
(2) Introduce different accuracy classes for devices covered by this code.

Item Under Consideration:
Amend NIST Handbook 44 Belt-Conveyor Scale Systems Code as follows:

S.1.3. Value of the Scale Division.

S.1.3.1. For Scales Not Marked With an Accuracy Class and Installed After January 1, 1986. *– The value of the scale division shall not be greater than 0.125 % ($^1/_{800}$) of the minimum totalized load.*
[Nonretroactive as of January 1, 1986]
(Added 1985)(Amended 2009 **and 20XX**)

S.1.3.2. For Scales Installed Before January 1, 1986. – The value of the scale division shall not be greater than $^1/_{1200}$ of the rated capacity of the device. However, provision shall be made so that compliance with the requirements of the zero-load test as prescribed in N.3.1. Zero Load Tests may be readily and accurately determined in 20 minutes of operation.

S.1.3.3. For Scales Marked With an Accuracy Class. - The value of the scale division shall not be greater than:
a) 0.125 % ($^1/_{800}$) of the minimum totalized load for scales marked with an accuracy class of 0.25; and
b) 0.05 % ($^1/_{2000}$) of the minimum totalized load for scales marked with an accuracy class of 0.1.
(Added 20XX)
[Nonretroactive as of January 1, 20XX]

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S.1.9. Zero-Ready Indicator. – *A belt-conveyor scale shall be equipped with a zero-ready indicator that produces an audio or visual signal* ***during an unloaded belt condition*** *when the zero balance is within****:***
(a) *± 0.12 % of the rated capacity of the scale* ***during and unloaded belt condition for scales not marked with an accuracy class and those marked Class 0.25; and***
(b) ± 0.05 % for scales marked Class 0.1.
The type of indication (audio or visual) shall be determined by the individual installation.
[Nonretroactive as of January 1, 2014]
(Added 2012) **(Amended 20XX)**

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S.4. Accuracy Class. – Weighing devices shall be marked with an appropriate accuracy class as either Class 0.25 or as Class 0.1. This designation is determined by the manufacturer.
(Added 20XX)
[Nonretroactive as of January 1, 2020]

S.45. Marking Requirements. – Belt-conveyor scale systems and weigh-belt systems shall be marked with the following: (Also see also G-S.1. Identification.)

(a) the rated capacity in units of weight per hour (minimum and maximum);

(b) the value of the scale division;

(c) the belt speed in terms of feet (or meters) per minute at which the belt will deliver the rated capacity, or the maximum and minimum belt speeds at which the conveyor system will be operated for variable speed belts;

(d) the load in terms of pounds per foot or kilograms per meter (determined by material tests); and

*(e) the operational temperature range if other than − 10 °C to 40 °C (14 °F to 104 °F) *.*

(f) the accuracy classification as declared by the manufacturer **.
[Nonretroactive as of January 1, 1986]****[** Nonretroactive as of January 1, 20XX]***
(Amended 2015 **and 20XX**)

S.56. Provision for Sealing.

Table S.56.
Categories of Device and Methods of Sealing

Categories of Devices	***Methods* of Sealing**
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 3: *Remote configuration capability.*	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*

[Nonretroactive as of January 1, 1999]
(Table Added 1998)

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N.1. General. – Belt-conveyor scales are capable of weighing bulk material accurately. (Also see Tolerances.) However, their The performance **of belt-conveyor scales** can be detrimentally affected by the conditions of the installation. (Also see User Requirements.) The performance of the equipment is not to be determined by averaging the results of the individual tests. The results of all tests shall be within the tolerance limits.
(Amended 2002**, and 20XX**)

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N.2. Conditions of Tests. – A belt-conveyor scale shall be tested after it is installed on the conveyor system with which it is to be used and under such environmental conditions as may normally be expected. Each test shall be conducted with test loads no less than the minimum test load. Before each test run, the inspector shall check the zero setting and adjust as necessary.
(Amended 1986, 2004, and 2009)

N.2.1. Initial Verification. – A belt-conveyor scale system or a weigh-belt system shall be tested using test runs as indicated in Table N.2.1. Initial Verification.
The minimum testing is to be conducted in pairs (2) of test runs performed consecutively and under the same (or practically identical) test conditions to establish repeatability. Results of the individual test runs in each pair of tests shall not differ by more than the absolute value of the tolerance as specified in T.2. Tolerance Values, Repeatability Tests. All tests shall be within the tolerance as specified in T.1. Tolerance Values.
Test runs may also be conducted at any other rate of flow that may be used at the installation **to establish linearity of the system**.
A minimum of four test runs may be conducted at only one flow rate if evidence is provided that the system is used at a constant speed/constant loading setting and that rate does not vary by an amount more than **plus or minus (+/-)** 10 % of the normal flow rate that can be developed at the installation for at least 80 % of the time.
(Amended 20XX)

Table N.2.1.
Initial Verification

Device Configuration	**Minimum of Two Test Runs at Each of the Following Settings**	**Total Tests (Minimum)**
Constant Belt Speed and Variable Loading	- Belt Loading: high (normal) - Belt Loading: medium (intermediate) - Belt Loading: low (35 %)	6
Variable Belt Speed and Constant Loading	- Belt Speed: maximum - Belt Speed: medium - Belt Speed: minimum	6
Variable Belt Speed and Variable Loading	- Belt Speed: maximum; Belt Loading: high (normal) - Belt Speed: maximum; Belt Loading: medium (intermediate) - Belt Speed: maximum; Belt Loading: low (35 %) - Belt Speed: minimum; Belt Loading: high (normal) - Belt Speed: minimum; Belt Loading: medium (intermediate) - Belt Speed: minimum; Belt Loading: low (35 %)	12
Constant Belt Speed and Constant Loading	**When system is operated only at a single flow rate, minimum of four test runs at the flowrate used in normal operation**	***4**

1. Use the device configurations in the left-hand column to identify the scale being tested.
2. Perform two test runs (minimum) at each of the settings shown in the center column.
3. The following terminology applies to "Belt Loading":

- Low: 35 % of the maximum rated capacity of the system.
- Medium: an intermediate rate between the high and low settings.

- High: maximum (normal use) operational rate.

***As provided in N.2.1. Initial Verification; for single flow rate systems, a minimum of four test runs at a single flow rate are required.**

(Table Added 2015)

(Added 2004) (Amended 2009**,** 2015**, and 20XX**)

N.2.2. Subsequent Verification. – Subsequent testing shall include testing at the normal use flow rate and other flow rates used at the installation **using a minimum of two consecutive test runs performed at each flow rate**. The official with statutory authority may determine that testing only at the normal use flow rate is necessary for subsequent verifications if evidence is provided that the system is used to operate:

(a) at no less than 70 % of the maximum rated capacity for at least 80 % of the time (excluding time that the belt is unloaded); or

(b) with a normal use flow rate that does not vary by more than **plus or minus (+/-)** 10 % of the maximum rated capacity.

Example: If a belt-conveyor scale system has a maximum rated capacity of 200 tons per hour (tph), and the normal use flow rate is 150 tph (75 % of the maximum rated capacity), no testing at additional flow rates is required provided the flow rates remain above 140 tph for more than 80 % of the time. If the same device were operating with a normal use flow rate of 130 tph, it is operating at 65 % of the maximum rated capacity. In this case, testing at flow rates in addition to the normal use flow rate would be required if the normal use flow rate varies by more than 20 tph (10 % of the maximum rated capacity).

(Added 2004) **(Amended 20XX)**

N.2.3. Minimum Test Load.

N.2.3.1. Minimum Test Load, Weigh-Belt Systems. – The minimum test load shall not be less than the largest of the following values:

(a) **2 000 divisions for systems marked Class 0.1, and** 800 scale divisions **for systems marked Class 0.25**;

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

(c) at least one minute of operation.

(Amended 2015 **and 20XX**)

N.2.3.2. Minimum Test Load, All Other Belt-Conveyor Scale Systems. – Except for applications where a normal weighment is less than 10 minutes, the minimum test load shall not be less than the largest of the following values:

(a) **2 000 divisions for systems marked Class 0.1, and** 800 scale divisions **for systems marked Class 0.25**;

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

(c) at least 10 minutes of operation.

For applications where a normal weighment is less than 10 minutes (e.g., belt-conveyor scale systems used exclusively to issue net weights for material conveyed by individual vehicles and railway track cars) the minimum test load shall be the normal weighment that also complies with N.2.3.2.(a) and (b).

The official with statutory authority may determine that a smaller minimum totalized load down to 2 % of the load totalized in one hour at the maximum flow rate may be used for subsequent tests, provided that:

1. the smaller minimum totalized load is greater than the quantities specified in N.2.3.2.(a) and (b); and

2. consecutive official testing with the minimum totalized loads described in N.2.3.2.(a), (b), or (c) and the smaller minimum test load has been conducted that demonstrates the system complies with applicable tolerances for repeatability, acceptance, and maintenance.

(Added 2004) (Amended 2008**,** 2015**, and 20XX**)

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N.3. Test Procedures.

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N.3.1.2. Test of Zero Stability. – The conveyor system shall be operated to warm up the belt and the belt scale shall be zero adjusted as required. A series of zero-load tests shall be carried out immediately before conducting the simulated load or materials test until the three consecutive zero-load tests each indicate an error which does not exceed**:**

(a) ± 0.06 % of the totalized load at full scale capacity for the duration of the test **for scales that are not marked with an accuracy class and for those marked Class 0.25; and**

(b) ± 0.03 % of the totalized load at full scale capacity for the duration of the test for scales that are marked Class 0.1.

No adjustments can be made during the three consecutive zero-load test readings.

(Added 2002) (Amended 2004**,** 2009**, and 20XX**)

N.3.1.3. Check for Consistency of the Conveyor Belt along Its Entire Length. – During a zero-load test with any operational low-flow lock-out disabled, the absolute value of the difference between the maximum and minimum totalizer readings indicated on the totalizer during any complete revolution of the belt shall not exceed 0.12 % of the minimum test load.

Note: The end value of the zero-load test must meet the ± 0.06 % **for scales that are not marked with an accuracy class or marked Class 0.25, or ± 0.03 % for scales marked Class 0.1** requirement referenced in the "Test for Zero Stability."

(Added 2002) (Amended 2004**,** 2011**, and 20XX**)

N.3.2. Material Tests. – Material tests should be conducted using actual belt loading conditions. These belt loading conditions shall include, but are not limited to conducting materials tests using different belt loading points, all types and sizes of products weighed on the scale, at least one other belt speed, and in both directions of weighing.

On subsequent verifications, at least two individual tests shall be conducted **as specified in N.2.2. Subsequent Verification**. The results of all these tests shall be within the tolerance limits.

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N.3.2.1. Accuracy of Material.

(a) For scales not marked with an accuracy class and those marked Class 0.25, Tthe quantity of material used to conduct a material test shall be weighed on a reference scale to an accuracy within 0.1 %.

(b) For scales that are marked Class 0.1, the quantity of material used to conduct a material test shall be weighed on a reference scale to an accuracy within 0.035 %.

Scales typically used for this purpose include Class III and III L scales or a scale without a class designation as described in Handbook 44, Section 2.20., Table T.1.1. Tolerances for Unmarked Scales.

(Added 1989) (Amended 1991, 1993, 1998, **and** 2000**, and 20XX**)

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T.1. Tolerance Values.[2] – Maintenance and acceptance tolerances on materials tests, relative to the weight of the material, shall be**:**
(a) for systems not marked with an accuracy class and for accuracy class 0.25, the tolerance shall be ± 0.25 % of the test load**; and**
(b) for accuracy class 0.1 the tolerance shall be ± 0.1 % of the test load.
(Amended 1993 **and 20XX**)

T.1.1. Tolerance Values – Test of Zero Stability. – Immediately after material has been weighed over the belt-conveyor scale during the conduct of any material test run, the zero-load test shall be repeated. The change in the accumulated or subtracted weight during the zero-load test shall not exceed**:**

(a) 0.12 % of the totalized load at full scale capacity for the duration of that test**. for scales that are not marked with an accuracy class and those marked Class 0.25; and**

(b) 0.06 % of the totalized load at full scale capacity for the duration of the test for scales that are marked Class 0.1.

If the range of zero adjustments during a complete (official) verification test exceeds 0.18 % of the totalized load at full scale capacity for the duration of the zero-load test **for unmarked scales and those marked Class 0.25 or 0.09 % of the totalize load at full scale capacity for the duration of the zero-load test for scales marked Class 0.1**, the official with statutory authority may establish an interval for zero-load testing during normal operation.
(Added 2004) (Amended 2009 **and 20XX**)

T.2. Tolerance Values
T.2.1 Tolerance Values, Repeatability Tests. – The variation in the values obtained **in any pair (2) of totalization operations performed consecutively, and under the same (or practically identical) test conditions** during the conduct of materials tests shall **not be greater than comply with the following:**
(a) for systems not marked with an accuracy class and those marked Class 0.25, the variation shall not be greater than 0.25 % ($^1/_{400}$)**; and**
(b) for systems marked Class 0.1, the variation shall not be greater than 0.1 % ($^1/_{1000}$).
(Amended 20XX)
T.2.2. Linearity Tests. – For systems that operate using multiple or variable flow rates, the variation in the results obtained from multiple totalization operations performed under different test conditions (e.g., different flow rates, different test loads, different test material) during the conduct of material tests shall comply with the following:
(a) for systems not marked with an accuracy class and those marked Class 0.25 the variation shall not be greater than plus or minus 0.25 %; and(b) for those systems marked Class 0.1, the tolerance shall not be greater than plus or minus 0.1 %.
(Added 20XX)
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UR.3. Maintenance Requirements – Scale and Conveyor Maintenance. – Weighing systems and idlers shall be maintained and serviced in accordance with manufacturer's instructions and the following:

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[2] The variables and uncertainties included in the relative tolerance represent only part of the variables that affect the accuracy of the material weighed on belt-conveyor scales. If this tolerance was based on an error analysis beginning with mass standards through all of the test processes and following the principle expressed in Section 3.2. of the Fundamental Considerations in Appendix A, the tolerance would be 0.5 %.

(Added 1993)

(a) Zero Balance. – The zero balance condition of a belt-conveyor scale shall be maintained such that, prior to beginning any commercial transaction, with no load on the belt, the zero balance condition is within**:**

i. for Class 0.25, ± 0.12 % of the scale's rated capacity**; and**

ii. for Class 0.1, ± 0.05 % of the scale's rated capacity.

(Added 2012)**(Amended 20XX)**

(b) Scale Clearance. – The scale and area surrounding the scale shall be kept clean of debris or other foreign material that can detrimentally affect the performance of the system.

(c) Weighed Material. – There shall be provisions to ensure that weighed material does not adhere to the belt and return to the scale system area.

(Added 2004)

(d) Simulated and Zero-Load Test Intervals. – Zero-load tests and simulated load or material tests shall be conducted at periodic intervals between official tests and after a repair or mechanical adjustment to the conveyor system in order to provide reasonable assurance that the device is performing correctly. The minimum interval for periodic zero-load tests and simulated load tests shall be established by the official with statutory authority or according to manufacturer recommendations.

The actions to be taken as a result of the zero-load test are shown in the following table.

Change in Zero (Δ 0)	**Actions to be Taken**
If the change in zero is less than ± 0.25 % (Δ 0 < 0.25 %)	Perform zero adjustment and proceed to simulated load test.
If the change in zero is ± 0.25 % to ± 0.5 % (0.25 % ≤ Δ 0 ≤ 0.5 %)	Inspect the conveyor and weighing area for compliance with UR.1. Installation Requirements and repeat the zero-load test.
If the change in zero is greater than ± 0.5 % (Δ 0 > 0.5 %)	Inspect the conveyor and weighing area for compliance with UR.1. Installation Requirements repeat the zero-load test, and reduce the interval between zero-load tests.

The action to be taken as a result of the simulated load or material tests is shown in the following table.

Change in Factor (Reference) Established in N.3.3.(b) **[**Δ N.3.3.(b)]	**Action to be Taken**
For scales marked Class 0.25, Iif the error is less than 0.25 % (Δ N.3.3.(b) < 0.25 %)**, and** **For scales marked Class 0.1 if the error is less than 0.1 %** **(Δ N.3.3.(b) < 0.1 %)**	No Action
For scales marked Class 0.25,Iif the error is at least 0.25 % but not more than 0.6 % (0.25 % ≤ Δ N.3.3.(b) ≤ 0.6 %)**, and** **For scales marked Class 0.1, if the error is at least 0.1% but not more than 0.25%** **(0.1 % ≤ Δ N.3.3.(b) ≤ 0.25 %)**	Inspect the conveyor and weighing area for compliance with UR.1. Installation Requirements and, after compliance is verified, repeat the test. If the result of that test remains greater than ± 0.25 % **for scales marked Class 0.25, or greater than ± 0.1 % for scales marked Class 0.1**, a span correction shall be made

	and the official with statutory authority notified. (Amended 1991)
For scales marked Class 0.25, Iif the error is greater than 0.6 % but does not exceed 0.75 % (0.6 % < Δ N.3.3.(b) ≤ 0.75 %)**, and** **For scales marked Class 0.1, if the error is greater than 0.25% but does not exceed 0.3%** **(0.25 % < Δ N.3.3.(b) ≤ 0.3 %)**	Inspect the conveyor and weighing area for compliance with UR.1. Installation Requirements and, after compliance is verified, repeat the test. If the result of that test remains greater than ± 0.25**6** % **for scales marked Class 0.25, or greater than ± 0.25 % for scales marked Class 0.1**, a span correction shall be made, the official with statutory authority shall be notified, and an official test shall be conducted. (Amended 1991)
For scales marked Class 0.25 %,Iif the error is greater than 0.75 % (Δ N.3.3.(b) > 0.75 %)**, and** **For scales marked Class 0.1, if the error is greater than 0.3%** **(Δ N.3.3.(b) > 0.3 %)**	An official test is required. (Amended 1987)

(Amended 2002**,** 2009**, and 20XX**)

(e) Scale Alignment. – Alignment checks shall be conducted in accordance with the manufacturer's recommendation. A material test is required after any realignment.

(Amended 1986, 2000, and 2015)

(f) Simulated Load Equipment. – Simulated load equipment shall be clean and properly maintained.

(g) Zero Load Reference Information. – When zero load reference information is recorded for a delivery, the information must be based upon zero load tests performed as a minimum both immediately before and immediately after the totalized load.

(Added 2002)

(Amended 1986, 2000, 2002, 2004, 2009, 2012, and 2015)

Background/Discussion: See Appendix A, Page S&T-A310.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

ABW – AUTOMATIC BULK WEIGHING SYSTEMS

ABW-3 D A. Application, S Specifications, N. Notes, UR. User Requirements and Appendix D – Definitions: automatic bulk weighing system.

Source:
Kansas (2016)

Purpose:
Modernize the ABWS Code to more fully the reflect the types of systems in use and technology available while still maintaining the safeguards of the current code and amend the ABWS definition by removing requirements that are included in specifications and providing guidance as to what amount of automation is required for an Automatic Bulk Weighing System.

Item Under Consideration:

NOTE: This proposal was updated by the submitter in October 2017 for consideration at the 2018 Interim Meeting. The previous version is included in the Background/Discussion of this item in Appendix A.

Amend NIST Handbook 44 Automatic Bulk Weighing Systems Code as follows:

A. Application

A.1. General. – This code applies to ~~**automatic bulk**~~ weighing systems, ~~**that is, weighing systems**~~ **capable of** ~~**adapted to the automatic**~~ **automatically** weighing ~~**of a commodity in**~~ successive drafts of **a commodity without operator intervention.** ~~**predetermined amounts automatically recording the no-load and loaded weight values and accumulating the net weight of each draft.**~~
(Amended 1987 **and 20XX**)

S. Specifications

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

S.1.1. Zero Indication. – ~~**Provisions**~~ **An automatic bulk weighing system** shall ~~**be made to**~~ indicate and record a no-load reference value and, if the no-load reference value is a zero value indication, to indicate and record an out-of-balance condition on both sides of zero.
(Amended 20XX)

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S.1.5. Recording Sequence. – ~~**Provision**~~ **An automatic bulk weighing system** shall ~~**be made so that**~~ **indicate** all weight values ~~**are indicated**~~ until ~~**the completion of the**~~ recording of the indicated value **is completed**.
(Amended 20XX)

S.1.6. Provision for Sealing Adjustable Components on Electronic Devices. – Provision shall be made for applying a security seal in a manner that requires the security seal to be broken before an adjustment can be made to any component affecting the performance of the device.

S.1.7. No Load Reference Values – An automatic bulk weighing system shall indicate and record weight values with no load in the load-receiving element. No load reference values must be recorded at a point in time when there is no product flow into or out of the load receiving element. Systems may be designed to stop operating if a no load reference value falls outside of user designated parameters. If this feature is designed into the system then the no load reference value indicated when the system is stopped must be recorded, an alarm must activate, weighing must be inhibited, and some type of operator intervention must be required to restart the system after it is stopped.
(Added 20XX)

S.1.8. Loaded Weight Values – An automatic bulk weighing system shall indicate and record loaded weight values for each weighment.
(Added 20XX)

S.1.9. Net Weight Values – An automatic bulk weighing system shall calculate and record net weight for each weighment.
(Added 20XX)

S.1.10. Net Weight Accumulation – An automatic bulk weighing system shall accumulate and record the sum of all net weight values for all weighments performed during a weighing process.
(Added 20XX)

S.3. Interlocks and ~~Gate Control~~Product Flow Control.

S.3.1. ~~Gate Position~~Product Flow Control. ~~Provision~~ An automatic bulk weighing system shall **~~be made to~~** clearly indicate to the operator **product flow status ~~the position of the gates leading directly~~** to and from the **~~weigh hopper~~ load receiving element. Many types of equipment can be used to control the flow of product into and out of a load receiving element automatically including but not limited to gates, conveyors, augers, robots, pipes, tubes, elevators, buckets, etc. (Amended 20XX)**

S.3.2. Interlocks. – Each automatic bulk weighing system shall have operating interlocks to provide for the following:

(a) Product cannot be cycled and weighed if the weight recording element is disconnected or subjected to a power loss.

(b) **can only ~~cannot print~~ record** a weight if **~~either of the gates~~ equipment controlling product flow to or from the load-receiving element is in a condition which prevents product entering or leaving the load receiving element. ~~leading directly to or from the weigh hopper is open.~~**

(c) A "low paper" sensor, when provided, is activated.

(d) The system will operate only in the proper sequence in all modes of operation.

(e) When an overfill alarm is activated, the system shall indicate and record an overfill condition.

(Amended 1993 **and 20XX**)

S.3.3. Overfill ~~Sensor~~And Interference Detection.

(a) **An automatic bulk weighing system must have a means to detect when ~~The~~ the ~~weigh hopper~~ load-receiving element ~~shall be equipped with an~~ is** overfill**ed. When an overfill condition exists ~~sensor which will cause the feed~~ product flow to the load receiving element must be stopped, ~~gate to close~~ an alarm must activate**, **~~activate an alarm, and inhibit~~** weighing **must be inhibited** until the overfill condition has been corrected**, and some type of operator intervention must be required to restart the system**. **An alarm could be many things including a flashing light, siren, horn, flashing computer screen, etc. The intent of an alarm is to make the operator aware there is a problem which needs corrected.**
(Added 1993) **(Amended 20XX)**

(b) **~~If the system is equipped with a~~ Downstream storage devices and other equipment, permanent or temporary, ~~lower garner or surge bin, that garner shall also~~ which have the potential to interfere with weighment when overfilled or not functioning properly must have a means to prevent interference. When interference exist the system must stop, an alarm must activate, product flow must stop, weighing must be inhibited until the interference has been corrected, and some type of operator intervention is required to restart the system. ~~be equipped with an overfill sensor which will cause the gate of the weigh hopper to remain open, activate an alarm, and inhibit weighing until the overfill condition has been corrected.~~**
[Nonretroactive as of January 1, 1998]
(Amended 1997 **and 20XX**)

N. Notes

N.1. Testing Procedures.

N.1.1. Test Weights. – The increasing load test shall be conducted using test weights equal to at least 10 % of the capacity of the system:

(a) on automatic ~~**grain**~~ bulk~~-~~ weighing systems installed after January 1, 1984 **used to weigh grain**; and

(b) on other automatic bulk-weighing systems installed after January 1, 1986.
(Amended 1987**, and 20XX)**

UR. User Requirements

UR.4. System Modification. – **Components of** ~~**The**~~ **the automatic bulk** weighing system, shall not be modified except when the modification has been approved by a competent engineering authority, preferably that of the engineering department of the manufacturer of the scale, and the official with statutory authority having jurisdiction over the scale.
(Amended 1991 **and 20XX**)

And amend Handbook 44 Appendix D – Definitions as follows:

automatic bulk weighing system. – A weighing system **capable of** ~~**adapted to the automatic**~~ **automatically** weighing ~~**of bulk commodities in**~~ successive drafts of **a commodity without operator intervention.** ~~**predetermined amounts, automatically recording the no-load and loaded weight values and accumulating the net weight of each draft.**~~ [2.22]

Background/Discussion: See Appendix A, Page S&T-A312.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

AWS – AUTOMATIC WEIGHING SYSTEMS

AWS-3 S.3.2. Load Cell Verification Interval Value.

Source:
NTEP Weighing Sector (2019)

Purpose:
Correct inconsistency between device codes dealing with compliance of the v_{min} to "d" relationship formula when a complete scale undergoes NTEP temperature testing.

Item Under Consideration:
Amend NIST Handbook 44 Automatic Weighing Systems Code as follows:

S.3.2. Load Cell Verification Interval Value. – The relationship of the value for the load cell verification scale interval, v_{min}, to the scale division d for a specific scale installation shall be:

$$v_{min} \leq \frac{d}{\sqrt{N}}$$, where N is the number of load cells in the scale.

Note: When the value of the scale division d differs from the verification scale division e for the scale, the value of e must be used in the formula above.

This requirement does not apply to complete weighing/load-receiving elements or scales which satisfy all the following criteria:

- the complete weighing/load-receiving element or scale has been evaluated for compliance with T.7.1. Temperature under the National Type Evaluation Program (NTEP);
- the complete weighing/load-receiving element or scale has received an NTEP Certificate of Conformance; and
- the complete weighing/load-receiving element or scale is equipped with an automatic zero-tracking mechanism which cannot be made inoperative in the normal weighing mode. (A test mode which permits the disabling of the automatic zero-tracking mechanism is permissible, provided the scale cannot function normally while in this mode.)

[Nonretroactive as of XXXX]
(Amended XXX)

Background/Discussion: See Appendix A, Page S&T-A319.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

WIM – WEIGH-IN-MOTION SYSTEMS USED FOR VEHICLE ENFORCEMENT SCREENING TENTATIVE CODE

WIM-1 Title of Tentative Code, S.1.7.1. Values to be Recorded., S.4.1. Designation of Accuracy., N.1. Test Procedures, T.2. Tolerance Values for Accuracy ~~Class A~~ Classes., UR.1.1. General, Table 1. Typical Class or Type of Device for Weighing Applications.

Source:
Intercomp Company (2019)

Purpose:
Provide for certification of non-legal for trade weigh-in-motion scales for vehicles.

Item Under Consideration:
Amend NIST Handbook 44 Weigh-in-Motion Systems used for Vehicle Enforcement Screening Code as follows:

Section 2.25. Weigh-In-Motion Systems

Used for Vehicle ~~Enforcement~~ Weight Screening – Tentative Code

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S.1.7.1. Values to be Recorded. – At a minimum, the following values shall be printed and/or stored electronically for each vehicle weighment:

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(j) violations **if applicable,** as identified in paragraph S.2.1. Violation Parameters, which occurred during the weighing of the vehicle; and

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S.2.1. Violation Parameters (if applicable,). – The instrument shall be capable of accepting user-entered violation parameters

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S.4.1. Designation of Accuracy. – Weigh-in-motion systems meeting the requirements **in table T.2.2** of this code shall be designated **with appropriate accuracy class.** ~~**as accuracy Class A.**~~

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N.1. Test Procedures

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N.1.4. Test Speeds. – All dynamic tests shall be conducted **up to the intended speed limit of the WIM system or** within 20 % below or at the posted speed limit**, whichever is lower.**

N.1.5. Test Procedures.

N.1.5.1. Dynamic Load Test. – The dynamic test shall be conducted using the test vehicles defined in N.1.1. Selection of Test Vehicles. The test shall consist of a minimum of 20 runs for each test vehicle at the speed as stated in N.1.4. Test Speeds.

At the conclusion of the dynamic test there will be a minimum of 20 weight readings for each single axle, axle group, and gross vehicle weight of the test vehicle. The tolerance for each weight reading shall be based on the percentage values specified in Table T.2.2. ~~**Tolerances for Accuracy Class A.**~~

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T.2. Tolerance Values for Accuracy Classes ~~**Class A.**~~

T.2.2. Tolerance Values for Dynamic Load Test. – The tolerance values applicable during dynamic load testing are as specified in Table T.2.2.

~~**Table T.2.2. Tolerances for Accuracy Class A**~~

~~Load Description*~~	~~Tolerance as a Percentage of Applied Test Load~~
~~Axle Load~~	~~± 20 %~~
~~Axle Group Load~~	~~± 15 %~~
~~Gross Vehicle Weight~~	~~± 10 %~~
~~* No more than 5 % of the weighments in each of the load description subgroups shown in this table shall exceed the applicable tolerance.~~	

Table T.2.2. Tolerances for Accuracy Classes

	Tolerance as a Percentage of Applied Test Load			
Load Description*	**D**	**C**	**B**	**A**
Axle Load	**± 5 %**	**± 10 %**	**± 15 %**	**± 20 %**
Axle Group Load	**± 3 %**	**± 7 %**	**± 10 %**	**± 15 %**
Gross Vehicle Weight	**± 1 %**	**± 2 %**	**± 5 %**	**± 10 %**
*** No more than 5 % of the weighments in each of the load description subgroups shown in this table shall exceed the applicable tolerance**				

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UR.1.1. General. – The typical class or type of device for particular weighing applications is shown in Table 1. Typical Class or Type of Device for Weighing Applications.

Table 1.
Typical Class or Type of Device for Weighing Applications

Class	Weighing Application
A	Screening and sorting of vehicles based on axle, axle group, and gross vehicle weight.
B	**Industrial Screening, GVW axle, and axle group checkweighing**
C	**TBD**
D	**TBD**
Note: A WIM system with a higher accuracy class than that specified as "typical" may be used.	

Background/Discussion: See Appendix A, Page S&T-A320.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

BLOCK 1 ITEMS (B1) TERMINOLOGY FOR TESTING STANDARDS

Source:
NIST OWM (2018)

Purpose:
To remove the current limited definition and use of the term "Transfer Standard" and eliminate terms "Testing Standards", "Verification (Testing) Standards", and instead use the term Field Standard, consistent with its reference in Handbook 44, Appendix A, Fundamental Considerations and its use in several sections of Handbook 44. To correct the broad use of the term Transfer Standard and instead replace its use with the term Field Standard. To update all use of the term "standard" to use the term "Field Standard". To remove the current limited definition of Transfer Standard and instead use the term Field Standard.

B1: SCL-4 D N.2. Verification (Testing) Standards

Item Under Consideration:
Amend NIST Handbook 44, Scales Code as follows:

N.2. ~~**Verification (Testing)**~~ **Field** Standards. – Field standard weights used in verifying weighing devices shall comply with requirements of NIST Handbook 105-Series standards (or other suitable and designated standards) or the tolerances expressed in Fundamental Considerations, paragraph 3.2. (i.e., one-third of the smallest tolerance applied).
(Amended 1986 **and 20XX**)

B1: ABW-1 D N.2. Verification (Testing) Standards

Item Under Consideration:
Amend NIST Handbook 44, Automatic Bulk Weighing Systems Code as follows:

N.2. ~~Verification (Testing)~~ Field Standards. – **Field** ~~**S**~~standard weights and masses used in verifying weighing devices shall comply with requirements of NIST Handbook 105-1 (Class F) or the tolerances expressed in Appendix A, Fundamental Considerations, paragraph 3.2. (i.e., one-third of the smallest tolerance applied).
(Amended 20XX)

B1: AWS-1 D N.1.3. Verification (Testing) Standards, N.3.1. Official Tests, UR.4. Testing Standards

Item Under Consideration:
Amend NIST Handbook 44, Automatic Weighing Systems Code as follows:

N.1.3. ~~Verification (Testing)~~ Field Standards. – Field standard weights shall comply with requirements of NIST Handbook 105-1, "Specifications and Tolerances for Field Standard Weights (Class F)" or the tolerances expressed in Fundamental Considerations, paragraph 3.2. (i.e., one-third of the smallest tolerance applied).
(Amended 20XX)

N.3.1. Official Tests. – Officials are encouraged to periodically witness the required "in house" verification of accuracy. Officials may also conduct official tests using the on-site ~~**testing**~~ **field** standards or other appropriate standards belonging to the jurisdiction with statutory authority over the device or system.
(Amended 20XX)

UR.4. ~~Testing~~ Field Standards. – The user of a commercial device shall make available to the official with statutory authority over the device ~~**testing**~~ **field** standards that meet the tolerance expressed in Fundamental Considerations, paragraph 3.2. Tolerances for Standards (i.e., one-third of the smallest tolerance applied). The accuracy of the ~~**testing**~~ **field** standards shall be verified annually or on a frequency as required by the official with statutory authority and shall be traceable to the appropriate SI standard.

(Amended 20XX)

B1: CLM-1 D N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards

Item Under Consideration:

Amend NIST Handbook 44, Cryogenic Liquid-Measuring Devices Code as follows:

N.3.2. ~~Transfer~~ Field Standard Test. – When comparing a meter with a calibrated ~~**transfer**~~ **field** standard, the test draft shall be equal to at least the amount delivered by the device in two minutes at its maximum discharge rate, and shall in no case be less than 180 L (50 gal) or equivalent thereof. When testing uncompensated volumetric meters in a continuous recycle mode, appropriate corrections shall be applied if product conditions are abnormally affected by this test mode.

(Amended 1976 **and 20XX**)

~~**T.3. On Tests Using Transfer Standards. To the basic tolerance values that would otherwise be applied, there shall be added an amount equal to two times the standard deviation of the applicable transfer standard when compared to a basic reference standard. (Added 1976)**~~

B1: CDL-1 D N.3.2. Transfer Standard Test, T.3. On Tests Using Transfer Standards

Item Under Consideration:

Amend NIST Handbook 44, Carbon Dioxide Liquid-Measuring Devices Code as follows:

N.3.2. ~~Transfer~~ Field Standard Test. – When comparing a meter with a calibrated ~~**transfer**~~ **field** standard, the test draft shall be equal to at least the amount delivered by the device in two minutes at its maximum discharge rate.

(Amended 20XX)

~~**T.3. On Tests Using Transfer Standards. To the basic tolerance values that would otherwise be applied, there shall be added an amount equal to two times the standard deviation of the applicable transfer standard when compared to a basic reference standard.**~~

B1: HGM-1 D N.4.1. Master Meter (Transfer) Standard Test, T.4. Tolerance Application on Test Using Transfer Standard Test Method

Item Under Consideration:

Amend NIST Handbook 44, Hydrogen Gas-Measuring Devices Tentative Code as follows:

N.4.1. Master Meter ~~(Transfer)~~ Field Standard Test. – When comparing a measuring system with a calibrated ~~**transfer**~~ **field** standard, the minimum test shall be one test draft at the declared minimum measured quantity and one test draft at approximately ten times the minimum measured quantity or 1 kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed.

(Amended 20XX)

~~**T.4. Tolerance Application on Test Using Transfer Standard Test Method. To the basic tolerance values that would otherwise be applied, there shall be added an amount equal to two times the standard deviation of the applicable transfer standard when compared to a basic reference standard.**~~

B1: GMM-1 D 5.56(a): N.1.1. Air Oven Reference Method Transfer Standards, N.1.3. Meter to Like-Type Meter Method Transfer Standards and 5.56(b): N.1.1. Transfer Standards, T. Tolerances[1]

Item Under Consideration:

Amend NIST Handbook 44, Grain Moisture Meters Code as follows:

5.56.(a) Grain Moisture Meters

N.1.1. Air Oven Reference Method ~~Transfer~~ Field Standards. – Official grain samples shall be used as the official ~~**transfer**~~ **field** standards with moisture content and test weight per bushel values assigned by the reference methods. The reference methods for moisture shall be the oven drying methods as specified by the USDA GIPSA. The test weight per bushel value assigned to a test weight transfer standard shall be the average of 10 test weight per bushel determinations using the quart kettle test weight per bushel apparatus as specified by the USDA GIPSA. Tolerances shall be applied to the average of at least three measurements on each official grain sample. Official grain samples shall be clean and naturally moist, but not tempered (i.e., water not added). (Amended 1992, 2001, ~~**and**~~ 2003**, and 20XX**)

N.1.3. Meter to Like-Type Meter Method Transfer Standards. – Properly standardized reference meters using National Type Evaluation Program approved calibrations shall be used as ~~**transfer**~~ **field** standards. A reference meter shall be of the same type as the meter under test. Tests shall be conducted side-by-side using, as a comparison medium, grain samples that are clean and naturally moist, but not tempered (i.e., water not added). (Added 2001) **(Amended 20XX)**

5.56.(b) Grain Moisture Meters

N.1.1. ~~Transfer~~ Field Standards. – Official grain samples shall be used as the official ~~**transfer**~~ **field** standards with moisture content values assigned by the reference methods. The reference methods shall be the oven drying methods 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).

(Amended 1992 **and 20XX**)

T. Tolerances[1]

[1]These tolerances do not apply to tests in which grain moisture meters are the ~~**transfer**~~ **field** standards.

(Amended 20XX)

B1: LVS-1 D N.2. Testing Standards

Item Under Consideration:

Amend NIST Handbook 44, Electronic Livestock, Meat and Poultry Evaluation Systems and/or Devices Code as follows:

N.2. ~~Testing~~ Field Standards. – ASTM Standard F2343 requires device or system users to maintain accurate ~~**reference**~~ **field** standards that meet the tolerance expressed in NIST Handbook 44 Fundamental Considerations, paragraph 3.2. Tolerances for Standards (i.e., one-third of the smallest tolerance applied).
(Amended 20XX)

B1: OTH-1 D Appendix A: Fundamental Considerations, 3.2. Tolerances for Standards, 3.3. Accuracy of Standards

Item Under Consideration:

Amend NIST Handbook 44, Appendix A: Fundamental Considerations as follows:

3.2. Tolerances for Field Standards. – Except for work of relatively high precision, it is recommended that the accuracy of standards used in testing commercial weighing and measuring equipment be established and maintained so that the use of corrections is not necessary. When the standard is used without correction, its combined error and uncertainty must be less than one-third of the applicable device tolerance.

Device testing is complicated to some degree when corrections to standards are applied. When using a correction for a standard, the uncertainty associated with the corrected value must be less than one-third of the applicable device tolerance. The reason for this requirement is to give the device being tested as nearly as practicable the full benefit of its own tolerance.
(Amended 20XX)

3.3. Accuracy of Field Standards. – Prior to the official use of testing apparatus, its accuracy should invariably be verified. Field standards should be calibrated as often as circumstances require. By their nature, metal volumetric field standards are more susceptible to damage in handling than are standards of some other types. A field standard should be calibrated whenever damage is known or suspected to have occurred or significant repairs have been made. In addition, field standards, particularly volumetric standards, should be calibrated with sufficient frequency to affirm their continued accuracy, so that the official may always be in an unassailable position with respect to the accuracy of his testing apparatus. Secondary field standards, such as special fabric testing tapes, should be verified much more frequently than such basic standards as steel tapes or volumetric provers to demonstrate their constancy of value or performance.

Accurate and dependable results cannot be obtained with faulty or inadequate field standards. If either the service person or official is poorly equipped, their results cannot be expected to check consistently. Disagreements can be avoided and the servicing of commercial equipment can be expedited and improved if service persons and officials give equal attention to the adequacy and maintenance of their testing apparatus.
(Amended 20XX)

B1: OTH-2 D Appendix D – Definitions: fifth-wheel, official grain samples~~, transfer standard~~ and Standard, Field

Item Under Consideration:
Amend NIST Handbook 44, Appendix A: Fundamental Considerations as follows:

fifth wheel. – A commercially-available distance-measuring device which, after calibration, is recommended for use as a field ~~**transfer**~~ standard for testing the accuracy of taximeters and odometers on rented vehicles. [5.53, 5.54]
(Amended 20XX)

official grain samples. – Grain or seed used by the official as the official ~~**transfer**~~ **field** standard from the reference standard method to test the accuracy and precision of grain moisture meters. [5.56(a), 5.56(b)]
(Amended 20XX)

~~**transfer standard. A measurement system designed for use in proving and testing cryogenic liquid-measuring devices. [3.38]**~~

Standard, Field. – A physical standard that meets specifications and tolerances in NIST Handbook 105-series standards (or other suitable and designated standards) and is traceable to the reference or working standards through comparisons, using acceptable laboratory procedures, and used in conjunction with commercial weighing and measuring equipment.
(Added 20XX)

Background/Discussion: See Appendix A, Page S&T-A322.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

BLOCK 2 ITEMS (B2) DEFINE "FIELD REFERENCE STANDARD"

Source:
Endress + Hauser Flowtec AG USA (2018)

Purpose:
Add definition field reference standard meter to HB 44. Delete transfer standard definition. Change terms in sections 3.34, 3.38 and 3.39.

B2: CLM-2 D N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards

Item Under Consideration:
Amend NIST Handbook 44, Cryogenic Liquid-Measuring Devices Code as follows:

N.3.2. Field Reference~~Transfe~~r Standard Meter Test. – When comparing a meter with a calibrated **field reference**~~**transfer**~~ standard **meter**, the test draft shall be equal to at least the amount delivered by the device in two minutes at its maximum discharge rate, and shall in no case be less than 180 L (50 gal) or equivalent thereof. When testing uncompensated volumetric meters in a continuous recycle mode, appropriate corrections shall be applied if product conditions are abnormally affected by this test mode.
(Amended 1976 **and 20XX**)

T.3. On Tests Using Field ReferenceTransfer Standards Meters. – To the basic tolerance values that would otherwise be applied, there shall be added an amount equal to two times the standard deviation of the applicable **field referencetransfer** standard **meter** when compared to a basic reference standard. (Added 1976)

B2: CDL-2 D N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards

Item Under Consideration:

Amend NIST Handbook 44, Carbon Dioxide Liquid-Measuring Devices Code as follows:

N.3.2. Field ReferenceTransfer Standard Meter Test. – When comparing a meter with a calibrated **field referencetransfer** standard **meter**, the test draft shall be equal to at least the amount delivered by the device in two minutes at its maximum discharge rate.

(Amended 20XX)

T.3. On Tests Using Field ReferenceTransfer Standards Meters. – To the basic tolerance values that would otherwise be applied, there shall be added an amount equal to two times the standard deviation of the applicable **field referencetransfer** standard when compared to a basic **field referencereference** standard **meter**.

B2: HGM-2 D N.4.1. Master Meter (Transfer) Standard Test and T.4. Tolerance Application on Test Using Transfer Standard Test Method

Item Under Consideration:

Amend NIST Handbook 44, Hydrogen Gas-Measuring Devices Tentative Code as follows:

N.4.1. Field ReferenceMaster Meter (Transfer) Standard Meter Test. – When comparing a measuring system with a calibrated **field referencetransfer** standard **meter**, the minimum test shall be one test draft at the declared minimum measured quantity and one test draft at approximately ten times the minimum measured quantity or 1 kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed.

(Amended 20XX)

T.4. Tolerance Application on Test Using Field ReferenceTransfer Standard Meters Test Method. – To the basic tolerance values that would otherwise be applied, there shall be added an amount equal to two times the standard deviation of the applicable **field referencetransfer** standard **meter** when compared to a basic reference standard.

B2: OTH-3 D Appendix D – Definitions: field reference standard meter and ~~transfer standard~~

Item Under Consideration:

Amend NIST Handbook 44, Appendix D as follows:

field reference standard meter – A measurement system designed for use in proving and testing measuring devices and meters.

~~transfer standard – A measurement system designed for use in proving and testing cryogenic liquid measuring devices.~~

Background/Discussion: See Appendix A, Page S&T-A326.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

BLOCK 3 ITEMS (B3) ADDRESS DEVICES AND SYSTEMS ADJUSTED USING A REMOVABLE DIGITAL STORAGE DEVICE

Source:
NIST OWM (2013)

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

B3: GEN-2 D G-S.8.2. Devices and Systems Adjusted Using Removable Digital Device Storage

Item Under Consideration:
Modify the General Code as follows:

G-S.8.2. Devices and Systems Adjusted Using Removable Digital Storage Device. - For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device*, such as a secure digital (SD) card, USB flash drive, etc., security shall be provided for those parameters using either (1) an event logger in the device; or (2) a physical seal that must be broken in order to remove the digital storage device from the device (or system). If security is provided using an event logger, the event logger shall include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available on demand through the device or through another on-site device. In addition to providing a printed copy of the information, the information may be made available electronically. The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)

*** Applies only to removable digital storage devices that must remain in the device or system for it to be operational.**
(Added 20XX)

B3: SCL-5 D S.1.11. Provision for Sealing.

Item Under Consideration:
Modify the Scales Code as follows:

S.1.11.1 Devices and Systems Adjusted Using a Removable Digital Storage Device. - For devices and systems in which the calibration or configuration parameters, as defined in Appendix D, can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2.
S.1.11.2 All Other Devices. - *Except on Class I scales and devices specified in S.1.11.1. the following provisions for sealing applies:*

(a) Provision shall be made for applying a security seal in a manner that requires the security seal to be broken before an adjustment can be made to any component affecting the performance of an electronic device.
[Nonretroactive as of January 1, 1979]

(b) A device shall be designed with provision(s) for applying a security seal that must be broken, or for using other approved means of providing security (e.g., data change audit trail available at the time of inspection), before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism.
[Nonretroactive as of January 1, 1990]

(c) Audit trails shall use the format set forth in Table S.1.11.
[Nonretroactive as of January 1, 1995]

A device may be fitted with an automatic or a semi-automatic calibration mechanism. This mechanism shall be incorporated inside the device. After sealing, neither the mechanism nor the calibration process shall facilitate fraud.
(Amended 1989, 1991, 1993**,** and **20XX**)

B3: BCS-1 D S.5. Provision for Sealing.

Item Under Consideration:
Modify the Belt-Conveyor Scale Systems Scales Code as follows:

S.5. Provision for Sealing. – **For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2.** ***For all other devices, the following provisions for sealing apply:***

A device shall be designed using the format set forth in Table S.5. with provision(s) for applying a security seal that must be broken, or for using other approved means of providing security (e.g. data change audit trail available at the time of inspection), before any change that affects the metrological integrity of the device can be made to any electronic mechanism.
[Nonretroactive as of January 1, 1999]

(Added 1998) **(Amended 20XX)**

B3: ABW-2 D S.1.6. Provision for Sealing Adjustable Components on Electronic Devices.

Item Under Consideration:
Modify the Automatic Bulk Weighing Systems Code as follows:

S.1.6. Provision for Sealing Adjustable Components on Electronic Devices. – **For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, p**~~**P**~~rovision shall be made for applying a security seal in a manner that requires the security seal to be broken before an adjustment can be made to any component affecting the performance of the device.

(Amended 20XX)

B3: AWS-2 D S.1.3. Provision for Sealing.

Item Under Consideration:
Modify the Automatic Weighing Systems Code as follows:

S.1.3. Provision for Sealing.

(a) **Automatic Weighing Systems, Except Automatic Checkweighers. –** **For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2.**

For parameters adjusted using other means, a ~~**A**~~ device shall be designed with provision(s) as specified in Table S.1.3. Categories of Device and Methods of Sealing for applying a security seal that must be broken, or for using other approved means of providing security (e.g., data change audit trail available at the time of inspection), before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism.

(b) **For Automatic Checkweighers.** – Security seals are not required in applications where it would prohibit an authorized user from having access to the calibration functions of a device.

(Amended 20XX)

B3: LMD-1 D S.2.2. Provision for Sealing.

Item Under Consideration:
Modify the Liquid Measuring Devices Code as follows:

S.2.2. Provision for Sealing. – For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:

Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or for physically applying a security seal in such a manner that requires the security seal to be broken before an adjustment or interchange can be made of:

(a) any measuring or indicating element;

(b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries; and

(c) any metrological parameter that will affect the metrological integrity of the device or system.

When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal.

*[Audit trails shall use the format set forth in Table S.2.2.]**
*[*Nonretroactive and Enforceable as of January 1, 1995]*

(Amended 1991, 1993, 1995, 2006**,** and **20XX**)

B3: VTM-2 D S.2.2. Provision for Sealing.

Item Under Consideration:
Modify the Vehicle Tank Meters Code as follows:

S.2.2. Provision for Sealing. – For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for

those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:

Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or for physically applying a security seal in such a manner that requires the security seal to be broken before a change or an adjustment or interchange may be made of:

(a) any measuring or indicating element;

(b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries; and

(c) any metrological parameter that will affect the metrological integrity of the device or system.

When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal.
*[Audit trails shall use the format set forth in Table S.2.2. Categories of Device and Methods Sealing.]**
*[*Nonretroactive as of January 1, 1995]*
(Amended 2006 **and 20XX**)

B3: LPG-1 D S.2.2. Provision for Sealing.

Item Under Consideration:
Modify the LPG and Anhydrous Ammonia Liquid-Measuring Devices Code as follows:

S.2.2. Provision for Sealing. For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:

Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or for physically applying a security seal in such a manner that requires the security seal to be broken before an adjustment or interchange may be made of:

(a) any measuring or indicating element;

(b) any adjustable element for controlling delivery rate, when such rate tends to affect the accuracy of deliveries; and

(c) any metrological parameter that will affect the metrological integrity of the device or system.

When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal.

*[Audit trails shall use the format set forth in Table S.2.2. Categories of Device and Methods of Sealing.]**

*[*Nonretroactive as of January 1, 1995]*

(Amended 2006 **and 20XX**)

B3: HGV-1 D S.2.2. Provision for Sealing.

Item Under Consideration:
Modify the Hydrocarbon Gas Vapor-Measuring Devices Code as follows:

S.2.2. Provision for Sealing. For devices or systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:

Adequate provision shall be made for applying security seals in such a manner that no adjustment or interchange may be made of any measurement element.

(Amended 20XX)

B3: CLM-2 D S.2.5. Provision for Sealing.

Item Under Consideration:
Modify Cryogenic Liquid-Measuring Devices Code as follows:

S.2.5. Provision for Sealing. – For devices or systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:

Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or for physically applying a security seal in such a manner that requires the security seal to be broken before an adjustment or interchange may be made of:

(a) any measuring or indicating element;

(b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries;

(c) any automatic temperature or density compensating system; and

(d) any metrological parameter that will affect the metrological integrity of the device or system.

When applicable, any adjusting mechanism shall be readily accessible for purposes of affixing a security seal.

[Audit trails shall use the format set forth in Table S.2.5. Categories of Device and Methods of Sealing]*[*Nonretroactive as of January 1, 1995]

(Amended 2006 **and 20XX**)

B3: MLK-1 D S.2.3. Provision for Sealing.

Item Under Consideration:
Modify Milk Meters Code as follows:

S.2.3. Provision for Sealing. – **For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:**

Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or for physically applying a security seal in such a manner that requires the security seal to be broken before an adjustment or interchange may be made of any:

(a) measuring element or indicating element;

(b) adjustable element for controlling delivery rate, when such rate tends to affect the accuracy of deliveries; and

(c) metrological parameter that will affect the metrological integrity of the device or system.

When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal.

*[Audit trails shall use the format set forth in Table S.2.3. Categories of Device and Methods of Sealing]**
*[*Nonretroactive as of January 1, 1995]*

(Amended 2006 **and 20XX**)

B3: WTR-1 D S.2.1. Provision for Sealing.

Item Under Consideration:
Modify Water Meters Code as follows:

S.2.1. Provision for Sealing. – **For devices or systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:**

Adequate provision shall be made for applying security seals in such a manner that no adjustment or interchange may be made of:

(a) any measurement elements; and

(b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries.

The adjusting mechanism shall be readily accessible for purposes of affixing a security seal.

(Amended 20XX)

B3: MFM-1 D S.3.5. Provision for Sealing.

Item Under Consideration:
Modify Mass Flow Meters Code as follows:

S.3.5. Provision for Sealing. – **For devices or systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:**

Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or physically applying security seals in such a manner that no adjustment or interchange may be made of:

(a) any measuring or indicating element;

(b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries;

(c) the zero adjustment mechanism; and

(d) any metrological parameter that will affect the metrological integrity of the device or system.

When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal.

*[Audit trails shall use the format set forth in Table S.3.5. Categories of Device and Methods of Sealing]**
*[*Nonretroactive as of January 1, 1995]*

(Amended 1992, 1995, 2006**,** and **20XX**)

B3: CDL-3 D S.2.5. Provision for Sealing.

Item Under Consideration:
Modify Carbon Dioxide Liquid-Measuring Devices Code as follows:

S.2.5. Provision for Sealing. – <u>For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:</u>

Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or for physically applying a security seal in such a manner that requires the security seal to be broken before an adjustment or interchange may be made of:

(a) any measuring or indicating element;

(b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries;

(c) any automatic temperature or density compensating system; and

(d) any metrological parameter that will affect the metrological integrity of the device or system.

When applicable any adjusting mechanism shall be readily accessible for purposes of affixing a security seal.

*[Audit trails shall use the format set forth in Table S.2.5. Provision for Sealing]**
*[*Nonretroactive as of January 1, 1995]*

(Amended 2006 **<u>and 20XX</u>**)

B3: HGM-3 D S.3.3. Provision for Sealing.

Item Under Consideration:
Modify Hydrogen Gas-Measuring Devices Tentative Code as follows:

S.3.3. Provision for Sealing. – **For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:**

Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or physically applying security seals in such a manner that no adjustment may be made of:

(a) each individual measurement element;

(b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries;

(c) the zero adjustment mechanism; and

(d) any metrological parameter that detrimentally affects the metrological integrity of the device or system.

When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal. Audit trails shall use the format set forth in Table S.3.3. Categories of Device and Methods of Sealing.

(Amended 20XX)

B3: EVF-1 D S.3.3. Provision for Sealing.

Item Under Consideration:
Modify Electric Vehicle Refueling Systems Code as follows:

S.3.3. Provision for Sealing. – **For devices or systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:**

Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or physically applying security seals in such a manner that no adjustment may be made of:

(a) each individual measurement element;

(b) any adjustable element for controlling voltage or current when such control tends to affect the accuracy of deliveries;

(c) any adjustment mechanism that corrects or compensates for energy loss between the system and vehicle connection; and

(d) any metrological parameter that detrimentally affects the metrological integrity of the EVSE or system.

When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal. Audit trails shall use the format set forth in Table S.3.3. Categories of Device and Methods of Sealing.

(Amended 20XX)

B3: TIM-1 D S.4. Provision for Sealing.

Item Under Consideration:
Modify Timing Devices Code as follows:

S.4. Provisions for Sealing. – **For devices or systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means,** ~~**A**~~**a**dequate provisions shall be made to provide security for the timing element.
(Added 2015) **(Amended 20XX)**

B3: GMA-1 D S.2.5. Provision for Sealing.

Item Under Consideration:
Modify 5.56.(a) Grain Moisture Meters Code as follows:

S.2.5. Provision for Sealing. – **For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:**

~~P~~rovision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., audit trail available at the time of inspection as defined in Table S.2.5. Categories of Device and Methods of Sealing) before any change that affects the metrological integrity of the device can be made to any mechanism.
(Amended 20XX)

B3: MDM-1 D S.1.11. Provision for Sealing.

Item Under Consideration:
Modify Multiple Dimension Measuring Devices Code as follows:

S.1.11. Provision for Sealing. - For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:

(a) ~~**A**~~ **The** device **or system** shall be designed with provision(s) for applying a security seal that must be broken, or for using other approved means of providing security (e.g., data change audit trail available at the time of inspection), before any change that detrimentally affects the metrological integrity ~~**of the device**~~ can be made to any measuring element.

(b) Audit trails shall use the format set forth in Table S.1.11. Categories of Devices and Methods of Sealing for Multiple Dimension Measuring Systems.

(Amended 20XX)

Background/Discussion: See Appendix A, Page S&T-A328.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

BLOCK 4 ITEMS (B4) AUTOMATIC TIMEOUT SPECIFICATIONS

Source:
NIST OWM (2019)

Purpose:
Prevent the facilitation of fraud on a vehicle fueling system equipped with the capability for authorization of a transaction by a credit card, debit card, or cash.

B4: MFM-3 S.2.9. Automatic Timeout – Pay-At-Retail Motor-Fuel Devices.

Item Under Consideration:
Amend NIST Handbook 44 Mass Flow Meter Code as follows:

S.2.9. Automatic Timeout – Pay-At-Retail Motor-Fuel Devices. – Once a retail motor-fuel device has been authorized, it must de-authorize within two minutes if not activated. Re-authorization of the retail motor-fuel device must be performed before product is delivered. If the time limit to de-authorize the retail motor-fuel device is programmable, it shall not accept an entry greater than two minutes.

[Nonretroactive as of January 1, 2020]

(Added 2019)

B4: HGM-4 S.2.8. Automatic Timeout – Pay-At-Vehicle Fuel Dispensers.

Item Under Consideration:
Amend NIST Handbook 44 Hydrogen Gas-Measuring Devices Code as follows:

S.2.8. Automatic Timeout – Pay-At-Vehicle Fuel Dispensers. – Once a vehicle fuel dispenser has been authorized, it must de-authorize within two minutes if not activated. Re-authorization of the vehicle fuel dispenser must be performed before any product is delivered. If the time limit to de-authorize the vehicle fuel dispenser is programmable, it shall not accept an entry greater than two minutes.

[Nonretroactive as of January 1, 2020]

(Added 2019)

B4: EVF-2 S.2.8. Automatic Timeout – Pay-At-EVSE.

Item Under Consideration:
Amend NIST Handbook 44 Electric Vehicle Fueling Systems Tentative Code as follows:

S.2.8. Automatic Timeout – Pay-At-EVSE. – Once an EVSE has been authorized, it must de-authorize within two minutes if not activated. Re-authorization of the EVSE must be performed before any electrical energy is delivered and/or timing charges assessed. If the time limit to de-authorize the EVSE is programmable, it shall not accept an entry greater than two minutes.

[Nonretroactive as of January 1, 2020]

(Added 2019)

Background/Discussion: See Appendix A, Page S&T-A332.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

BLOCK 5 ITEMS (B5) REPEATABILITY TESTS AND TOLERANCES

Note: This item appeared as LPG-5 in the 2018 NCWM Publication 16. It was expanded by the developer for 2019 to uniformly address the same issue across multiple Section 3 codes.

Source:
Ross Andersen Retired (2017)

Purpose:
Address differences between NIST Handbook 44 and NCWM Publication 14 practices for repeatability testing.

B5: LMD-2 D ~~N.4.1.2.~~ N.4.6. Repeatability Tests. and T.3. Repeatability.

Item Under Consideration:
Amend NIST Handbook 44 Liquid Measuring Devices Code as follows:

~~N.4.1.2.~~ **N.4.6. 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. **When conducting the tests, the flow rates shall be within the minimum and maximum discharge rates as marked by the manufacturer. For devices with no marked minimum and maximum flow rates, the minimum discharge rates shall be as specified in N.4.2.1. or N.4.2.2. and the maximum discharge rates shall be the maximum discharge rate developed under the conditions of the installation. For devices equipped with an automatic temperature compensator, the results shall be based on uncompensated (gross) volume, i.e. with the temperature compensator deactivated.**

(Added 2001) **(Amended 20XX)**

and

T.3. Repeatability. – When multiple tests are conducted at approximately the same flow rate and draft size, the range of the test results for the flow rate shall not exceed 40 % of the absolute value of the maintenance tolerance and the results of each test shall be within the applicable tolerance. This tolerance does not apply to the test of the automatic temperature-compensating system. (Also see ~~N.4.1.2.~~ **N.4.6**. Repeatability Tests.)

(Added 1992) (Amended 2001**,** ~~**and**~~ 2002, **and 20XX)**

B5: VTM-3 D ~~N.4.1.2.~~ N.4.6. Repeatability Tests. and T.3. Repeatability.

Item Under Consideration:
Amend NIST Handbook 44 Vehicle Tank Meter Code as follows:

~~N.4.1.2.~~ **N.4.6. 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 **When conducting the tests, the flow rates shall be within the minimum and maximum discharge rates as marked by the manufacturer. For devices equipped with an automatic temperature compensator, the results shall be based on uncompensated (gross) volume, i.e. with the temperature compensator deactivated.**

(Added 2001) **(Amended 20XX)**

and

T.3. Repeatability. – When multiple tests are conducted at approximately the same flow rate and draft size, the range of the test results for the flow rate shall not exceed 40 % of the absolute value of the maintenance tolerance and the results of each test shall be within the applicable tolerance. (Also see ~~**N.4.1.2.**~~ **N.4.6.** Repeatability Tests.)

(Added 1992) (Amended 2001**,** ~~**and**~~ 2002, **and 20XX)**

B5: LPG-4 D ~~N.4.1.2.~~ N.4.6. Repeatability Tests. and T.3. Repeatability.

Item Under Consideration:
Amend NIST Handbook 44 Liquefied Petroleum Gas and Anhydrous Ammonia Liquid-Measuring Devices Code as follows:

~~**N.4.1.2.**~~ **N.4.6. 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. **When conducting the tests, the discharge rates shall be within the minimum and maximum discharge rates as marked by the manufacturer. Results shall be based on the uncompensated (gross) volume, e.g. with the temperature compensator deactivated.**

(Added 2001) **(Amended 20XX)**

and

T.3. Repeatability. – When multiple tests are conducted at approximately the same flow rate and draft size, the range of the test results for the flow rate shall not exceed 40 % of the absolute value of the maintenance tolerance and the results of each test shall be within applicable tolerance. ~~This tolerance does not apply to the test of the automatic temperature compensating system.~~ (Also **see** ~~**N.4.1.2.**~~ **N.6.** Repeatability Tests.)

(Added 1992) (Amended 2001**,** ~~**and**~~ 2002, **and 20XX)**

B5: HGV-2 D ~~N.4.1.2.~~ N.4.3. Repeatability Tests. and T.2. Repeatability.

Item Under Consideration:
Amend NIST Handbook 44 Hydrocarbon Gas Vapor-Measuring Devices Code as follows:

~~**N.4.1.2.**~~**N.4.3. 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. **When conducting the tests, the minimum discharge rate shall at least 20% of the marked capacity rate or the minimum flow rate marked on the device, whichever is less, and the maximum discharge rates shall not exceed the capacity rate as marked by the manufacturer.**

(Added 2002) **(Amended 20XX)**

Note: the repeatability test will not be performed at the low-flame flow rate for these devices as the time required would be unrealistic.

and

T.2. Repeatability. – When multiple tests are conducted at approximately the same flow rate and draft size, the range of the test results for the flow rate shall not exceed 0.9 % and the results of each test shall be within the applicable tolerance. (Also see ~~**N.4.1.2.**~~ **N.4.3.** Repeatability Test.)

(Added 2002) **(Amended 20XX)**

B5: CLM-3 D ~~N.5.1.1.~~ N.5.3. Repeatability Tests. and T.4. Repeatability.

Item under Consideration:
Amend NIST Handbook 44 Cryogenic Liquid-Measuring Devices Code as follows:

~~**N.5.1.1.**~~ **N.5.3. 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. **When conducting the tests, the discharge rates shall be within the minimum and maximum discharge rates as marked by the manufacturer.**

(Added 2001) **(Amended 20XX)**

and

T.4.Repeatability**.** – When multiple tests are conducted at approximately the same flow rate and draft size, the range of the test results for the flow rate shall not exceed 40 % of the absolute value of the maintenance tolerance and the results of each test shall be within the applicable tolerance. Also see ~~**N.5.1.1.**~~ **N.5.3.** Repeatability Tests.

(Added 2001) **(Amended 20XX)**

B5: MLK-2 D ~~N.4.1.1.~~ N.4.4. Repeatability Tests. and T.3. Repeatability.

Item Under Consideration:
Amend NIST Handbook 44 Milk Meters Code as follows:

~~**N.4.1.1.**~~ **N.4.4. 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. **When conducting the tests, the discharge rates shall be within the minimum and maximum discharge rates as marked by the manufacturer.**

(Added 2002) **(Amended 20XX)**

and

T.3. Repeatability. – When multiple tests are conducted at approximately the same flow rate and draft size, the range of the test results for the flow rate shall not exceed 40 % of the absolute value of the maintenance tolerance and the results of each test shall be within the applicable tolerance. (Also see ~~**N.4.1.1.**~~ **N.4.4.** Repeatability Tests.)

(Added 2002) **(Amended 20XX)**

B5: WTR-2 D ~~N.4.1.1.~~ N.4.4. Repeatability Tests.

Item Under Consideration:
Amend NIST Handbook 44 Water Meters Code as follows:

~~N.4.1.1.~~ N.4.4. **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. **When conducting the tests, the minimum flow rate shall be at least the minimum rate specified in Table N.4.2.a., and the maximum discharge rates shall not exceed the maximum discharge rate developed under the conditions of the installation.**

(Added 2002) **(Amended 20XX)**

B5: MFM-6 D ~~N.6.1.1.~~ N.6.3. Repeatability Tests. and T.3. Repeatability.

Item Under Consideration:
Amend NIST Handbook 44 Mass Flow Meters Code as follows:

~~N.6.1.1.~~ N.6.3. **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. **When conducting the tests, the discharge rates shall be within the minimum and maximum discharge rates as marked by the manufacturer.**

(Added 2001) **(Amended 20XX)**

and

T.3. Repeatability. – When multiple tests are conducted at approximately the same flow rate and draft size, the range of the test results for the flow rate shall not exceed 40 % of the absolute value of the maintenance tolerance and the results of each test shall be within the applicable tolerance. (Also see ~~N.6.1.1.~~ N.6.3. Repeatability Tests.)

(Amended 1992, 1994, ~~and~~ 2001**, and 20XX)**

B5: CDL-4 D ~~N.4.1.1.~~ N.4.5. Repeatability Tests. and T.2.1. Repeatability.

Item Under Consideration:
Amend NIST Handbook 44 Carbon Dioxide Liquid-Measuring Code as follows:

~~N.4.1.1.~~ N.4.5. **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. **When conducting the tests, the discharge rates shall be within the minimum and maximum discharge rates as marked by the manufacturer.**

(Added 2002) **(Amended 20XX)**

and

T.2.1. Repeatability. – When multiple tests are conducted at approximately the same flow rate and draft size, the range of the test results for the flow rate shall not exceed 40 % of the absolute value of the maintenance

tolerance and the results of each test shall be within the applicable tolerance. (Also see ~~**N.4.1.1.**~~ **N.4.5.** Repeatability Tests.)

(Added 2002) **(Amended 20XX)**

B5: HGM-5 D N.6.1.1. N.6.2. Repeatability Tests. and T.3. Repeatability.

Item Under Consideration:
Amend NIST Handbook 44 Hydrogen Gas-Metering Devices Code as follows:

~~**N.6.1.1.**~~ **N.6.2. 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 are reduced to minimize the effect on the results obtained. **When conducting the tests, the discharge rates shall be within the minimum and maximum discharge rates as marked by the manufacturer.**

(Amended 20XX)

and

T.3.Repeatability. – When multiple tests are conducted at approximately the same flow rate and draft size, the range of the test results for the flow rate shall not exceed 40 % of the absolute value of the maintenance tolerance and the results of each test shall be within the applicable tolerance. (Also see ~~**N.6.1.1.**~~ **N.6.2.** Repeatability Tests.)

(Amended 20XX)

Background/Discussion: See Appendix A, Page S&T-A334.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

LMD – LIQUID MEASURING DEVICES

LMD-3 A.1. General., S.2.5. Zero-Set-Back Interlock, for Retail ~~Motor Fuel~~ Devices., S.4. Marking Requirements., S.5. Zero-Set-Back Interlock, for Retail ~~Motor Fuel~~ Devices., UR.2.4. Diversion of Liquid Flow. and UR.2.5. Product Storage Identification.

Source:
NIST OWM (2019)

Purpose:
To adequately address requirements for retail liquid measuring devices that measure DEF and other products.

Item Under Consideration:
Amend NIST Handbook 44 Liquid Measuring Device Code as follows:

A.1. General. – This code applies to:

(a) devices used for the measurement of liquids, ~~including liquid fuels and lubricants,~~ and
(b) wholesale devices used for the measurement and delivery of agri-chemical liquids such as fertilizers, feeds, herbicides, pesticides, insecticides, fungicides, and defoliants.
(Added 1985)

S.1.6.10. Automatic Timeout – Pay-At-Pump <u>for</u> Retail ~~Motor Fuel~~ Devices. *– Once a device has been authorized, it must de-authorize within two minutes if not activated. Re-authorization of the device must be performed before any product can be dispensed. If the time limit to de-authorize the device is programmable, it shall not accept an entry greater than two minutes*
[Nonretroactive as of January 1, 2017]
(Added 2016) <u>(Amended 20XX)</u>

S.2.5. Zero-Set-Back Interlock, <u>for</u> Retail ~~Motor Fuel~~ Devices. – A device shall be constructed so that:

(a) after a delivery cycle has been completed by moving the starting lever to any position that shuts off the device, an automatic interlock prevents a subsequent delivery until the indicating elements, and recording elements if the device is equipped and activated to record, have been returned to their zero positions;

(b) the discharge nozzle cannot be returned to its designed hanging position (that is, any position where the tip of the nozzle is placed in its designed receptacle and the lock can be inserted) until the starting lever is in its designed shut-off position and the zero-set-back interlock has been engaged; and

(c) in a system with more than one dispenser supplied by a single pump, an effective automatic control valve in each dispenser prevents product from being delivered until the indicating elements on that dispenser are in a correct zero position.

(Amended 1981~~, and~~ 1985<u>, and 20XX</u>)

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 in accordance with S.4.4.2. Location of Marking Information; Retail ~~Motor Fuel~~ Dispensers. The marked minimum discharge rate shall not exceed 20 % of the marked maximum discharge rate.*
[Nonretroactive as of January 1, 1985]
(Added 1984) (Amended 2003 <u>and 20XX</u>)

S.4.4.2. Location of Marking Information; <u>for</u> Retail ~~Motor Fuel~~ Dispensers. *– The marking information required in the General Code, paragraph G-S.1. Identification shall appear as follows:*

(a) within 60 cm (24 in) to 150 cm (60 in) from the base of the dispenser <u>for system in a dispenser</u>;

(b) either internally and/or externally provided the information is permanent and easily read; and

(c) on a portion of the device that cannot be readily removed or interchanged (i.e., not on a service access panel).

Note: *The use of a dispenser key or tool to access internal marking information is permitted for retail liquid-measuring devices.*
[Nonretroactive as of January 1, 2003]
(Added 2002) (Amended 2004 <u>and 20XX</u>)

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S.5. Totalizers for Retail ~~Motor-Fuel~~ Dispensers. *– Retail ~~motor-fuel~~ dispensers shall be equipped with a non-resettable totalizer for the quantity delivered through the metering device.*
[Nonretroactive as of January 1, 1995]
(Added 1993) (Amended 1994 and 20XX)

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N.4.2.2. Retail Motor-Fuel and DEF Devices.

(a) Devices without a marked minimum flow-rate shall have a "special" test performed at the slower of the following rates:

(1) 19 L (5 gal) per minute; or

(2) the minimum discharge rate at which the device will deliver when equipped with an automatic discharge nozzle set at its slowest setting.

(b) Devices with a marked minimum flow-rate shall have a "special" test performed at or near the marked minimum flow rate.

(Added 1984) (Amended 2005 and 20XX)

UR.2.4. Diversion of Liquid Flow. – A ~~motor-fuel~~ device equipped with two delivery outlets used exclusively in the fueling of trucks shall be so installed that any diversion of flow to other than the receiving vehicle cannot be readily accomplished and is readily apparent. Allowable deterrents include, but are not limited to, physical barriers to adjacent driveways, visible valves, or lighting systems that indicate which outlets are in operation, and explanatory signs.
(Amended 1991 and 20XX)

UR.2.5. Product Storage Identification.

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

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(Added 1975) (Amended 1976, and 20XX)

Background/Discussion: See Appendix A, Page S&T-A337.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

LMD-4 Airport Refueling Systems – Agreement of Indications and Reset to Zero

Source:
NIST OWM (2019)

Purpose:
Address self-service airport fueling dispensing systems equipped with a primary analog indicator and a separate card activated console with a printer that are used to fuel multiple tanks on aircrafts.

Item Under Consideration:
A specific proposal is not yet ready for consideration. This item is requested as a "Developing" item to allow an opportunity for the community to provide input on possible approaches that could be used to solve this problem. Details of the issue are provided in the "Justification" below.

Background/Discussion: See Appendix A, Page S&T-A340.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

LMD-5 UR.3.4. Printed Ticket

Source:
Morrow and Carroll Counties, Ohio (2019)

Purpose:
Allow adequate time for users to upgrade existing equipment to meet requirements that will become effective in 2019.

Item Under Consideration:

UR.3.4. Printed Ticket. – The total price, the total volume of the delivery, the price per liter or gallon, *and a corresponding alpha or numeric dispenser designation shall be shown*, either printed by the device or in clear hand script, on any printed ticket issued by a device and containing any one of these.
(Amended, 2001 and 2019) (*Nonretroactive as of January 1, 2021*)

Establishments with a single dispenser having multiple meters or not more than one individual dispenser with a single meter for each product delivered are exempt from the dispenser designation requirement. (Retroactive as of January 1, 2023.)
(Added 2020)

Background/Discussion: See Appendix A, Page S&T-A343.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

VTM – VEHICLE TANK METERS

VTM-1 S.3.1.1. Means for Clearing the Discharge Hose and UR.2.6. Clearing the Discharge Hose.

Source:
New York and NIST OWM (Carryover from 2018, VTM 1-B)

Purpose:
Provide specifications and user requirements for manifold flush systems. Recognize that there is a balance between a mechanism that provides an important safety benefit but also, if used incorrectly, facilitates fraud. Ensure that VTM owners understand their responsibilities when installing such a system and ensure uniformity in enforcement throughout the country.

Item Under Consideration:
Amend NIST Handbook 44 Vehicle-Tank Meters Code as follows**:**

S.3.1.1. Means for Clearing the Discharge Hose. - Metering systems may be equipped with systems specifically designed to facilitate clearing of the discharge hose prior to delivery to avoid product contamination. In such systems. a valve to temporarily divert product from the measuring chamber of the meter to a storage tank, shall be installed only if all the following are met:

(a) the discharge hose remains of the wet-hose type;

(b) the valve and associated piping are approved by the weights and measures authority having jurisdiction over the device prior to commercial use;

(c) the valve is permanently marked with its purpose (e.g. flush valve);

(d) the valve is installed in a conspicuous manner and as far from the hose reel as practical;

(e) the system clearly and automatically indicates the direction of product flow during operation of the flush system; and

(f) clear means, such as an indicator light or audible alarm, is used to identify when the valve is in use **on both quantity indications and any associated recorded representations (e.g., using such terms as "flushing mode" or "not for commercial use")**;

(g) effective, automatic means shall be provided to prevent passage of liquid through any such flush system during normal operation of the measuring system; and

(h) no hoses or piping are connected to the inlet when it is not in use.

(Added 2018)

UR.2.6. Clearing the Discharge Hose

UR.2.6.1. **Clearing the Discharge Hose, General. – A manifold flush or similar system designed to assist in flushing product between deliveries is not to be used or operational during a commercial transaction. The inlet valves for the system are not to be connected to any hose or piping (dust covers are permitted) when not in use. When the flushing system is in operation, the discharge hose is only to be connected to the port for the product type being flushed from the discharge line. Following the flushing process, indications and recording elements must be reset to zero prior to beginning a commercial delivery.**

(Added 20XX)

UR.2.6.2. Records. Whenever, prior to delivery, a different product is pumped through the discharge hose to avoid contamination, a record including the date, time, original product, new product, and gallons pumped shall be maintained. These records shall be kept for a period of 12 months and available for inspection by the weights and measures authority.
(Added 2018)

Background/Discussion: See Appendix A, Page S&T-A344.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

LPG – LPG AND ANHYDROUS AMMONIA LIQUID-MEASURING DEVICES

LPG-2 D S.2.5. Zero-Set-Back Interlock, Stationary and Vehicle Mounted Meters, Electronic

Source:
Maryland (2018)

Purpose:
To align the LPG Code with the VTM Code for electronic registers/indicators used in stationary and mobile applications.

Item Under Consideration:
Amend NIST Handbook 44 LPG and Anhydrous Ammonia Liquid-Measuring Devices Code as follows:

S.2.5. ***Zero-Set-Back Interlock, Stationary and Vehicle Mounted Meters, Electronic. - A device shall be so constructed that after an individual or multiple deliveries at one location have been completed, an automatic interlock system shall engage to prevent a subsequent delivery until the indicating and, if equipped, recording elements have been returned to their zero position. For individual deliveries, if there is no product flow for three minutes the transaction must be completed before additional product flow is allowed. The 3-minute timeout shall be a sealable feature on an indicator.***
(Added 20XX) (Nonretroactive as of 20XX)

S.2.6~~5~~. ***Zero-Set-Back Interlock for Stationary Retail Motor-Fuel Devices.*** *– A device shall be constructed so that:*

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Renumber remaining paragraphs

Background/Discussion: See Appendix A, Page S&T-A346.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

LPG-3 D N.3. Test Drafts.

Source:
Endress + Hauser Flowtec AG USA (2015)

Purpose:
Allow transfer standard meters to be used to test and place into service dispensers and delivery system flow meters.

Item Under Consideration:
Amend NIST Handbook 44 LPG and Anhydrous Ammonia Liquid-Measuring Devices as follows:

N.3. Test Drafts.

N.3.1 Minimum Test - Test drafts should be equal to at least the amount delivered by the device in 1 minute at its normal discharge rate.
(Amended 1982)

N.3.2. Field Reference Standard Meter Test. – The minimum quantity for any test draft shall be equal to or greater than the amount delivered in one minute at the flow rate being tested.
(Added 20XX)

Background/Discussion: See Appendix A, Page S&T-A349.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

MFM – MASS FLOW METERS

MFM-2 S.1.3.3. Maximum Value of Quantity-Value divisions.

Source:
NIST OWM (2019)

Purpose:
Delete the reference to "gasoline liter equivalent (GLE)" since that term that was removed from all Mass Flow Meters Code requirements in 2016 and clarify and limit the maximum value of the quantity division for indicated and recorded deliveries in the diesel gallon equivalent (DGE) to an increment of 0.001.

Item Under Consideration:
Amend NIST Handbook 44 Mass Flow Meters Code as follows:

S.1.3.3. Maximum Value of Quantity-Value Divisions.

(a) The maximum value of the quantity-value division for liquids shall not be greater than 0.2 % of the minimum measured quantity.

(b) For dispensers of compressed natural gas used to refuel vehicles, the value of the division for the ~~gasoline liter equivalent shall not exceed 0.01 GLE; the division for~~ gasoline gallon equivalent (GGE) shall not exceed 0.001 GGE**; the division for the diesel gallon equivalent (DGE) shall not exceed 0.001 DGE**. **Dispensers of liquefied natural gas used to refuel vehicles; the value of the division for the DGE shall not exceed 0.001 DGE. For dispensers of either fuel; T**~~t~~he maximum value of the mass division shall not exceed 0.001 kg or 0.001 lb.

(Amended 1994 **and 2019**)

Background/Discussion: See Appendix A, Page S&T-A359.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

MFM-4 S.5.1. Location of Marking Information; Retail Motor-Fuel Dispensers.

Source:
NIST OWM (2019)

Purpose:
Extend the provision allowing the use of a key or tool for accessing internal required markings for *liquid* retail motor-fuel dispensers to include retail motor-fuel dispensers delivering *compressed gases*.

Item Under Consideration:
Amend NIST Handbook 44 Mass Flow Meters Code as follows:

S.5.1. Location of Marking Information; Retail Motor-Fuel Dispensers. *– The marking information required in General Code, paragraph G-S.1. Identification shall appear as follows:*

(a) within 60 cm (24 in) to 150 cm (60 in) from the base of the dispenser;

(b) either internally and/or externally provided the information is permanent and easily read; and

(c) on a portion of the device that cannot be readily removed or interchanged (i.e., not on a service access panel).

Note: *The use of a dispenser key or tool to access internal marking information is permitted for retail liquid* ***and compressed gas****-measuring devices.*
[Nonretroactive as of January 1, 2003]
(Added 2006) **(Amended 2019)**

Background/Discussion: See Appendix A, Page S&T-A360.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

MFM-5 D N.3. Test Drafts.

Source:
Endress + Hauser Flowtec AG USA (2015)

Purpose:
Allow transfer standard meters to be used to test and place into service dispensers and delivery system flow meters.

Item Under Consideration:
Amend NIST Handbook 44 Mass Flow Meters Code as follows:

N.3. Test Drafts. –

N.3.1 Minimum Test - The minimum test shall be one test draft at the maximum flow rate of the installation and one test draft at the minimum flow rate. More tests may be performed at these or other flow rates. (See T.3. Repeatability.)
(Amended 1982 **and 20XX)**)

N.3.2. Field Reference Standard Meter Test. – The minimum quantity for any test draft shall be equal to or greater than the amount delivered in one minute at the flow rate being tested.
(Added 20XX)

Background/Discussion: See Appendix A, Page S&T-A360.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

HGM – HYDROGEN GAS-MEASURING DEVICES

HGM-6 Tentative Code Status and Preamble., A.2.(c) Exceptions., N.2 Test Medium., N.3. Test Drafts., N.4.1. Master Meter (Transfer) Standard Test., N.4.2. Gravimetric Tests., N.4.3 PVT Pressure Volume Temperature Test., N.6.1.1. Repeatability Tests., T.3. Repeatability., T.6. Tolerance –Minimum Measured Quantity (MMQ). and Appendix D. Definitions where applicable.

Source:
California (2019)

Purpose:
Remove the tentative status and amendments to support current dispenser and test equipment capabilities.

Item Under Consideration:
Amend NIST Handbook 44, Hydrogen Gas-Measuring Devices Core follows:

Section 3.39. Hydrogen Gas-Measuring Devices ~~– Tentative Code~~

~~This tentative code has trial or experimental status and is not intended to be enforced. The requirements are designed for study prior to the development and adoption of a final code. Requirements that apply to wholesale applications are under study and development by the U.S. National Working Group for the Development of Commercial Hydrogen Measurement Standards. Officials wanting to conduct an official examination of a device or system are advised to see paragraph G-A.3. Special and Unclassified Equipment.0~~
~~(Tentative Code Added 2010)~~

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A.2. Exceptions. -
(c) Devices used for dispensing a hydrogen gas with a hydrogen fuel index lower than 99.97 % and concentrations of specified impurities that exceed level limits **in the ~~most current~~ latest version of SAE International J2719.**

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N.2. Test Medium. – The device shall be tested with the product commercially measured except that, in a type evaluation examination, hydrogen gas as specified in NIST Handbook 130 shall be used.
~~Note: Corresponding requirements are under development and this paragraph will be revisited.~~

N.3. Test Drafts. –The minimum test shall be one test draft at **twice** the declared minimum measured quantity and one test draft at approximately ~~ten~~ **five** times the minimum measured quantity or ~~1~~ **4** kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed. (See T.3. Repeatability)

The test draft shall be made at flows representative of that during normal delivery. The pressure drop between the dispenser and the proving system shall not be greater than that for normal deliveries. The control of the flow (e.g., pipework or valve(s) size, etc.) shall be such that the flow of the measuring system is maintained within the range specified by the manufacturer.

N.4. Tests.

N.4.1. Master Meter (Transfer) Standard Test. –When comparing a measuring system with a calibrated transfer standard, the minimum test shall be one test draft at **twice** the declared minimum measured quantity and one test draft at approximately ~~ten~~ **five** times the minimum measured quantity or ~~1~~ **4** kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed.

N.4.1.1. Verification of Master Metering Systems. – A master metering system used to verify a hydrogen gas-measuring device shall be verified before and after the verification process. A master metering system used to calibrate a hydrogen gas-measuring device shall be verified before starting the calibration and after the calibration process.

N.4.2. Gravimetric Tests. – The weight of the test drafts shall be equal to at least **twice** the amount delivered by the device at the declared minimum measured quantity and one test draft at approximately ~~ten~~ **five** times the minimum measured quantity or ~~1~~ **4** kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed

N.4.3 PVT Pressure Volume Temperature Test. – The minimum test with a calibrated volumetric standard shall be one test draft at **twice** the declared minimum measured quantity and one test draft at approximately ~~ten~~ **five** times the minimum measured quantity or ~~1~~ **4** kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed.

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N.6.1.1. Repeatability Tests. –Tests for repeatability should include a minimum of three consecutive test drafts of approximately the same size **with ~~no less than~~ a minimum of 1000 ~~scale intervals (divisions),~~** and be conducted under controlled conditions where variations in factors are reduced to minimize the effect on the results obtained.
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T.3. Repeatability. – When multiple tests are conducted at approximately the same flow rate and draft size **greater than 1000 ~~scale intervals (divisions)~~**, the range of the test results for the flow rate shall not exceed 40 % of the absolute value of the maintenance tolerance and the results of each test shall be within the applicable tolerance. (Also see N.6.1.1. Repeatability Tests.)

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T.6. Tolerance – on Minimum Measured Quantity (MMQ). - The ~~maximum error~~ applicable tolerance to the minimum measured quantity is twice ~~the applicable tolerance~~ those shown in Table T.2. Accuracy Classes and Tolerances for Hydrogen Gas-Measuring Devices.

And

Appendix D. Definitions

Instructions:

(A) Take all the definitions from the 3.39. Hydrogen Gas-Measuring Devices – Tentative Code and replace the current definitions in NIST HB 44 Appendix D. Definitions, and

(B) Add **3.39** to these definitions in NIST HB 44 Appendix D. Definitions:

configuration parameter. – Any adjustable or selectable parameter for a device feature that can affect the accuracy of a transaction or can significantly increase the potential for fraudulent use of the device and, due to its nature, needs to be updated only during device installation or upon replacement of a component, e.g., division value (increment), sensor range, and units of measurement. [2.20, 2.21, 2.24, 3.30, 3.37, **3.39,** 5.56(a)]

equipment, commercial. – Weights, measures, and weighing and measuring devices, instruments, elements, and systems or portion thereof, used or employed in establishing the measurement or in computing any basic charge or payment for services rendered on the basis of weight or measure. As used in this definition, measurement includes the determination of size, quantity, value, extent, area, composition (limited to meat and poultry), constituent value (for grain), or measurement of quantities, things, produce, or articles for distribution or consumption, purchased, offered, or submitted for sale, hire, or award. [1.10, 2.20, 2.21, 2.22, 2.24, 3.30, 3.31, 3.32, 3.33, 3.34, 3.35, 3.38, **3.39,** 4.40, 5.51, 5.56.(a), 5.56.(b), 5.57, 5.58, 5.59]

unit price. – The price at which the product is being sold and expressed in whole units of measurement. [1.10, 3.30, **3.39**] (Note: The Specifications and Tolerances Committee may wish to check other code sections to add for reference to this definition.)

Background/Discussion: See Appendix A, Page S&T-A367.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

EVF – ELECTRIC VEHICLE FUELING SYSTEMS

EVF-3 S.3.5. Temperature Range for System Components. and S.5.2. EVSE Identification and Marking Requirements.

Source:
NIST OWM (2019)

Purpose:
Ensure there are no inconsistencies in the tentative code between the temperature range requirement of – 40 °C to + 85 °C (− 40 °F to 185 °F) specified for the EVSE's operation and the requirement in paragraph S.5.2. EVSE Identification and Marking Requirements that specifies an EVSE must be marked with its temperature limits when they are narrower than and within – 20 °C to + 50 °C (− 4 °F to 122 °F).

Item Under Consideration:
Amend NIST Handbook 44, Electric Vehicle Fueling Systems follows:

S.3.5. Temperature Range for System Components. – EVSEs shall be accurate and correct over the temperature range of – 40 °C to + 85 °C (− 40 °F to 185 °F). If the system or any measuring system components are not capable of meeting these requirements, the temperature range over which the system is capable shall be stated on the NTEP CC, marked on the EVSE, and installations shall be limited to the narrower temperature limits.

S.5.2. EVSE Identification and Marking Requirements. – In addition to all the marking requirements of Section 1.10. General Code, paragraph G-S.1. Identification, each EVSE shall have the following information conspicuously, legibly, and indelibly marked:

(a) voltage rating;

(b) maximum current deliverable;

(c) type of current (AC or DC or, if capable of both, both shall be listed);

(d) minimum measured quantity (MMQ); and

(e) temperature limits, if narrower than and within – 20 °C to + 50 °C (− 4 °F to 122 °F).

Background/Discussion: See Appendix A, Page S&T-A372.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

EVF-4 Appendix D – Definitions: power factor (PF).

Source:
NIST OWM (2019)

Purpose:
Simplify the definition for "Power Factor" in NIST Handbook 44 Section 3.40. Electric Vehicle Fueling Systems – Tentative Code and align this definition with one in a separate proposal under the Laws and Regulations Committee to adopt a "Method of Sale" requirement for electric watt hour meters.

Item Under Consideration:
Amend NIST Handbook 44, Electric Vehicle Fueling Systems follows:

power factor (PF). – The ratio of ~~**the**~~ **"**active power**"** to ~~**the**~~ **"**apparent power**"** in an AC circuit. ~~**The power factor is a number between 0 and 1 that is equal to 1 when the voltage and current are in phase (load is entirely resistive).**~~ **It describes the efficient use of available power.** [3.40]

Background/Discussion: See Appendix A, Page S&T-A373.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

TXI – TAXIMETERS

TXI-1 N.1.3.2. Taximeters Using Other Measurement Data Sources.

Source:
NIST OWM (2019)

Purpose:
Permit the field examination of taximeters on other than public roads.

Item Under Consideration:
Amend NIST Handbook 44 Taximeter Code as follows:

N.1.3.2. Taximeters Using Other Measurement Data Sources. – Except during type evaluation, all tests shall be performed under conditions that are considered usual and customary for the location(s) where the system is normally operated and as deemed necessary by the statutory authority.
(Added 2017)

~~**N.1.3.2.1. Roads.** All tests shall be conducted on public roads.~~
~~(Added 2017)~~

N.1.3.2.1~~2~~.Testing for Environmental Influences. – During type evaluation, the distance test may be performed on a route traveled by the vehicle that exposes the system to conditions possibly contributing to the loss of, or interference with, the signal(s) providing measurement data. This may include:

(a) objects that may obstruct or reflect signals such as tall buildings/structures, forestation, tunnels, etc.;
(b) routes that do not follow a straight-line path;
(c) significant changes in altitude; and
(d) any other relevant environmental conditions.

(Added 2017)

Background/Discussion: See Appendix A, Page S&T-A374.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

GMA – GRAIN MOISTURE METERS 5.56 (A)

GMA-2 Table S.2.5. Categories of Devices and Methods of Sealing.

Source:
NTEP Grain Analyzer Sector (2019)

Purpose:
Require future NTEP certified grain moisture meters to utilize Category 3 sealing methods.

Item Under Consideration:

Amend NIST Handbook 44 Grain Moisture Meter Code 5.56 (a) as follows:

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

[1] **Not allowed for devices manufactured on or after January 1, 20XX**
[2] **Required for all devices manufactured on or after January 1, 20XX**

[Nonretroactive as of January 1, 20XX]
[*Nonretroactive as of January 1, 2014]
(Amended 1998 and 2013 **and 20XX**)

Background/Discussion: See Appendix A, Page S&T-A375.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

GMA-3 Table T.2.1. Acceptance and Maintenance Tolerances Air Oven Method for All Grains and Oil Seeds.

Source:
NTEP Grain Analyzer Sector (2019)

Purpose:
Reduce the tolerances for the air oven reference method.

Item Under Consideration:
Amend NIST Handbook 44 Grain Moister Meter Code 5.56 (a) as follows:

T.2.1. Air Oven Reference Method. – Maintenance and acceptance tolerances shall be as shown in Table T.2.1. Acceptance and Maintenance Tolerances Air Oven Reference Method. Tolerances are expressed as a fraction of the percent moisture content of the official grain sample, together with a minimum tolerance.
(Amended 2001)

~~**Table T.2.1.**~~
~~**Acceptance and Maintenance Tolerances Air Oven Reference Method**~~

~~Type of Grain, Class, or Seed~~	~~Tolerance~~	~~Minimum Tolerance~~
~~Corn, oats, rice, sorghum, sunflower~~	~~0.05 of the percent moisture content~~	~~0.8 % in moisture content~~
~~All other cereal grains and oil seeds~~	~~0.04 of the percent moisture content~~	~~0.7 % in moisture content~~

Table T.2.1.
Acceptance and Maintenance Tolerances Air Oven Reference Method for All Grains and Oil Seeds

Tolerance	Minimum Tolerance
0.03 of the percent moisture content	0.5 % in moisture content

(Amended 2001 **and 20XX**)

Background/Discussion: See Appendix A, Page S&T-A375.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

MDM – MULTIPLE DIMENSION MEASURING DEVICES

MDM-2 S.1.7. Minimum Measurement

Source:
Parceltool P/L (2019)

Purpose:
Accept mobile tape based MDMD devices from the 12D minimum measurement.

Item Under Consideration:
Amend NIST Handbook 44 Multiple Dimension Measuring Devices Code as follows:

> **S.1.7. Minimum Measurement. –** Except for entries of tare **and mobile tape based MDMD devices**, the minimum measurement by a device is 12 d. The manufacturer may specify a longer minimum measurement. For multi-interval devices, this applies only to the first measuring range (or segment) of each measurement axis (length, width, and height).
> (Amended 2017)

Background/Discussion: See Appendix A, Page S&T-A377.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

TNS – TRANSPORTATION NETWORK SYSTEMS

TNS-1 A.4. Type Evaluation.

Source:
NIST OWM (2019)

Purpose:
Facilitate the evaluation of devices/systems submitted to NTEP for type and to exclude those devices/systems not complying with all requirements contained in that code from the NTEP evaluation process.

Item Under Consideration:
Amend NIST Handbook 44 Transportation Network Systems Code as follows:

> **A.4. Type Evaluation. – The National Type-Evaluation Program (NTEP) will accept for type evaluation only those devices that comply with all requirements of this code.**

Background/Discussion: See Appendix A, Page S&T-A378.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

OTH – OTHER ITEMS

OTH-4 D Electric Watthour Meters Code under Development

Source:
NIST OWM (2016)

Purpose:

1) Make the weights and measures community aware of work being done within the U.S. National Work Group on Electric Vehicle Fueling and Submetering to develop proposed requirements for electric watthour meters used in submeter applications in residences and businesses;
2) Encourage participation in this work by interested regulatory officials, manufacturers, and users of electric submeters.
3) Allow an opportunity for the USNWG to provide regular updates to the S&T Committee and the weights and measures community on the progress of this work;
4) Allow the USWNG to vet specific proposals as input is needed.

Item Under Consideration:
Create a "Developing Item" for inclusion on the NCWM S&T Committee Agenda where progress of the USNWG can be reported as it develops legal metrology requirements for electric watthour meters and continues work to develop test procedures and test equipment standards. The following narrative is proposed for this item:

In 2012, NIST OWM formed the U.S. National Working Group on Electric Vehicle Fueling and Submetering to develop proposed requirements for commercial electricity-measuring devices (including those used in sub-metering electricity at residential and business locations and those used to measure and sell electricity dispensed as a vehicle fuel) and to ensure that the prescribed methodologies and standards facilitate measurements that are traceable to the International System of Units (SI).

In 2013, the NCWM adopted changes recommended by the USNWG to the NIST Handbook 130 requirements for the Method of Sale of Commodities to specify the method of sale for electric vehicle refueling. At the 2015 NCWM Annual Meeting, the NCWM adopted NIST Handbook 44 Section 3.40 Electric Vehicle Refueling Systems developed by the USNWG.

This Developing Item is included on the Committee's agenda (and a corresponding item is proposed for inclusion on the L&R Committee Agenda) to keep the weights and measures community apprised of USNWG current projects, including the following:

- The USNWG continues to develop recommended test procedures for inclusion in a new EPO 30 for Electric Vehicle Refueling Equipment along with proposed requirements for field test standards.

- The USWNG is continuing work to develop a proposed code for electricity-measuring devices used in sub-metering electricity at residential and business locations. This does not include metering systems under the jurisdiction of public utilities. The USNWG hopes to have a draft code for consideration by the community in the 2019-2020 NCWM cycle.

The USNWG will provide regular updates on the progress of this work and welcomes input from the community.
For additional information, contacts for the subgroups of the USNWG are:

Electric Vehicle Refueling Subgroup:

- Chairman, Tina Butcher at tbutcher@nist.gov or (301) 975-2196

- Technical Advisor, Juana Williams at juana.williams@nist.gov or (301) 975-3989

Electric Watthour Meters Subgroup:

- Chairman, Lisa Warfield at lisa.warfield@nist.gov or (301) 975-3308
- Technical Advisor, Tina Butcher at tbutcher@nist.gov or (301) 975-2196

Background/Discussion: See Appendix A, Page S&T-A379.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

OTH-5 D Appendix D – Definitions: Batch (Batching)

Source:
Kansas (2018)

Purpose:
To clarify when batching is a metrologically significant event.

Item Under Consideration:
Amend NIST Handbook 44, Appendix D. Definitions as follows:

batch (batching) - The combining or mixing of two or more materials or ingredients using weighing and/or measuring devices or systems to produce a finished product whose quantity is determined from the summation of those weights and/or measurements.
(Added 20XX)

Background/Discussion: See Appendix A, Page S&T-A381.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Ms. Rachelle Miller, Wisconsin | Committee Chair
Mr. Loren Minnich, Kansas | Member
Mr. Josh Nelson, Oregon | Member
Mr. Brad Bachelder, Maine | Member
Mr. Jason Glass, Kentucky | Member
Mr. Luciano Burtini, Measurement Canada | Canadian Technical Advisor
Mr. Rick Harshman, NIST, OWM | NIST Technical Advisor
Mr. Darrell Flocken, NCWM | NTEP Technical Advisor

Specifications and Tolerances Committee

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Appendix A

Background/Discussion on Agenda Items of the Specifications and Tolerances (S&T) Committee

Subject Series List

Table A
Table of Contents

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
ABWS	Automatic Bulk Weighing System	NEWMA	Northeastern Weights and Measures Association
AAR	Association of American Railroads	NIST	National Institute of Standards and Technology
API	American Petroleum Institute	NTEP	National Type Evaluation Program
CNG	Compressed Natural Gas	OIML	International Organization of Legal Metrology
CWMA	Central Weights and Measures Association	OWM	Office of Weights and Measures
EPO	Examination Procedure Outline	RMFD	Retail Motor Fuel Dispenser
FHWA	Federal Highway Administration	S&T	Specifications and Tolerances
GMM	Grain Moisture Meter	SD	Secure Digital
GPS	Global Positioning System	SI	International System of Units
HB	Handbook	SMA	Scale Manufactures Association
LMD	Liquid Measuring Devices	SWMA	Southern Weights and Measures Association
LNG	Liquefied Natural Gas	TC	Technical Committee
LPG	Liquefied Petroleum Gas	USNWG	U.S. National Work Group
MMA	Meter Manufacturers Association	VTM	Vehicle Tank Meter
MDMD	Multiple Dimension Measuring Device	WIM	Weigh-in-Motion
NCWM	National Conference on Weights and Measures	WWMA	Western Weights and Measures Association

Table C
Summary of Voting Results

Reference Key Number	*House of State Representatives*		*House of Delegates*		*Results*
	Yeas	*Nays*	*Yeas*	*Nays*	
Consent Calendar: LPG-1, CLM-3, WTR-2, CDL-3, TXI-1	41	0	56	0	Adopted
SCL-6	34	6	50	6	Adopted
ABW-4	28	12	39	13	Adopted
LMD-2	38	2	49	6	Adopted
VTM-1	41	0	54	1	Adopted
To Accept the Report	Voice Vote				Adopted

Details of All Items
(In order by Reference Key)

GEN – GENERAL CODE

GEN-1 A G-A.1. Commercial and Law-Enforcement Equipment. and G-S.2. Facilitation of Fraud.

Background/Discussion:
These items have been assigned to the Credit Card Skimmer Task Group for further development. For more information or to provide comment, please contact:

Mr. Hal Prince, Task Group Chairman
Florida Department of Agriculture and Consumer Protection
(850) 921-1570, harold.prince@freshfromflorida.com

Given the potential financial impact to consumers and credit issuing companies Weights & Measures recognizes the need to offer more protection to both buyer and seller in these transactions. The current design of these devices offers little to no barrier to fraud through theft of credit information, as such it is our belief that the current design, in most cases, already violates G.S.2. by facilitating easy access to allow installation of these fraudulent card reading devices. Therefore, in our opinion stronger means must be implemented to decrease the potential for fraudulent activity with these devices.
The Florida Department of Agriculture and Consumer Services estimates that on average, each skimmer results in 100 counterfeit cards, each of which are used to make $1,000 in fraudulent purchases. In other words, a single skimmer typically leads to $100,000 in theft. This is a nationwide problem that causes millions of dollars in fraudulent charges to consumers, device owners and banking institutions each year. A solution can be achieved through upgraded security measures on the weighing and measuring devices that fall within the guidelines of this handbook.

One possible argument is that these preventative measures should be in User Requirements instead of in Specifications, but this is intended to be a long-term solution. The State of Florida has enacted legislation to require device users to add security measures. They have found that most owner/operators have chosen to use security seals or non-standard locks on the dispensers and that 85% of the skimming equipment being found is in devices with user applied security measures. User applied security measures are not as effective as electronic security and/or unique, tamper proof locks. The current design of these devices offers little to no barrier to fraud through theft of credit information, as such it is our belief that the current design, in most cases, already violates G.S.2. by facilitating easy access to allow installation of these fraudulent card reading devices.

Manufacturers of these devices may argue that the cost to make the necessary upgrades will be prohibitive. This item is not intended to be retroactive and the cost of the additional security measures will be universal and not place any manufacturer at a competitive disadvantage. Several manufacturers of electronic security systems designed for retail motor fuel dispensers have products available and at least three new manufacturers of low cost systems have recently come into the marketplace (at least one of them is working with OEM manufacturers and the security systems are being integrated into newly manufactured dispensers).

During the 2018 NCWM Interim Meeting, the Committee heard comments from Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA. Mr. Vires stated that the SMA supported the item but recommended a "Developing" status. Mr. Vires questioned the definition of the term "access" and questioned if the term means that it required keys or other tools to access the device.

Mr. Dmitri Karimov (Liquid Controls) stated that he opposed the item.

Mr. Kurt Floren (LA County, CA) commented that he opposed the item. Placing the language in the General Code would weaken the existing language already in place. He does not believe it is a weights and measures issue.

Mr. Gordon Johnson (Gilbarco Inc.) commented that he opposed the item. He is confused on how Gilbarco would satisfy the specification. Should this be user requirement?

Mr. Constantine Cotsoradis (Flint Hills Resources) commented that the language is too broad. If the requirement is not retroactive, the device owner should be responsible.

Ms. Kristin Macy (California) is concerned of the misapplication of the word "user". She feels the new language should be a separate paragraph and they have same language in California.

Mr. Hal Prince (Florida) stated this item was submitted from jurisdictions from all four of the regional weights and measures associations. (He submitted a letter for support). He recommended the item be Informational at minimum, if not voting.

Mr. Richard Suiter (Richard Suiter Consulting) mentioned several devices subject to being skimmed. He agreed something needs to be done but not sure the item is ready. He will support making this item a "Developing" or "Informational" item. He said that he believes many stakeholders outside of weights and measures should have input.

Ms. Paige Anderson (National Association of Convenience Stores) mentioned there are over 160 million transactions per day. She agreed there is a need for something but wasn't sure the item is ready. She believes other groups should get involved also.

Ms. Fran Elson-Houston (Ohio) stated some counties do not want to be involved while other counties inspect specifically for skimmers. The State of Ohio feels it should be looked for during routine inspections.

Mr. Mike Sikula (New York) uses training since 2015. Weights and Measures will look for skimmers and will call law enforcement if one is found. Also believes other stakeholders should be involved with the process. He reviewed this item with law enforcement and law enforcement felt they should be involved.

Mr. Scott Mason (Phillips 66) agreed it is a good idea but not ready for voting. Mentioned others have not been consulted including banks and credit card companies.

Ms. Linda Toth (Conexxus) stated the item is not ready and recommended Informational.

Mr. Randy Moses (Wayne Manufacturing) stated it needs to be discussed with banks and credit card companies since they already deal with this issue. We don't need to go off on our own direction with this.

Mr. Jimmy Cassidy (City of Cambridge, MA) one of the submitters of the items recommended the items be given a status of "Informational" or "Assigned". He believes we need something to move forward and in the General Code to extend beyond gas pumps.

Ms. Michelle Wilson (Arizona) said the problem is increasing and not going away. Recommended focus to be placed on new devices and make it non-retroactive. She recommended moving the item forward as "Informational."

Mr. Gordon Johnson (Gilbarco Inc.) feels the pain when working with other agencies or stakeholders. Gilbarco is ready to work with the NCWM, banks, and credit card companies. We need all the stakeholders at the table.

During the Committee work session, the Committee members discussed the comments heard both in favor and opposition to the item. Comments included involving more stakeholders on the development of the item. Members also asked if the item should be considered a weights and measures issue. The Committee agreed to recommend

giving this item an "Assigned" status and request the formation of a task group. (A letter of request was sent to the NCWM Chair.)

The Committee offers the identified stakeholders as being part of the task group as individuals from convenience store associations, meter manufacturers, retailers, petroleum marketers association, weights and measures regulators (one from each region), and NIST.

At the 2018 NCWM Annual Meeting the Committee received an update on this item from the Chairman of the NCWM Skimmer Task Group, Mr. Hal Prince (Florida). Mr. Prince reported work is ongoing on this item and the TG has been meeting bi-weekly since May 2018. Much of the TG discussion has revolved around two key questions:

1. Is this a weights and measures issue that NCWM should take on?

2. If so, does weights and measures have the authority to require manufacturers and users of commercial weighing and measuring equipment to take whatever steps needed to ensure such equipment prevents unauthorized access to non-metrological changes to the equipment?

Mr. Prince further reported members of the TG were recently surveyed and asked these questions, but results are not yet available. It is hoped more information will be available to report at the next (2019) NCWM Interim Meeting.

Mr. Prince also stated that more members and stakeholders are needed for the TG. Members of the TG believe that Weights and Measures needs an educational component, e.g., an outreach program set up for law enforcement and consumers and perhaps a "best practice guide" developed.

Regional Association Comments:
WWMA 2018 Annual Meeting: Lou Straub (Fairbanks), speaking on behalf of SMA, commented that SMA opposes this item and recommends it be withdrawn. Speaking on behalf of Fairbanks, he noted that Fairbanks understands the problem and the desire for weights and measures officials to get involved but is not sure Handbook 44 is the right place to address this.

The Committee also heard comments from Brent Price (Gilbarco, Inc.) who expressed concerns about proposed paragraph G-S.2.(b). There are references to the use of "universal key, master key, etc."; however, it is not clear to what these terms refer.

NCWM Chairman, Brett Gurney (UT) stated the TG is working on this issue and will continue to develop the item prior to bringing back recommendations for the community to consider.

Michelle Wilson (AZ) commented that Arizona weights and measures has found numerous "skimmers" and this is a big problem. She recommends the item be maintained as an "Assigned" item and allow the TG to continue its work.

The Committee reviewed the proposed language and offers the following suggestions for the Task Group to consider as it further develops this item:

- The Committee questioned whether the new language proposed for inclusion in G-S.2. Facilitation of Fraud should be included as part of G-S.2. The Committee is concerned this may dilute the core paragraph and suggests that, should the TG proceed with recommending this language for inclusion in Handbook 44, the TG should consider moving the new language into a separate paragraph, perhaps in a new sub-paragraph G-S.2.1. or a separate paragraph altogether.
- The additional language proposed under G-A.1. Commercial and Law-Enforcement Equipment part (b) should be moved into a separate subsection of G-A.1., perhaps a G-A.1.(d).

The Committee recommended the item be maintained on the NCWM S&T Committee agenda as an "Assigned" item to allow the Task Group to further develop it.

NEWMA 2018 Interim Meeting: Mike Sikula (NY) commented that while he supports W&M looking for and informing law enforcement on the presence of skimmers, he does not believe this item belongs in HB44. He also stated that without intimate knowledge of the ever-changing methods of skimming, NCWM may inadvertently make changes that could actually facilitate fraud. Walt Remmert (PA) supported Mr. Sikula's comments. He believes that the responsibility should fall on the device owner. Jimmy Cassidy (MA) acknowledged a serious skimmer problem across the country. This item is currently assigned to the task group that is working together with industry. He recommended that this item remain an assigned item. Eric Golden (SMA) stated that their positions are on record. He opposes this item and recommends withdrawal. Mr. Sikula supported the efforts of the task group. Mr. McGuire also supported the task group. The NEWMA S&T Committee believes it would be remiss to withdraw this item while the task group is working on it and recommended maintaining the Assigned status.

SWMA 2018 Annual Meeting: The Scale Manufacturers Association stated they had previously opposed the item before it was an assigned item. Mettler Toledo commented they were encouraged to see it designated as Assigned. A representative of Arkansas asked for an update from the working group. A representative of Florida and leader of the workgroup commented that the group had been divided and that the latest work was to look at three options; continue to develop the item, continue education or Withdraw the item. The Committee is looking forward to recommendations from the workgroup.

CWMA 2018 Interim Meeting: Craig VanBuren, a member of the task group, provided an update and asked for input. Several commented that this item may be more appropriate as a User Requirement and should possibly be moved to the LMD code. Concerns were raised that this is not a Weights & Measures issue. The Committee looks forward to the task group's continued work on this item and recommended that it be maintained with Assigned status.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents. **Return To the Agenda Item**

GEN-3 G-T.5. Tolerances on Tests When Transfer Standards are Used., Appendix D – Definitions: standards, field., ~~transfer standard.~~ and standard, transfer.

Background/Discussion:

Over the last several years, there have been, and still are, proposals to recognize some types of meters as either transfer standards or as field standards. Handbook 44 already recognizes the use of many different types of master meters, other reference materials, or devices as transfer standards. This proposal is based upon the existing recognition and permitted use of transfer standards that are already in Handbook 44.

However, there is no common understanding among industry and weights and measures officials as to what distinguishes a field standard from a transfer standard. Consequently, definitions are proposed for field standards and transfer standards to highlight the critical differences between these two types of standards. Any artifact, reference material or measuring device that meets the requirements of accuracy and repeatability as specified in Section 3.2. of the Handbook 44 Fundamental Considerations qualifies as a field standard. However, what has not been clearly understood is that **the field standard must meet Section 3.2. over the environmental and operational parameters in which the commercial measuring devices under test are used.** The ranges for these environmental and operational parameters may be very large and include:

- The range of flow rates at which the commercial meters under test operate (from the minimum to maximum flow rates for the meters);
- The range of air temperatures over which meters are used (perhaps 10° F to 105° F);
- The range of product temperatures over which meters are used (perhaps 10° F to 105° F, especially applicable for above ground storage tanks) ;

- The range of temperature differences that may exist between the product, the standard and the air over which meters are used (perhaps up to 50° F, especially for cold fuel in underground tanks and hot air temperatures);
- The range of pressures at which the pumping systems operate at different times and locations;
- The different products measured by similar meters; and
- Tests of multiple "standards" of the same type when used in different test system configurations (and "standards" of different sizes) to verify that the results agree and are consistent.

A range of environmental and operational parameters over which a transfer standard must meet the accuracy and repeatability requirements are more limited, that is, a transfer standard need only be accurate and repeatable over the conditions that exist for the "short" time that the transfer standard is used. Transfer standards may be tested before and after use to verify a commercial measuring device, so the range of conditions in which accuracy and repeatability may be relatively small. The transfer standard is only required to be accurate and repeatable during the time it is in use, which might be to test only one commercial device. For example:

- The range of flow rates at which the meters under test operate **at the time of the test**;
- The range of air temperatures that exist **at the time of the test**;
- The range of product temperatures that exist **at the time of the test**;
- The range of temperature differences that may exist between the product, the standard and the air **at the time of the test**;
- The range of pressures at which the pumping systems operate **at the time of the test**; and
- The product being measured by the meter **at the time of the test**.

A critical issue that has not be adequately addressed and defined is, "How long must a field standard remain valid (i.e., accurate and repeatable)?" Common sense dictates that the field standard must remain valid over an extended period of time. Transfer standards need only remain valid during their "short" period of use. Because (1) there are some many different types of field standards used to test commercial measuring devices, (2) there are so many transfer standards recognized in Handbook 44, and (3) the applications vary greatly, it isn't clear that a common minimum time period for field standards or for transfer standards can be established. Nevertheless, field standards must be valid and stable over long time periods and wide ranges of environmental and operational parameters as compared to transfer standards.

Additionally, transfer standards do not have to meet the one-third requirement for the uncertainty associated with its performance. Consequently, Handbook 44 typically specifies that the basic tolerances to be applied to the device under test be increased by two times the standard deviation of the transfer standard. This presumes that the transfer standard has been adjusted to have "zero error" or corrections are used to address any significant systematic errors in the transfer standard. This also applies when field standards are used. "The reason for this requirement is to give the device being tested as nearly as practicable the full benefit of its own tolerance."[1]

There are instances in some codes in Handbook 44 that do not state that, when transfer standards are used, the basic tolerances to be applied to the devices under test are to be increased by the uncertainty of the transfer standard (i.e., two times the standard deviation of the transfer standard). Consequently, a General Code paragraph under tolerances is proposed to be added to address those codes where these increases in the basic tolerances have not be included.

The submitter added the following points:

I. There are several proposals before the S&T Committee to recognize some meters as field standards and field standard reference meters. These proposals have not specified how the proposed field standards are to be tested to demonstrate compliance with the Fundamental Considerations requirements of Section. 3.2. It is

[1] Handbook 44, Fundamental Considerations, Section 3.2.

possible that some companies will push for recognition of meters as field standards without submitting data to support their claims of performance as field standards.

II. It is very difficult, time consuming and expensive to test meters that are proposed for use as field standards, especially to test using different fuels over the range of temperatures that exist for commercial applications and for temperature differences between the fuel and the air. It is possible that some will object to having to prove meter performance over the range of environmental and operational parameters.

III. It is possible that some companies will want to use performance data collected under laboratory conditions as being indicative of the expected performance of the meters under field conditions.

IV. Laboratory calibration procedures may not reflect the performance of the proposed field standard under field conditions.

V. Some companies may object to the cost of collecting data for transfer standards (meters) of different sizes and with different flow rate ranges to prove that the results for the different sized transfer standards (metering systems) will produce consistent test results on the same commercial meters.

VI. It is difficult to assess the errors and uncertainties associated with loaded trucks and railroad cars to be used as reference weight vehicles, when the scales on which they are weighed are not tested to the weight of the loaded cars. Furthermore, it is difficult to apportion the errors for section tests to the weight of the loaded trucks or railroad cars. There may be concerns that closer scrutiny of reference cars and material used in materials tests may result in some current test practices to be prohibited in the future.

VII. An interesting topic for discussion at this point is whether or not the basic tolerances must be increased if the correction and uncertainty (specifically, the repeatability) of a transfer standard, over its "short" period of use, is less than one-third of the tolerance during the time a commercial device is under test using the transfer standard. This topic is not discussed further here, because the situation already exists in the current application of Handbook 44 and it is not unique to this proposal.

VIII. Establishing a reasonably good estimate of the standard deviation associated with a transfer standard (to be added to the basic tolerances for the devices under test) may require significant time, effort and cost.

IX. Some companies may want to modify the device under test to be able to test the commercial measuring device, rather than testing the device as used.

Regional Association Comments:

WWMA 2018 Annual Meeting: The Committee recommended this item be addressed together with the items in Block 1 and 2; LPG-3; and MFM-5 and designate the status as Developing. For details, see the "Comments and Justification" in Block 1.

NEWMA 2018 Interim Meeting: Please see the comments on Block 1. This is recommended as a Developing Item and part of a group (with Block 1, Block 2, LPG-3, and MFM-5) on the NCWM agenda.

SWMA 2018 Annual Meeting: NIST commented that these items were similar to the items in Block 1, Block 2, , LPG-3, MFM-5 and that the proposals should be combined into one block so that items may be worked developed. The Committee received written comments from Seraphin that the items mentioned above were similar to items but that the terminology was different. The Scale Manufactures Association looks forward to the development of the item. The Committee received written comment from Seraphin that this item does address the need to add to the tolerance when a transfer standard is used but does recognize transfer standards that are already allowed in Handbook 44.

The Committee does recognize that GEN-4, LPG-3 and MFM-5 are different in that they add further considerations to their respective items in addition to what is being discussed in Block 1 and Block 2. The Committee recommends that the submitters of these items should work out the differences in terminology before moving the items forward.

CWMA 2018 Interim Meeting: No comments were heard. The Committee questioned the need for G-T.5., and believes the terms included in the Transfer Standard definition are already defined throughout Handbook 44. The Committee recommended this item be Developing.

Return To the Agenda Item

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

SCL – SCALES

SCL-1 S.1.1.1. Digital Indicating Elements. and UR.2.10. Primary Indicating Elements Provided by the User.

Background/Discussion:

There are point-of-sale systems in use that have 7" inch customer display indicators with a weight display that is 6.90 mm in height, making it difficult for the consumer to read. The height of the weight display must conform to a regulation regardless of the size of the indicating screen to enable the consumer to view the weight display on the indicator.

Scale manufacturers noted that the operator may elect to supply the weighing system with an LCD having scalable characters that do not comply with the proposed size requirements. This user requirement is necessary in addition to the proposed specification requirement to ensure that scale operators do not make incorrect modifications to weighing systems or use non-compliant equipment.

Regional Association Comments:

WWMA 2018 Annual Meeting: No comments were received. The Committee identified a few points for the submitter to consider as the item is further developed:

- Terms such as "NON SCALABLE" need additional clarification.
- In determining an appropriate retroactive date, the Committee notes the importance of fully vetting this item and ensuring that those affected by the proposal have adequate time to modify their equipment.
- The submitter may want to consider making this a nonretroactive requirement, noting that systems already in use must comply with general requirements for clarity and visibility.
- Discussions during the Committee work session indicate that some in the audience misread the proposal as a "nonretroactive" proposal because of the italicized type.

The Committee understands the submitter is continuing to develop this item. The Committee agrees the item has merit and recommends this be a Developing Item.

NEWMA 2018 Interim Meeting: Jimmy Cassidy (MA, submitter) explained changes are meant to give the consumer an "absolute length" of font size in order to always be readable, even when screen size decreases. He proposed that the readout to be a non-scalable. Lou Sakin (MA) voiced his strong support and also stated that the issue is more wide spread than one specific retailer. Mike Sikula (NY) voiced his support for this proposal. Eric Golden (Cardinal Scales) stated it is a retroactive proposal and that some older devices may not be able to comply, but that older devices typically had large screens and would not be in violation. John McGuire (NJ) voiced his support for this item. Mr. Cassidy believes a software update will allow devices to conform. The NEWMA S&T Committee believes this item is fully developed and recommended Voting status.

SWMA 2018 Annual Meeting: Arkansas supported the item. Florida supported the item and stated that an issue they had been concerned with had been resolved. NIST commented that they had not had an opportunity to fully review the item but that the User Requirement mentions non-OEM and questioned how it would apply to not built for purpose devices (i.e. a generic monitor or screen). The SMA has not reviewed the item. Fairbanks Scales questioned the definition of non-scalable used in the item. A representative of NCR explained that in some instances that font size cannot be adjusted in response to any change in the display area. The Committee agrees with the item and recommends it as a voting item.

CWMA 2018 Interim Meeting: The Committee wasn't sure what was meant by "direct sale digital devices". There may be a potential conflict between (c) and (d) and requiring indications to be non-scalable may create unforeseen issues. The Committee believes the language needs further clarification, and this item should be developing.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

SCL-2 A S.1.8.5. Recorded Representations, Point of Sale Systems

Background/Discussion:
NCWM Chairman Brett Gurney (Utah) is forming a task group at the request of the committee to develop this item. Contact information will be listed here. for more information or to provide comment.

This proposal would benefit consumers by enabling them to see at a glance that tare is being taken on the commodities they purchase. It would also educate the public about tare and make them better and more aware consumers.

Retailers would benefit because this proposal would aid their quality control efforts behind the counter and at the cash register. Retailers would be able to see that their employees are taking tare on packages, and that the tare employees take is the appropriate tare. For example, a meat manager would be able to spot packages of 1 lb. hamburger which had been packaged on the night shift mistakenly using the tare for family packs of chicken, just by walking down the meat counter and noticing a 0.06 lb. tare on a package size that would normally have a 0.02 or 0.03 lb. tare. The manager could also spot a 0.03lb tare on packages that should have a 0.06lb tare. Either way, the manager would be able to remove the items from the shelf and make corrections before the store or its customers were harmed. The manager would also be able to re-educate the employees responsible for the error. This improved quality control and transparency would build consumer confidence in retailers' establishments. It might even reduce the time and disruption retailers experience from official package inspections.

Package checking inspections potentially could be reduced because weights and measures officials could make risk-based assessments on the need to do package checking inspections at any given location. If an official note that gross weights or tares are visible on all random-weight packages, and that the tares seem appropriate to the package sizes, the official may be able to skip that location and focus package checking efforts on locations where tares are absent or seem inappropriate for the package sizes. That would be more efficient for both retailers and weights and measures jurisdictions.

Finally, this proposal would aid weights and measures officials investigating complaints about net contents of item by creating written proof of how much tare was taken on a given package or transaction.

Scale manufacturers will need to modify software and label and receipt designs before the non-retroactive date. Retailers with point of sale systems and packaging scales may feel pressured to update software or purchase new devices in response to consumer demand for tare information on labels and receipts. The amount of paper needed to print customer receipts may increase depending on the formatting of the information and the size of the paper being used. Some retailers may not want consumers to have this information as it will allow consumers and weights and measures officials to hold them accountable and would be written proof tare was not taken when, and if, that happens.

During the 2017 NCWM Interim Meeting S&T Committee open hearings, Mr. Doug Musick (Kansas), one of three co-submitters of this item, proposed splitting the item into two separate items: Item 3200-3A and 3200-3B. He suggested Item 3200-3A contain only the changes proposed to existing Scales Code paragraph S.1.8.5. Recorded Representations, Point of Sale Systems and Item 3200-3B contain only proposed new Scales Code paragraph S.1.9.3. Recorded Representations, Random Weight Package Labels. Mr. Musick also proposed, for the sake of clarity, removing the term "gross weight" from proposed new subsection "(b)" of paragraph S.1.8.5., leaving the term "tare weight" in that subsection and assigning that subsection a non-retroactive enforcement date of January 1,

2020. Mr. Musick commented that the changes proposed to paragraph S.1.8.5., if adopted, would provide consumers the additional sales transaction information needed to determine if an adequate amount of tare was taken on weighted items.

The Committee received numerous comments in support of amending HB 44 Scales Code paragraph S.1.8.5., some of which proposed additional changes to those proposed by the submitters of the item. Ms. Tina Butcher (NIST OWM), in presenting OWM's comments and recommendations regarding this item, emphasized the need for additional information to be provided on the receipt. She stated that it is very difficult for customers at a checkout stand to determine whether or not tare has been taken on products weighed by a store cashier in their presence on POS systems that display only a gross weight when the net weight of each package weighed is the only weight information appearing on the sales receipt. This is especially true, she said, when there are multiple items in a customer's shopping cart to be weighed. Consumers are not always able to focus their attention on the indication when individual items are being weighed and, for systems which do not display both a gross and net weight, recall those indications when reviewing a sales receipt.

Ms. Butcher noted too, that by allowing either gross weight or tare weight to be recorded on the receipt as proposed, stores would be provided the option of selecting one method over the other. Consequently, competing stores in a given area might opt to provide different information on the receipts, thereby causing customer confusion to those customers that frequent different stores. For this reason, OWM suggested amending the proposal that the receipt provide the gross, tare, *and* net weight. As an alternative to requiring additional information be recorded on the sales receipt, OWM suggested that the Committee may wish to draft language to require the *net weight* also be displayed on the indicator of such systems and provide some future date in which these systems must comply.

Officials from several different states highlighted, in comments provided to the Committee, the need for additional information to be provided on the sales receipt to make it possible for consumers to ensure tare had been taken on items weighed at a POS checkout.

Ms. Julie Quinn (Minnesota), co-submitter of the item, in response to OWM's suggestion to alternatively require the net weight be displayed on the indicator, stated that even if a customer is able to view the tare indication from a POS display, there still needs to be a paper trail of the recorded transaction information for enforcement purposes. She said that she was supportive of splitting the item into two parts so as not to derail moving forward with the changes proposed to paragraph S.1.8.5. She also made note of the existence of labels on packages currently being offered for sale in the marketplace, which include recorded tare values.

The Committee also received several comments in opposition to adding proposed new paragraph S.1.9.3. Recorded Representations, Random Weight Package Labels and to Agenda Item 3200-3 as a whole.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that the SMA opposes the agenda item and feels it would be too costly with little benefit.

Ms. Butcher reported that OWM recommends deleting proposed new paragraph S.1.9.3. from the proposal because it conflicts with NIST Handbook 130 Uniform Packaging and Labeling Regulation, which requires a declaration of the "net" quantity of contents. Ms. Butcher made note of a few additional points to consider relating to this portion of the item as follows:

- Those who package products in advance of sale often increase tare values to take into account moisture loss and good distribution practices. Thus, it cannot be determined from a tare value specified on a package how much of that value represents the packaging material and how much represents additional deduction.
- Tare values on packages cannot be enforced and do not provide indication of whether or not the declaration of net contents specified on a package is correct.
- Displaying a declaration of both gross weight and net weight on a package would confuse consumers.

Mr. Ross Andersen (NY, retired) commented that he didn't see a great amount of benefit to Item 3200-3B.

Additionally, the Committee acknowledged receiving written comments from Ms. Elizabeth K. Tansing, on behalf of the Food Marketing Institute, opposing the item and requesting that the Committee withdraw it (i.e., the item as a whole).

During the Committee's work session, members of the Committee agreed, based on comments received during open hearings, to simply delete proposed new paragraph S.1.9.3. from the proposal, rather than split the agenda item into two separate items as suggested by Mr. Musick during the Committee's open hearings. Members of the Committee also agreed to amend proposed new subsection (b) of paragraph S.1.8.5. by deleting the words "gross weight or" from the text in that subsection and assigning subsection (b) a nonretroactive enforcement date of January 1, 2020. The Committee agreed to present the item, as amended by the Committee, for vote at the 2017 NCWM Annual Meeting. The following depicts the changes that were agreed and made to the proposal by the Committee at the 2017 NCWM Interim Meeting:

S.1.8.5. Recorded Representations, Point-of-Sale Systems. – The sales information recorded by cash registers when interfaced with a weighing element shall contain the following information for items weighed at the checkout stand:

(a) the net weight;[1]

(b) the ~~gross weight or~~ tare weight;[1]

(**~~b~~c**) the unit price;[1]

(**~~c~~d**) the total price; and

(**~~d~~e**) the product class or, in a system equipped with price look-up capability, the product name or code number.

[Non-retroactive January 1, 2020~~XX~~]

(Amended 20XX)

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[1] For devices interfaced with scales indicating in metric units, the unit price may be expressed in price per 100 grams. Weight values shall be identified by kilograms, kg, grams, g, ounces, oz, pounds, or lb. *The "#" symbol is not acceptable.*
[Nonretroactive as of January 1, 2006]
(Amended 1995 and 2005)

~~S.1.9.3. Recorded Representations, Random Weight Package Labels. A prepackaging scale or a device that produces a printed ticket as the label for a random weight package shall produce labels which must contain the following information:~~

~~(a) the net weight;[1]~~

~~(b) the gross weight or tare weight;[1]~~

~~(c) the unit price;[1]~~

~~(d) the total price; and~~

~~(e) the product class or, in a system equipped with price look-up capability, the product name or code number.~~

~~*[Non-retroactive as of January 1, 20XX]*~~

At the 2017 NCWM Annual Meeting open hearings, Ms. Elizabeth Tansing (Food Marketing Institute, hereafter FMI) reported that the FMI opposed the item. Ms. Tansing stated that all tare weights would be required on the receipt, regardless of if it were 1 or 100 weight transactions. FMI could not find one customer that wants tare printed on the receipt. The requirement would be costly to industry (e.g., increased costs for software development, employee training, and consumer education) and additional costs would be passed on to the consumer. Customers have not asked for this information. Chain and single store operators would suffer in trying to comply. In addition to the cost concern, Ms. Tansing stated that other consequences of the proposal would be more paper used in receipts and longer wait times for customers.

Mr. Russ Vires (Mettler-Toledo, LLC) speaking on behalf of the SMA reported that the SMA also opposes the item. The implementation cost would be prohibitive for industry and retailers and that cost would be passed on to consumers who would receive little or no benefit.

Mr. John Barton (NIST OWM) commented that it is extremely difficult for customers at a checkout stand to determine whether tare has been taken on packages weighed by a store cashier in their presence when the weight display of the POS system provides only an indication of the gross weight and the net weight of those same packages gets recorded on the sales receipt, which is provided to the customer after all items have been priced. Consumers are not always able to focus their attention on the indication when individual items are being weighed and recall those indications when reviewing a sales receipt. This is especially true when there are multiple items in a customer's shopping cart to be weighed. The proposed item would benefit consumers and provide more information for investigations of consumer complaints.

Mr. Tim Chesser (Arkansas) stated he has concerns with this requirement resulting in requirements for all packages to have tare weights printed on the package label. Arkansas receives very few complaints on net weight and for these reasons Arkansas opposes this item.

Mr. Matthew Morris (Nebraska Grocers Association) opposes this item. The requirement places a burden on retailers and would be costly for consumers. Very few complaints have been received and this would create mass confusion for consumers.

Ms. Julie Quinn (Minnesota) commented that printing tare values on POS register receipts is a tool for regulators and store managers to audit how personnel are doing with taking tares. Consumers deserve to be protected. This is a non-retroactive requirement that impacts equipment that is installed after the non-retroactive date.

One of the original submitters Mr. Doug Musick (Kansas) showed a video with mathematical examples of the overcharges for several produce transactions. The video highlighted how difficult it is to tell if tare was taken and if taken correctly. Mr. Musick stated that the proposed requirement is simple, inexpensive to implement, and would provide equity in the marketplace. Mr. Loren Minnich (Kansas) also commented on the video, stating that if customers were asked if they wanted to be charged correctly they would say "yes," regardless if they knew what the term "tare" meant. Mr. Minnich also stated that many grocers deliver products from the store to customers' homes and customers are not present during the weighment of these items to witness whether tare was taken or not during the transaction.

Mr. Bart O'Toole (Nevada) supports item and commented that this requirement also involves other retailers outside of grocery stores. He gave a personal example of being overcharged at a frozen yogurt store because they failed to deduct tare for cup containers.

The Committee heard numerous comments from regulatory jurisdictions and consumers in support of this item.

No additional changes were made to the proposal; however, the Committee elected to delete the reference to S.1.9.3. Recorded Representations, Random Weight Package Labels from the title of the item since the Committee had earlier agreed at the 2017 NCWM Interim Meeting to delete proposed new paragraph S.1.9.3. from the proposal and consequently, the title too should no longer appear as part of the agenda item. The Committee agreed to present the

item for vote with the reference to S.1.9.3. in its title removed. During the voting session, the item failed to receive enough votes to pass and was subsequently returned to committee.

Shortly following the 2017 NCWM Annual Meeting, the Committee received a request from Kansas and Minnesota (two of the three original submitters of the item) to amend the proposal in an attempt to better clarify that "the tare weight" portion of the information to be included on the receipt is being proposed as a nonretroactive requirement. That is, the "tare weight" information on items weighed at a checkout stand would be required to be recorded on the receipts generated from POS systems that meet any of the four conditions specified in paragraph G-A.6. Nonretroactive Requirements as of the effective date of the requirement. The two states, in an effort to make clear that the change to paragraph S.1.8.5. is nonretroactive, proposed repositioning item (b), in the list of information required to be printed, to (d) so that "the tare weight" portion of the information required would appear at the very bottom of the list and directly above the nonretroactive date proposed. The submitters also requested that the enforcement date specified in the original proposal be extended an additional two years (i.e., until 2022) in consideration of some of the concerns raised by FMI and other industry representatives during the Committee's open hearings relating to the cost of implementation and the burden the changes would impose on grocery businesses having to comply with them. The submitters reported that they had decided to extend the effective date of enforcement to allow more time so that the cost of implementation could be spread over a longer period. A final suggested change was to amend the "Purpose" section of the item in the Committee's agenda to better reflect the true intent of the proposal; that is, to provide consumers the same opportunity afforded them by other scales that are used for direct sales (e.g. a retail-computing scales used to weigh lunch meat, cheeses, etc.) to be able to easily recognize that a tare deduction for packaging material, etc., is taken on items weighed in their presence. The State of Wisconsin, upon being contacted by Kansas and Minnesota and asked to consider these changes, reported that it wished to bow out of further involvement with the item.

The Committee, in considering the changes proposed to the item and the rationale provided by the submitters for requesting them, concurred that they were appropriate. Consequently, the Committee agreed to amend the proposal and replace the text in the "Purpose Section" as requested by the submitters and recommend the item move forward as shown in Item under Consideration.

During the 2018 NCWM Interim Meeting, the Committee heard from Mr. Loren Minnich (Kansas) who commented that the item will benefit consumers and asked the Committee to move the item forward as a Voting item.

Mr. Russ Vires (Mettler-Toledo, LLC) speaking on behalf of the SMA reported that the SMA opposes the item. The SMA feels that since regulators verify that tare values in POS systems are accurate. The proposal would provide little or no benefit to the consumer.

Ms. Fran Elson-Houston (Ohio) commented that she personally supports the item however, even with the change to the non-retroactive date, she still hears opposition from stakeholders. She also commented that inspectors should be checking programmed tare values. Ms. Elson-Houston stated that for these reasons she cannot support this item.

Mr. Ken Ramsburg (Maryland) commented that several POS devices already provide tare information on the printed receipt. He supports the item.

Ms. Julie Quinn (Minnesota) feels that the tare value is dynamic and changes often, and that inspection of programmed tare values is not sufficient as this may not be the value used during the transaction. She recommended that the item be presented as a Voting item.

Mr. Mike Sikula (New York) opposes the item and feels it will cause confusion to the consumer.

Mr. Loren Minnich (Kansas) commented that more grocery store transactions are moving to Internet sales where the consumer is not present. This gives inspectors another piece of information when performing packaging. Mr. Minnich asked the Committee to move the item forward as a Voting item.

The Committee received letters from the South Carolina Retail Association, the Florida Retail Federation, and the NC Retail Merchants Association, all stating their opposition to the item and a recommendation to withdraw.

The Committee also received a written recommendation asking the Committee to consider modifying the proposal to: (1) require the tare weight and/or the gross weight be printed on the receipt; (2) clarify printed weight values must be clearly and definitely identified as gross, tare, and/or net weights (as required by the General Code); and (3) move text currently in a footnote to the paragraph into the body of the paragraph for ease of reference.

During the Committee's work session, the Committee Members reviewed all information received and agreed to move the item forward as a "Voting" item without change.

At the 2018 NCWM Annual Meeting, the Committee received numerous comments on this item suggesting additional work is needed to further develop the proposal and recommending a new task group made up of regulatory officials, food marketing representatives, POS software programmers, NIST, and others.

Two of the original submitters of the item, Ms. Julie Quinn (Minnesota) and Loren Minnich (Kansas) spoke in favor of assigning the item to a work group; one noting that the complexities of packaging are more involved today than first realized indicating the need for this proposal to be looked at more in depth. Ms. Fran Elson-Houston (Ohio) commented that she too supported assigning the item to a TG. Mr. Ken Ramsburg (Maryland) commented that Maryland has always performed tare inspections at the front checkout of grocery stores to verify proper tare has been programmed into these systems. He further noted two of the larger grocery store chains already have this feature (tare values recorded on the receipt). He was in favor of presenting the item for vote.

Mr. Richard Harshman (NIST OWM) commented that OWM agrees additional information needs to be made available to customers for items weighed on a scale interfaced with a cash register in a POS system and that more work is still needed to develop the proposal. OWM supports the recommendations to assign it to a work group for further revision in hopes that a compromise proposal between industry and regulators could be agreed upon to advance this item. Mr. Harshman also provided an overview of some of the research OWM had completed on the proposal; the outcome of which, in OWM's opinion, suggested there may be other alternatives to providing additional customer information that's needed rather than requiring it be recorded on the sales receipt. He noted that within OWM's 2018 Annual Meeting analysis of this item OWM provides some additional thoughts on how additional information might be made available to customers and operators of POS scale systems to possibly help form a starting foundation for discussion by members of an assigned work group. OWM's 2018 Annual Meeting Analysis of all items on the S&T agenda is posted on NCWM's website for the 2018 Annual Meeting.

Ms. Elizabeth Tansing (Food Marketing Institute) stated that stores also want equity in the marketplace. The grocery industry is very competitive, and the current proposal would be extremely costly to implement. Noting that each grocery store chain typically designs its own POS system, including the layout of information that gets displayed to customers and store cashiers, Mr. Tansing said that implementing the changes proposed by this item would necessitate a software change to practically every register in each store. She also stated that she supported the suggestion to assign this item to a work group and that she would be willing to participate as a member of that WG to develop language fair to all parties.

Mr. Jon McCormick (Retail Growers Assoc. - KS) commented that he opposed the item. He gets few complaints from member stores of the Association. He encouraged weights and measures to increase fines for insufficient tare rather than change current requirements for POS systems.

The Committee also received numerous written letters from the grocery store industry opposing the item and requesting that the Committee withdraw it to include: the NC Retail Merchants Association, FL Retail Federation, SC Retail Association, Food Marketing Institute (FMI), and others.

In consideration of the number of comments received on this item in support of its further development by a work group, the Committee agreed to recommend this item be assigned to an NCWM Task Group (TG). The Committee also agreed the goal of the Point of Sale System-Tare Task Group (POST) should be to determine how to provide consumers (and operators) with the information necessary, whether on a receipt or displayed on the POS system itself, to verify charges for items weighed at checkout are based on net weight, similar to the opportunity provided them by retail-computing scales used in direct sale applications.

The task group should include representatives from the retailer sector, scale manufacturers, regulators, POS software developers, and if possible, packaging manufactures and OWM.

Regional Association Comments:
WWMA 2018 Annual Meeting: NCWM Chairman Brett Gurney reported the NCWM has established a Task Group, chaired by Loren Minnich (KS), to address this item. Lou Straub (Fairbanks), speaking on behalf of the SMA, stated the SMA opposes this item since regulators verify the tare values in POS systems are accurate. The SMA believes the proposal would provide little or no benefit to the consumer. The SMA will review the item at its November meeting and will reevaluate its position after the work group makes its recommendations. The Committee recommends the item be maintained as an Assigned item to allow the Task Group to further develop it.

NEWMA 2018 Interim Meeting: Mike Sikula (NY) voiced opposition to this item. Mr. Sikula did not see any benefit and believes that just because there is a tare on the receipt, it doesn't mean that the tare is correct. He also believes it will lead to consumer confusion. John McGuire (New Jersey) opposed this item. The NEWMA S&T Committee believes it would be remiss to withdraw this item while the task group is working on it and recommended that it be maintained with Assigned status.

SWMA 2018 Annual Meeting: Kansas stated that this was an assigned item. The NCWM Chairman remarked that the task group just recently started meeting to discuss this item. The Scale Manufacturers Association opposes the item at this time. The Committee looks forward to future proposals from the task group.

CWMA 2018 Interim Meeting: Loren Minnich (KS) gave an update on the task group's activities. The Committee looks forward to further updates and recommended that it be maintained as an Assigned item.

Additional letters, presentations and data may have been part of the Committee's consideration. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

SCL-3 A Sections Throughout the Code to Include Provisions for Commercial Weigh-in-Motion Vehicle Scale Systems

Background and Discussion:
These items have been assigned to the Weigh-in-Motion Task Group for further development. For more information or to provide comment, please contact:

Co- Chair
Alan Walker
Florida Bureau of Standards
P: (850) 274-9044
E: Alan.Walker@freshfromflorida.com

Co- Chair
Tim Chesser
Arkansas Bureau of Standards
P: (501) 570-1159
E: tim.chesser@aspb.ar.gov

The original purpose of this item was to recognize a higher accuracy class and appropriate requirements in Section 2.25. Weigh-In-Motion Systems Used for Vehicle Enforcement Screening Tentative Code by adding commercial and law enforcement applications. In particular, WIM vehicle scale systems capable of performing to within the tolerances specified for a higher accuracy class would be permitted for use in commercial applications and for highway law enforcement. The WIM Task Group (TG), however, agreed in 2016 that it would be more appropriate to address these higher accuracy WIM systems by proposing changes to Section 2.20. Scales Code, which remains the current effort of the TG.

Rinstrum and Right Weigh Innovation submitted a proposal in 2016 to modify the tentative WIM Code for Screening and Sorting. The idea was to keep all WIM applications within the same code section of Handbook 44. Rinstrum proposed to add slow-speed devices to the existing Screening and Sorting Code with two separate applications; one for commercial legal-for-trade and one for direct law enforcement. In consideration of the changes proposed, there would be three different applications covered by the same code, which was causing some

confusion. Because of the legal-for-trade application, it was suggested that that modification probably belonged in the Scales Code.

Rinstrum manufacturers the axleWEIGHr in-motion scale, which is a slow speed WIM axle scale system capable of being able to perform to within Class IIIL maintenance tolerance, according to Rinstrum. Rinstrum has indicated that the axleWEIGHr is a niche product, which creates a new segment for axle weighing devices. The axleWEIGHr calculates the GVW and weighs individual axles while a truck crosses the scale at 1-3 MPH. Rinstrum has also indicated the most common applications for its device will be agricultural farmers, small trucking companies or manufacturers that are interested to determine GVW and axle weights before the vehicle enters the public roadway. The proposed requirements are based in part on requirements in OIML R 134, "Automatic instruments for weighing road vehicles in motion and measuring axle loads." Test data and experience at multiple test sites demonstrate this system can meet the performance requirements that are proposed.

The 2016 NCWM Interim Meeting saw Rinstrum request the NCWM Chairman form a WIM TG to bring together regulators and private sector stakeholders to discuss Weigh-In-Motion technology. Rinstrum sought a Developing status so that it could maintain ownership of the proposal and continue to work on its development.

During the 2016 NCWM Interim Meeting, Mr. John Lawn (Rinstrum, Inc.) presented a short slide presentation on a slow speed WIM system that Rinstrum, Inc., manufactures. A copy of the slides from his presentation was inserted into Appendix B of the Committee's 2016 Final Report, which is available from the following link:

https://www.nist.gov/pml/weights-and-measures/ncwm-2016-annual-report-sp-1212

In February 2016, the NCWM agreed to form a TG, at the recommendation of the Committee, to consider a proposal that would expand the new NIST Handbook 44 Weigh-In-Motion Systems Used for Vehicle Enforcement Screening – Tentative Code to also apply to commercial use. Mr. Alan Walker (FL) agreed to serve as chairman of the new TG.

The Committee received an update on this item during the 2016 NCWM Annual Meeting from Mr. John Lawn (Rinstrum, Inc.). Mr. Lawn reported that the TG had agreed that the proposal needed to be changed to separate the requirements for WIM systems used in commercial application from those used for direct enforcement. He requested that the Committee replace the proposal included in the Item Under Consideration with a synopsis, which he offered to prepare and provide to the Committee given that the current proposal was no longer being considered.

The Committee agreed to replace the proposal in the Item Under Consideration with the synopsis to be developed by Mr. Lawn as requested. Rinstrum's original proposal was replaced following the 2016 NCWM Annual Meeting and is available for review, as is the synopsis developed by Mr. Lawn, in the Committee's 2016 Final Report from the following link:

http://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1212.pdf

The Committee also changed the status of the item to "Information" because an NCWM TG, under the direction of the Committee, was now assisting in the development of the proposal. This change in status is an indication that the Committee has taken on responsibility for the additional development of this item.

An update was given at the 2017 NCWM Interim Meeting on this item by Mr. Alan Walker (Florida), Chairman of NCWM's Weigh-In-Motion TG and Mr. John Lawn, (Rinstrum, Inc.). Mr. Walker noted that the TG is reviewing the different paragraphs in the Scales Code of HB 44 to determine needed amendments to address WIM vehicle scale systems. That review started with the "Application" section of the code and has now progressed to the "Notes" section of the code. Mr. Lawn reported on the recent testing of a Rinstrum WIM vehicle scale system by the State of Illinois, which had been witnessed by some members of the TG. He indicated the results of this testing proved inclusive due to poor weather conditions on the day of the test.

An update was given to the Committee at the 2017 NCWM Annual Meeting on this Information item and the status of the work performed by the NCWM's Weigh-In-Motion TG by Mr. Alan Walker (Florida), Chairman of the TG. Mr. Walker reported that the TG had made considerable progress this past year and had reached a point where it

believes it would of value to submit the revised document and ask for feedback. Mr. Walker also mentioned that the TG will develop a 'white paper' identifying specific changes for which the TG is hoping to receive feedback.

Mr. Lawn further reported that the TG needed feedback to determine the best way to test WIM vehicle scale systems intended for commercial application. He said that he felt if the device was tested statically, the tolerance values should be based on acceptance and maintenance tolerances currently defined for a Class III L device. He then indicated that testing for dynamic operation is different from static operation and that dynamic testing should consist of three consecutive test runs with the vehicle loaded with test weights followed by three consecutive test runs with the vehicle unloaded. Mr. Lawn stated that WIMs tested dynamically should be required to comply with tolerances where acceptance and maintenance tolerances are the same and that the rationale for this is the fact that dynamic tests on systems such as CIM RR scales and dynamic monorail systems use the same values for acceptance and maintenance tolerance. He further stated that tolerance values should only be applied to the value of the test weights used in the vehicle during the first three test runs. Mr. Lawn explained that the procedure consisting of three consecutive runs of a loaded vehicle followed by three consecutive runs of the vehicle unloaded would produce satisfactory results and would better avoid the introduction of unknown errors that may be incorporated if the testing involved a reference scale that was not installed at the same location as the WIM under test.

See the Committee's 2016 and 2017 Final Reports for additional details and background information relating to this item.

During the 2018 NCWM Interim Meeting, Mr. Tim Chesser (Arkansas) Co-Chairman of the NCWM's Weigh-In-Motion Task Group (TG) presented the Committee with a letter detailing a change to Section T.N.3.X.2 that the TG had made regarding the applied tolerance value when performing dynamic testing. Mr. Chesser reported the TG had resolved the tolerance issue and was now recommending acceptance tolerance be equal to one-half of maintenance tolerance when performing dynamic testing. Mr. Chesser also identified each TG member by name and thanked them for their efforts and asked the Committee on behalf of the TG to move the item forward as Voting.

Mr. Henry Oppermann (Weights and Measures Consulting LLC) commented that he was concerned that axle weights are being summed together to represent a gross weight and feels the proposed test method is not sufficient as the scale is not tested across it weighing range and not tested at its capacity. He is concerned as to how the error rounding of the individual axle weights and the gross weight would be handled. Mr. Oppermann also questioned if this was an automatic or non-automatic instrument as error handling are different for each. Mr. Oppermann stated that there are 15 different truck configurations on the highway; 3 axle trucks make up 25%, while a 4-axle truck is the most common at 40%. Only testing one truck configuration is not a satisfactory test. Mr. Oppermann does not support the proposal.

Mr. John Lawn (Rinstrum, Inc. submitter) summarized the progress of the TG and explained how the group reached an agreement on the change to the tolerance values used during dynamic testing. He went on to say that recommended test method is similar to the strain load test which is in use today.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, stated that the SMA position was developed before the TG agreed to the tolerance change and commented that the SMA will evaluate the change at its next meeting. Mr. Vires went on to speak on behalf of Mettler-Toledo LLC stating with agreement to the tolerance change he recommends moving the proposal forward as Voting.

Mr. Lou Straub (Fairbanks Scales) commented that while Fairbanks supports the change in tolerance values used during dynamic test, he feels that additional work is needed in the testing and believes that additional devices and tests need to be performed.

Mr. Eric Golden (Cardinal Scale Manufacturing) commended that he can support the code with the change in tolerance values used for dynamic testing and feels that the need for additional testing should not hold up the code from moving forward.

Mr. Louis Sakin (Towns of Holliston, Hopkinton, and Northbridge, MA), Mr. Jason Glass (KY), Mr. Gene Robertson (MS), and Mr. Rich Lewis (GA) all voiced their support for the item to move forward as a Voting item.

Mr. Ken Ramsburg (Maryland) stated support for the item but feels the wording of UR2.6.3 Approaches needs to be changed to mention this instrument type; specifically, regarding the length and level requirements.

Mr. Richard Suiter (Richard Suited Consulting) commended that the dynamic testing defined in N.7.2. represents testing of the instrument "as used" by testing loaded and unloaded vehicles and commented that this method is similar to the strain load test which has been in use for many years. Mr. Suiter commented that the approaches should be as recommended by the manufacturer. Mr. Suiter recommended the item move forward as Voting.

Mr. Steve Beitzel (Systems Associates Inc.) commented that the testing of in-motion railway track scale is more detailed than what is being proposed for in-motion vehicle scale testing. Mr. Beitzel opposed the item based on insufficient testing requirements.

During the Committee's work session, the Committee members considered all comments and agreed to change the tolerance values used during the dynamic testing as recommended by the TG. The Committee members also considered the comment from the TG stating that the item is complete and that its members feel it is ready for adoption. Consequently, members agreed to move the item forward as a Voting item.

At the 2018 NCWM Annual Meeting, the Committee received many comments suggesting that the current proposal was not developed enough to be considered for vote and recommending it be returned to the submitter or WIM TG for further development. The following is a list of the persons/groups suggesting this item be returned and the significant reasons provided for making such a suggestion:

- SMA: The SMA opposes the item as written and recommends the item be downgraded to Informational for further work. The SMA appreciates the work that the WIM Task Group has done thus far but believes that further work needs to be done regarding the testing methods to be used. Additional suggestions have been developed which should be considered.
- Mr. Russ Vires (Mettler-Toledo LLC and an active participant on the WIM TG): We are concerned that the changes proposed to HB 44 don't adequately address test procedures. HB44 should identify a robust standard (not the minimum), that if followed, would assure a good weighing result. Recommended the item be downgraded to Informational or Developing for further development. Mettler-Toledo LLC does not manufacture an axle-load scale that can perform to within Class IIIL tolerances.
- Mr. Richard Harshman (NIST OWM) emphasized the need for Rinstrum (or any other WIM vehicle scale manufacturer) to provide comparison test data that showed its system could comply with the Class IIIL Acceptance tolerance specified in the proposal. The follow comments were offered on behalf of NIST OWM during open hearings:
    - We think downgrading this item to Assigned or Developing is the right thing to do.
    - OWM believes this item still requires substantial development before it can be fully considered:
        - Some concerns have not been adequately addressed.
        - Many of the changes currently proposed lack the amount detail necessary to ensure these systems, once installed, will provide consistently accurate weighing results over time.
    - There is something very important that has been missing throughout this exercise to develop a proposal for consideration:
        - proof of the existence of a WIM vehicle scale system that can actually perform to within the 0.2% tolerance originally claimed by Rinstrum under all conditions of anticipated use.
        - To date, we have no evidence of a WIM vehicle scale system being manufactured that can meet the HB 44 Accuracy Class IIIL Maintenance and Acceptance tolerances currently specified in the proposal under all conditions of anticipated use.
        - We emphasize use of the words "under all conditions of anticipated use" because there are no use limitations specified in the current proposal, so our expectation is the system be accurate when weighing any and all types of vehicles.
    - It is inappropriate for members of a Task Group to be developing proposed changes to HB 44, which are intended to address commercial WIM vehicle scale systems of an Accuracy Class IIIL, without first knowing for certain there's a system being produced that can meet those tolerances under all conditions of anticipated use.

- If the weights and measures community is to accept these systems for commercial application, it must first be proven that the weights obtained from using them comply with the commercial tolerances under all conditions of anticipated use. This has not yet occurred.
- OWM appreciates Rinstrum's willingness to try and close this gap by offering to collect and share the data that the Committee would need to possibly support continuing efforts to develop the proposal.
    - We think it's important, as others have also pointed out, that this data needs to be collected in such a way that it's of use to the Committee in validating the accuracy of Rinstrum's system.
    - OWM would welcome the opportunity to assist in developing the testing model to be used in collecting the comparison data to better ensure this data would be useful.
    - To ensure that the Committee's needs are met we would encourage Rinstrum to involve the Committee so that members can see for themselves the results of the comparison testing and exactly how the data was collected.

- If the data collected shows the WIM system is capable of meeting the tolerances specified under all conditions of anticipated use, we would encourage further development of the proposal, but if the data does not support the manufacturer's claims, we would suggest the Committee consider withdrawing the item.

- Mr. Tim Chesser (AR and co-chairman of the WIM TG) commented the TG earlier had the majority of its members recommend the item be presented for vote. In consideration of those who most recently have suggested the proposal needs additional development, Mr. Chesser reported that he had surveyed members of the TG and the group is now in favor of continuing to work on the item. Mr. Chesser recommended the Committee assign the item, returning it to the TG.
- Two other members of the TG, Mr. Eric Golden (Cardinal Scale Manufacturing) and Mr. Lou Straub (Fairbanks Scales) recommended the item be assigned to the TG, noting a desire to keep the TG in place. A Developing status would return the item to the submitter and the TG would disband.

The Committee also received written comments from Mr. Henry Oppermann (W&M Consulting LLC) who opposed the item because he believes the proposed test procedure is inadequate and a more comprehensive test is needed. In his comments to the Committee, Mr. Oppermann provides a list of many unanswered questions, which he believes still need to be addressed.

Mr. Brad Fryburger (Rinstrum, Inc.) recommended the Committee change the status of the item from Voting to Assigned, which would provide Rinstrum the opportunity to collect the necessary data being requested. He requested feedback on the information the Committee would need to advance the item forward, noting that Rinstrum does not want to go through the expense and effort of collecting data only to learn later that it wasn't collected in a manner satisfactory to the Committer or wasn't the data being sought.

Mr. Richard Suiter (Richard Suiter Consulting and consultant to Rinstrum) suggested the TG could present the item for vote considering that the TG has been together for over two years developing the current proposal (which he referred to as being "well developed") and such action had been recommended by the TG at the 2018 NCWM Interim Meeting. The test procedures proposed in this item are technically sound. The WIM vehicle scale system is first tested statically, and then, when tested dynamically, the tolerance is applied only to the known test standards. Mr. Suiter reported that he was aware of four additional manufacturers of WIM vehicle scale systems that, either already had a device or system ready for sale or would soon have one ready.

In consideration of the numerous comments heard in support of assigning this item to the TG and the need for the submitter to provide comparison test data that shows its equipment can comply with the tolerances specified in the proposal, the Committee agreed to recommend the item be assigned to the TG. Members of the Committee also agreed it is important for the TG to develop the testing protocol for use in collecting the comparison test data. Mr. Fryburger, who was present during the Committee's work session, reported that he believed Rinstrum would be able

to provide the data required by the Committee by the 2019 NCWM Interim Meeting. He also requested Committee involvement in the collection of the comparison data.

Regional Association Comments:

WWMA 2018 Annual Meeting: The Committee heard multiple comments indicating test data is needed to demonstrate the capability of these systems. Lou Straub (Fairbanks), speaking on behalf of the SMA, stated the SMA opposes this item as currently presented and noted an area of concern is the lack of test procedures. An SMA member provided suggested test procedures to consider as did NIST OWM. All WIM Task Group (TG) members have acknowledged the need for clear test procedures. Speaking on behalf of Fairbanks, Mr. Straub commented Fairbanks supports the changes to the proposal relative to the Class IIIL tolerances. He encouraged the TG to require a 3rd party (such as a regulator) be present during the gathering of any test data to help validate it. Tina Butcher (NIST OWM) noted the need for test data to support the proposal and noted OWM forwarded recommended test procedures and criteria for collecting the test data to the TG for its consideration. OWM also noted this is going into a permanent code for commercial applications, underscoring the need for test data.

Dick Suiter (Richard Suiter Consulting), speaking on behalf of Rinstrum, Inc. noted Rinstrum is actively working to install a system for the purposes of collecting test data. Brad Fryburger, who is now the primary contact for Rinstrum, has lined up 10 different types of vehicles, including one with 8 axles, to represent the range of vehicle configurations that will be weighed on these systems. Mr. Fryburger has considered the input from OWM and a manufacturer on the TG in laying out the installation and selecting vehicles for the collection of data.

The Committee recommended the item be maintained as an "Assigned" item to allow the Task Group to further develop it.

NEWMA 2018 Interim Meeting: Walt Remmert (PA) opposed this item stating that he has tested a weigh in motion system before with less than favorable results. Mike Sikula (NY) opposed this item. Eric Golden (Cardinal Scale) commented that the NCWM has asked to see data from an actual test with positive supporting data. From that request, the company is building a static vehicle scale on site for side by side comparison testing to generate data. They are testing this fall and are planning to present their report to NCWM in January. Mr. Remmert added that this testing needs to be witnessed in order to ensure compliance with testing parameters. John McGuire (NJ) recommended this item be assigned to the task group for follow up in January. The NEWMA S&T Committee recommended maintaining the Assigned.

SWMA 2018 Annual Meeting: The SMA opposes this item but does recognize it has been given an Assigned status. A representative from Arkansas and a Co-Chair of the task group remarked that it has not met since the 2018 NCWM Annual Meeting. He did state it was his understanding that the submitter would be gathering data before the interim meeting. Richard Suiter stated that it was his understanding that this was a priority from the submitter and that 10 different types of vehicles had been secured for testing. NIST commented they had provided recommendations of types of data and procedures recommended to be used to gather the data. The Committee encourages the submitter to gather the data and present it to the National Committee as soon as possible.

CWMA 2018 Interim Meeting: Brad Fryburger (Rinstrum) gave an update and said they will soon begin testing to gather data. The Committee looks forward to future updates and recommended that the item be maintained as an Assigned item.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents. **Return To the Agenda Item**

SCL-6 UR.3.11. Class II Scales

Source:

A device was found in Kansas that is using the "d" value, which is smaller than "e", to calculate the dockage percentage for loads of grain. This often times is an indirect "sale" application, the "customer" isn't present during the transaction. While a specification was added to require Class II scales that are used in direct sales applications to display the same value for "e" and "d" there may be other instances in which a Class II scale is used in an indirect

sale application. This would make it clear that in those instances the commercial transaction should be based on the value of "e".

This may incur costs to those scale manufacturers that have to update devices that currently use "d" when calculating certain commercial transactions.

Regional Association Comments:

WWMA 2018 Annual Meeting: Loren Minnich (KS, submitter) reiterated the purpose of the proposal as outlined in the Committee's agenda. Loren noted there was a lot of confusion trying to clarify the appropriate use of "d" and "e." He also noted the proposal mirrors requirements for dynamic monorail scales. The Committee recommended this be designated as a Voting item on the NCWM S&T Committee's agenda.

NEWMA 2018 Interim Meeting: No comments or opposition were heard. The NEWMA S&T Committee believes this item is fully developed and recommended this Item be designated a Voting status \.

SWMA 2018 Annual Meeting: The submitter commented that this was submitted to clarify the intent of when "e" is to be used. A representative of Maryland rose in support of the item. The Committee believes the item is fully developed and they recommend it as a Voting item.

CWMA 2018 Interim Meeting: Loren Minnich (KS, submitter) spoke about clarification of the use of "e" and "d". The Committee believes this is fully developed and recommends voting.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents. **Return To the Agenda Item**

SCL-7 T.N.3.6. Coupled-In-Motion Railroad Weighing Systems., T.N.4.6. Time Dependence (Creep) for Load Cells during Type Evaluation., UR.5. Coupled-in-Motion Railroad Weighing Systems. and Appendix D – Definitions: point-based railroad weighing systems.

NOTE: This item replaces the 2018 Items, Block 1 Items: SCL-1 & SCL-2 that were designated as Developing items by the submitter, Meridian Engineers Pty LTD.

Background/Discussion:

T.N.3.6. Coupled-In-Motion Railroad Weighing Systems: Buyers and sellers of products transported by unit trains are willing to accept a larger tolerance than currently permitted in H44. This larger tolerance will apply to only unit trains and not individual cars. With the slightly increased tolerance sellers can benefit from reduced installation and maintenance costs of point-based weighing systems compared with traditional platform-based weighing systems. Point-based weighing systems are primarily designed for dynamic weighing only. It adds considerable cost and effort to have them tested for static weighing. In some instances, it will be more economical to obtain reference cars for dynamic testing from another certified source (see proposed UR.5.).

The submitter acknowledges that opponents argue that a 0.3% increase in the dynamic weighing tolerance (i.e. from 0.2% to 0.5%) is unacceptable. However, consider a long unit train in the US having a gross weight of 11,000 tons. The increased measurement uncertainty of 0.3% amounts to only 33 tons which still would represent a comparatively small cost to buyers and sellers for products shipped by unit train. The cost to provide and maintain the cheaper weighing systems will justify the small increase in weighing tolerance. If the product weighed were $50.00/ton the worst case would be $1650.00 on a unit train valued at more than half a million dollars.

T.N.4.6. Time Dependence (Creep) for Load Cells during Type Evaluation: During dynamic weighing operations Point-Based Load Cells used in In-Motion Railroad Weighing Systems never see a load for more than a second. Even if the system is used for static weighing to determine reference weights, the loading is a matter of 1 or 2 minutes.

The submitter acknowledges that opponents argue that all load cells must meet this requirement; however, Point-based weighers only weigh in dynamic mode for durations of less than 1 second. Point-based weighers are not used for static weighing other than reference weighing for dynamic calibration. Reference weighing with point-based weighers typically only weighs for 1-2 minutes at a time.

UR.5. Coupled-in-Motion Railroad Weighing Systems: Due to the large difference in installation and maintenance costs of point-based weighing systems compared with traditional platform-based weighing systems, buyers and sellers of products transported by trains are willing to accept the need to have a separate mechanism for determining the static weight for cars used for a dynamic test train. The sale of products using these systems will apply to only unit trains and not individual cars. Point based weighing systems are primarily designed for dynamic weighing only. It adds considerable cost and effort to have them tested for static weighing. In some instances, it will be more economical to obtain reference wagons for dynamic testing from another certified source.

The submitter acknowledges that opponents argue that all dynamic weighing systems must be test statically. However, there is already precedent for this type of testing in N.1.3.5.1. Dynamic Monorail weighing systems.

Definition for point-based railroad weighing systems: A number of these systems are already in the market place and have been used for legal for trade applications in overseas markets. This definition will supplement the proposed changes to **T.N.3.6.1**. and **UR.5.** and will help provide the membership with a better understanding of how these systems function.

The submitter acknowledges that opponents may argue that the proposed changes to **T.N.3.6.1.** and **UR.5.** should not be adopted and therefore there is no need for this definition. However, this technology has been established in the market place for many years and the Handbook should recognize the type of technology as a potential solution of weighing trains in motion even if no other changes are made to the Handbook. This is because certain tests called for in the Handbook are clearly intended to test platform scales and are not relevant for point based weighing systems (e.g. shift load test).

Regional Association Comments:

WWMA 2018 Annual Meeting: Richard Suiter (Richard Suiter Consulting) on behalf of Meridian noted that they submitted the load cells for testing with a 1-meter length of rail; however, the rail would not fit into the environmental chamber at NIST and the Ohio NTEP lab was also unable to accommodate it. Meridian is in the process of producing a shorter rail for use in the testing process and will resubmit for evaluation. The Committee asked that Mr. Suiter's presentation be included with the Committee's report on the WWMA's website.

Paul Jordan (Ventura County, CA) questioned whether there is limit to the speed of the car to achieve accurate weighing. Mr. Suiter explained that Meridian has included a limiter to limit the speed of the system. Tina Butcher (NIST OWM) questioned if a specification is needed in addition to automatically prevent weighing in a system in which speed can possibly result in inaccurate weighing. Ms. Butcher also noted that OWM had the opportunity to meet with Meridian to discuss the proposal a few weeks ago but has not yet had the opportunity to review the proposal as it was submitted. Steven Harrington (OR) commented that care needs to be taken whenever proposing expanded tolerances. He noted that train length, speed, fully loaded vs. empty, direction, and grade are all issues to be considered in achieving accurate weighing. He also challenged the notion that commodities being weighed are low cost; although the price per pound may be low, the volume of the weighments creates significant impact on cost.

The Committee recommended the item be designated as a Voting.

NEWMA 2018 Interim Meeting: Walt Remmert (PA) supported this item. Richard Suiter (Consultant representing the submitter) submitted written comments stating that he believes the item is fully developed and ready for a vote. The NEWMA S&T Committee recommended this item be designated with Voting status.

SWMA 2018 Annual Meeting: A representative speaking on behalf of the submitter gave a presentation of the use, merits and request of the item. Several comments were heard questioning expanding the tolerance for these types of

devices. The representative of the submitter stated that the device would have to meet current tolerances to get an NTEP certificate, but they were requesting expanded tolerances for maintenance purposes. The SMA will meet and review in their November meeting. Mettler Toledo commented that they were not in favor of relaxing the tolerances. Fairbanks Scales questioned the need for a relaxed tolerance. NIST commented that they had not completed a full analysis, but they did question the tolerance based on value of the product being weighed rather than performance and that the user requirement does have option to use the device as a reference scale which would involve static weighment when the device is used as a dynamic weighing device. The Committee would like to see the results when it has finished the NTEP process.

CWMA 2018 Interim Meeting: Richard Suiter (representing Meridian Engineers) provided a presentation. He answered questions about dynamic and static use, tolerance and accuracy. The Committee heard concerns related to the increase in tolerance from 0.2% to 0.5%. The Committee recommended this item be a developing item to give the submitter more time to receive input regarding the suggested tolerance.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents. **Return To the Agenda Item**

BCS – BELT-CONVEYOR SCALE

BCS-1 S.1.3. Value of the Scale Division., S.1.9. Zero-Ready Indicator., S.4.Accuracy Class., S.45. Marking Requirements., N.1. General., N.2. Conditions of Test., T.1. Tolerance Values., T.2. Tolerance Values. and UR.3. Maintenance Requirements – Scale and Conveyor Maintenance.

Background/Discussion:

During a 2016 meeting of the USNWG on Belt-Conveyor Scales, the USNWG recognized that there has been a difference of opinion in the interpretation of tolerance application among regulatory officials, manufacturers, and users of belt-conveyor scale type systems. The work group confirmed through their discussions that the tolerance prescribed in Handbook 44 Section 2.21. are being applied to the range of test run results by some evaluators as a "plus or minus" tolerance while others are taking a more conservative position and applying the tolerance as an absolute value. This lack of clarity in the Belt-Conveyor Scale Systems Code and the difference in interpretation of how the tolerance is to be applied was identified as a source of inconsistency in the regulation of this type of dynamic weighing systems. Since the USNWG recently amended the Belt-Conveyor Scale Systems Code to recognize systems that operate using multiple rates for the flow of material, this inconsistency was considered to be a significant issue that the work group should address.

The USNWG consulted past records of work group meetings, NTEP Sector meetings, and NCWM conference reports, along with other resources in attempts to determine the correct and intended application of the allowable variation between consecutive test runs when material tests are conducted. The USNWG was unable to arrive at any definitive conclusion on this issue through this research but they agreed it is necessary to amend the Belt-Conveyor Scale Systems Code to clearly identify the proper application of tolerances under specific sets of test conditions.

After lengthy discussion and much deliberation, the USNWG arrived at a consensus and agreed the existing tolerance should be applied as an absolute value when comparing test results performed under practically identical conditions (referring primarily to the flow rate of material). They also concluded that when comparing test results from test runs performed under different conditions, the tolerance should be applied as a plus or minus value to the range of test results.

The changes included in the attached proposal are intended to clarify how the prescribed tolerances are to be applied when comparing totalization operations during material tests on a "belt-conveyor scale system" or a "weigh-belt system." The recommended changes will specify the application of tolerances when material test runs are

performed under practically identical conditions, and the proper application of tolerances when those test runs are performed under different conditions.

During deliberations on the issue of how tolerances are to be applied in a comparison of material test results, the USNWG acknowledged that advances in design and technology have resulted in belt-conveyor scale systems and weigh-belt systems capable of performing within more stringent tolerances. The work group also recognized that the international recommendation OIML (R50) incorporates different accuracy classes for these types of systems. It was also noted the Handbook 44 Scales Code (Section 2.20.) incorporates different accuracy classes for weighing devices regulated under that code. The members of the work group agreed there were benefits to introduce different accuracy classes for belt-conveyor scales and weigh-belt systems in Handbook 44 Section 2.21., believing that adding another class of dynamic weighing systems would provide more alternatives for determining the weight of various products in a wider array of commercial applications.

The additional changes in this proposal recommending the introduction of two different accuracy classes would retain the existing performance requirements (0.25 % relative to the weight of reference material used) and add a second accuracy class for devices/systems capable of complying with more stringent performance requirements (0.1 % relative to the weight of the reference material). In addition to introducing a new accuracy class with a smaller tolerance, other changes are included in this proposal to accommodate the addition of a second accuracy class. This proposal also recommends changes to account for differences in minimum scale division size, marking requirements, minimum test load size, and requirements pertaining to zero-tests (see attached document). These changes to the U.S. standards will harmonize more closely with international recommendation OIML R50 and bring the Belt-Conveyor Scale Systems Code in alignment with certain requirements in the Scales Code in Handbook 44.

There may be opposing arguments from some that do not support allowing a "plus or minus" application of tolerances to the range of results from consecutive material test runs when those runs are performed under different flow rates.

In proportion to the number of these types of systems in commercial use, there are relatively few systems that are installed in a manner with the intent and/or ability to alter the flow rate of material.

Ensuring compliance with the provisions outlined in Section 3.2. in the Fundamental Considerations of Handbook 44 may prove challenging in some installations, depending upon the available equipment for weighing reference materials and conducting the test of the belt-conveyor scale system or weigh-belt system. The USNWG has received information however, from a device manufacturer (and member of the USNWG) that has demonstrated that these requirements are achievable.

Regional Association Comments:

WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM) commented that the NIST US National Working Group on Belt-Conveyor Scale Systems has worked on this proposal for several years and OWM believes this proposal is ready for a vote. Al Paige (MT W&M, retired) and Peter Sirrico (Thayer) who are both long-time members of the USNWG as well as Dave Frazer (MT) also commented in support of the item.

Hearing comments in support of the proposal and no comments in opposition, the Committee recommends the item be designated as a Voting item.

NEWMA 2018 Interim Meeting: No comments were received. Hearing no opposition or discussion on this item, the NEWMA S&T Committee believes this item is fully developed and recommends this Item be designated a Voting Item.

SWMA 2018 Annual Meeting: NIST stated that this proposal was submitted by the USNWG on Belt Conveyer Scales. There had been confusion amongst regulators and others on the correct application of the tolerances when repeatability and linearity where considered. This item was submitted to distinguish between the two terms and the appropriate application of tolerances, and to further add an accuracy class as a compromise based on how the

tolerances are to be applied and under what conditions the repeatability and linearity tests are to be performed. The Committee believes that the USNWG has fully developed recommends it be a Voting item

CWMA 2018 Interim Meeting: No comments were heard. This item was developed by the Belt Conveyor Sector and the Committee recommends this item be a voting item.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

ABW – AUTOMATIC BULK WEIGHING SYSTEMS

ABW-3 D A. Application, S Specifications, N. Notes, UR. User Requirements and Appendix D – Definitions: automatic bulk weighing system.

Background/Discussion:
This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Mr. Doug Musick
Kansas Department of Agriculture
(785) 564-6681, dmusick@ks.gov

The submitter responsible for developing this item provided an updated proposal in October 2017 for consideration at the 2018 Interim Meeting. The previous version of the item under consideration was as follows:

A. Application

A.1. General. – This code applies to ~~**automatic bulk**~~ weighing systems, ~~**that is, weighing systems**~~ **capable of**~~**adapted to the automatic**~~ **automatically** weighing ~~**of a commodity in**~~ successive drafts of **a bulk commodity without human intervention.**~~**predetermined amounts automatically recording the no-load and loaded weight values and accumulating the net weight of each draft.**~~
(Amended 1987 **and 20XX**)

S. Specifications

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

S.1.1. Zero Indication. – ~~**Provisions**~~ **An Automatic Bulk Weighing System (ABWS)** shall ~~**be made to**~~indicate and record a no-load reference value and, if the no-load reference value is a zero value indication, to indicate and record an out-of-balance condition on both sides of zero.
(Amended 20XX)
.
.
.
S.1.5. Recording Sequence. – ~~**Provision**~~ **An ABWS** shall ~~**be made so that**~~ **indicate** all weight values ~~**are indicated**~~ until ~~**the completion of the**~~ recording of the indicated value **is completed**.
(Amended 20XX)

S.1.6. Provision for Sealing Adjustable Components on Electronic Devices. – Provision shall be made for applying a security seal in a manner that requires the security seal to be broken before an adjustment can be made to any component affecting the performance of the device.

S.1.7. No Load Reference Values – An ABWS shall indicate and record weight values with no

load in the load-receiving element. No load reference values must be recorded at a point in time after product flow from the load receiving element is stopped and before product flow into the load receiving element has started. Systems may be designed to stop operating if a no load reference value falls outside of user designated parameters. If this feature is designed into the system then the no load reference value indicated when the system is stopped must be recorded, an alarm must activate, weighing must be inhibited, and some type of human intervention must be required to restart the system after it is stopped.
(Added 20XX)

S.1.8. Loaded Weight Values – An ABWS shall indicate and record loaded weight values for each weighment.
(Added 20XX)

S.1.9. Net Weight Values – An ABWS shall calculate and record net weight for each weighment.
(Added 20XX)

S.1.10. Net Weight Accumulation – An ABWS shall automatically accumulate and record the sum of all net weight values for each weighing process.
(Added 20XX)

S.3. Interlocks and ~~Gate Control~~Product Flow Control.

S.3.1. ~~Gate Position~~Product Flow Control. ~~**Provision**~~ **An ABWS** shall ~~**be made to**~~ clearly indicate to the operator **product flow status** ~~**the position of the gates leading directly**~~ to and from the ~~**weigh hopper**~~**load receiving element. Many types of equipment can be used to control the flow of product into and out of a load receiving element automatically including but not limited to gates, conveyors, augers, robots, pipes, tubes, elevators, buckets, etc.**
(Amended 20XX)

S.3.2. Interlocks. – Each automatic bulk weighing system shall have operating interlocks to provide for the following:

(a) Product cannot be cycled and weighed if the weight recording element is disconnected or subjected to a power loss.

(b) The recording element **can only** ~~**cannot print**~~ **record** a weight if ~~**either of the gates**~~ **equipment controlling product flow to or from the load-receiving element is in a condition that allows product to enter or leave the load receiving element.** ~~**leading directly to or from the weigh hopper is open.**~~

(c) A "low paper" sensor, when provided, is activated.

(d) The system will operate only in the proper sequence in all modes of operation.

(e) When an overfill alarm is activated, the system shall indicate and record an overfill condition.

(Amended 1993 **and 20XX**)

S.3.3. Overfill ~~Sensor~~And Interference Detection.

(a) **The system must have a means to detect when T~~t~~**he ~~**weigh hopper**~~**load-receiving element** ~~**shall be equipped with an**~~**is** overfill**ed. When an overfill condition exists** ~~**sensor which will cause the feed**~~**product flow to the load receiving element must be stopped,** ~~**gate to close,**~~an alarm must activate,~~**activate an alarm, and inhibit**~~ weighing **must be inhibited** until the overfill condition has been corrected**, and some type of human**

intervention must be required to restart the system. An alarm could be many things including a flashing light, siren, horn, flashing computer screen, etc. The intent of an alarm is to make the operator aware there is a problem which needs corrected.
(Added 1993) **(Amended 20XX)**

(b) ~~***If the system is equipped with a***~~***Downstream storage devices and other equipment, permanent or temporary,*** ~~***lower garner or surge bin, that garner shall also***~~ ***which have the potential to interfere with weighment when overfilled or not functioning properly must have a means to prevent interference. When interference exist the system must stop, an alarm must activate, product flow must stop, weighing must be inhibited until the interference has been corrected, and some type of human intervention is required to restart the system.***~~***be equipped with an overfill sensor which will cause the gate of the weigh hopper to remain open, activate an alarm, and inhibit weighing until the overfill condition has been corrected.***~~
[Nonretroactive as of January 1, 1998]
(Amended 1997 **and 20XX**)

N. Notes

N.1. Testing Procedures.

N.1.1. Test Weights. – The increasing load test shall be conducted using test weights equal to at least 10 % of the capacity of the system:

(a) on automatic ~~**grain**~~ bulk~~-~~weighing systems installed after January 1, 1984 **used to weigh grain**; and

(b) on other automatic bulk-weighing systems installed after January 1, 1986.
(Amended 1987**, and 20XX)**

UR. User Requirements

UR.4. System Modification. – **Components of** ~~**T**~~**t**he weighing system, shall not be modified except when the modification has been approved by a competent engineering authority, preferably that of the engineering department of the manufacturer of the scale, and the official with statutory authority having jurisdiction over the scale.
(Amended 1991 **and 20XX**)

The submitter provided the following points of discussion:

- There are many systems in use that don't meet the definition for a "scale" or an "Automatic Bulk Weighing System" or anything else in the Handbook. These changes will make it easier for regulators/inspectors to determine if a system should be evaluated as an "ABWS".
- The wording "automatic bulk weighing systems" should not be used in the definition of the same.
- The no load and loaded weight recordings are important, but they are specifications and should not be included in the application code.
- The current code does not clearly define at what level of automation a system would be considered an ABWS versus a scale with some accessory equipment (hopper, tank, etc.). This is an attempt to more clearly distinguish which systems should be considered ABWS's.
- Human intervention could be many things. Some examples include but are not limited to pushing a reset button, turning power off then back on, typing a password, or entering a statement into a system log. The intent with including the term "human intervention" is to not include all systems which have a high degree of automation, only the ones that cycle repeatedly and can potentially operate without anyone present to observe weighing malfunctions.

- There are many types of load receiving elements that will work with an ABWS to include but not limited to tanks and hoppers so the previous language referring to hoppers was removed and replaced with the generic but accurate term "load receiving element".
- The old language implied separate sensors (e.g. bindicators) were required. Newer systems have already bypassed the use of separate sensors and utilize the weight indications to identify an overfilled condition, similar to how the indications are used to regulate product flow into the load receiving element for some devices. Concerns for this approach have been raised for situations when an indicator is not functioning properly. That is a legitimate concern, but my reply then is: What is the backup for an indicator not indicating properly on any other type of device? This is something we know happens with other devices and commonly may not be detected until a device inspection and test is completed. Thus, one reason routine inspections and testing are required.
- Many types of equipment can be used to control the flow of product into and out of a load receiving element automatically including but not limited to gates, conveyors, augers, robots, pipes, tubes, elevators, and buckets. Examples would be a conveyer delivering product – in such a case the recording element should not record if the conveyer is still moving or in the case of a pneumatic transfer tube the recording element should not record if the blower forcing air through the tube is still operating. Therefore, the old language referring to gates was removed and replace with more generic terminology which can be applied to any equipment used to control product flow not just gates.
- Many types of equipment can be used for downstream commodity storage including but not limited to hoppers, tanks, bins, flat storage, trucks, totes, rail cars and pits. The language referring to "lower garner", "surge bin", etc. has been removed and replaced with a more terms such as "downstream storage devices" to allow for all potentials types of product handling equipment.
- A downstream storage device itself may not interfere with the weighing process directly, but it also cannot create a situation in which an overfill condition or some other malfunction of the equipment interferes with the weighing process. An example would be a grain storage hopper located under a weigh hopper in a position which when grain is mounded up above the storage hopper the grain touches the bottom of the weigh hopper and interferes with the weighing process. For this example, if the storage hopper can be lowered far enough below the weigh hopper so that the mounded grain when it reaches its' maximum potential height cannot touch the weigh hopper then it would not need the capability to detect an overfill condition. The same scenario would apply to a truck parked under the load receiving element, or a conveyer under the load receiving element. Wording was added to ensure interference does not occur and if it does that the system activates controls to prevent weighment errors.

The submitter modified the proposal in fall 2018 by adding an amendment to the definition of an automatic bulk weighing system. Many inspectors find it difficult to distinguish between ABWS and other weighing systems. Frequently inspectors observe systems which have many features and the functionality of an ABWS but don't meet the specifications included in the current ABWS definition, they therefore sometimes assume they are not ABWS systems.

ABWS applications have increased over time and will continue to do so as industries seek to improve efficiencies and accuracy. This has and will continue to increase the diversity of applications for ABWS. This increased diversity will further impact the correct application of codes. By removing specifications from the definition it will be easier to identify ABWS systems and will allow inspectors to better apply the relevant code during inspections. This should help improve consistency across jurisdictions and should improve equity as ABWS systems can determine net weight more accurately than other systems for some products and applications with the use of "no load reference" weights, ceteris paribus. Current systems in place which do not comply with the current definition, but function as an ABWS, may have the ABWS code applied during future inspections versus another code which may have been historically applied.

The original code was written for very specific equipment for a very specialized use. This is a fairly drastic change from the original and introduces some new terminology that may present some confusion or uncertainty to those who were fairly familiar with the existing code. Some individuals feel the proposed changes may add some uncertainty as to what systems should or shouldn't be considered an ABWS.

The Committee received an update on this item at the 2016 Interim Meeting from its submitter, Mr. Doug Musick (Kansas). Mr. Musick indicated that the current proposal is an initial attempt to update the current ABWS Code to

address some newer automated weighing systems known to exist in the marketplace. Some of these newer systems aren't able to comply with the existing ABWS Code, which provides indication of the need to update the current code.

OWM commented that it recognized the need for HB 44 to include requirements that address some ***automated*** weighing systems currently in the marketplace that, for one reason or another, fail to meet the definition of an ABWS or the application of the ABWS Code. As is the case with an ABWS, these systems are also used to weigh bulk commodities in an automatic operation. A number of these weighing systems do ***not*** consistently return to zero following discharge of a draft load due to:

- the density of the commodity being weighed and its susceptibility to cling;
- structural deformations in the load-receiving element (which trap and prevent product from being completely discharged);
- venting issues;
- system vibration; etc.

OWM gave the example of *some* seed treatment systems, known to exist in the commercial marketplace, that will automatically fill to a load value targeted by the system operator by weighing multiple drafts *automatically* and *without* operator intervention. When these systems are operational, not all the weighed product necessarily gets discharged with the draft load. The remaining product is typically referred to as a "heel." Some of these systems only record the gross weight of the different drafts weighed; yet, the "heel" remaining for each draft load cycled through the system needs to be taken into account for an accurate determination of the net quantity to be made.

OWM noted the single-most important factor in determining whether or not an automated weighing system needs to take into account the no-load reference and gross-load reference to determine an accurate net weight for individual drafts weighed is the system's ability to consistently return to zero following discharge of the load. This determination must be made on a case-by-case basis and will vary depending on the design of the system and the products being weighed.

The Committee agreed that more work was needed to develop the item and assigned it a "Developing" status. The Committee recommended that the item's submitter review the 2015 SWMA S&T Annual Report for additional proposed revisions to the proposal by that region's S&T Committee.
Mr. Musick also gave an update to the Committee on this proposal at the 2016 Annual Meeting. He reported work on the proposal is ongoing and that he soon planned to submit an updated version of it to the Committee. He reiterated a comment made at the 2016 Interim Meeting that the proposal is an attempt to update the current ABWS Code to address some newer automated weighing systems known to exist in the marketplace today that aren't able to comply with the existing ABWS Code.

The Committee agreed to recommend this item move forward as Developing to allow for additional time to fully develop the proposal.

Mr. Musick submitted an amended version of the proposal following the 2016 NCWM Annual Meeting. During Committee open hearings at the 2017 NCWM Interim Meeting and commented that he felt the proposal was now fully developed. He requested the Committee to assign it a Voting status.

Mr. Rick Harshman (NIST OWM) recommended that the item remain Developing. He questioned whether the proposed changes belonged in the ABWS Code or possibly in an entirely separate code intended to address some automatic weighing systems known to exist in the marketplace for which the Scales Code, nor the ABWS Code, seem to fit their design and operational characteristics. He noted that the existing ABWS Code is intended to apply to systems that weigh only one commodity at a time in successive drafts. He asked, "if the proposed changes are intended to expand the existing code to include a wider range of systems, which additional systems is the submitter intending to address by expanding the ABWS Code?" Mr. Musick answered that it addresses weighing systems capable of operating without human intervention.

Mr. Richard Suiter (Richard Suiter Consulting) urged the Committee to exercise caution in considering this item. He stated that he had concerns about striking the language for overfill sensor and described how the sensors are not

just for over capacity of the container. He noted that they are also for sensing when the height of the product reaches a point higher than the edge of the container, even though the container may not be at capacity. He advised that this redefining be done with careful consideration.

The SMA did not take a position on the item.

In consideration of the comments received, the Committee agreed that this item remain as Developing, to allow time to determine the impact of the changes on systems in this code.

At the 2017 NCWM Annual meeting, the Committee again received an update on the item from Mr. Musick, who reported work on the item is ongoing and he expects to have the proposal completed and ready for review at the 2018 NCWM Interim Meeting. Based on the update provided and in consideration of the ongoing work on this item, the Committee agreed to carryover the item on its agenda as a Developing item.

See the Committee's 2016 and 2017 Final Reports for additional details and background information on this item.

At the 2018 NCWM Interim Meeting the Committee received comments from Mr. Doug Musick (KS), submitter of the item. Mr. Musick asked the Committee to keep the item in a "Developing" status as there are changes being made to the item based on comments and feedback received from recent regional meetings.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that the SMA takes no position on this item at this time.

During the Committee's work session, it was agreed to keep the item "Developing" as requested by the items submitter.

The Committee did not take comments during open hearings on Developing items at the 2018 NCWM Annual Meeting except to grant the submitter of a Developing item (or block of Developing items) an opportunity to provide an update on the progress made to further develop the item(s) since the 2018 NCWM Interim Meeting. At the 2018 NCWM Annual Meeting open hearings, submitter Mr. Loren Minnich (KS) gave an update on the Developing item to the Committee. Mr. Minnich stated that he or Mr. Doug Musick (KS) planned on giving presentations at 2018 regional meetings to provide more detail on the item. He also reported there are no significant changes proposed to the ABWS Code by this item and that Kansas hopes to have this item fully developed so it can be presented for vote next year.

In written comments to the Committee the SMA reported it takes no position on this item at this time and looks forward to additional analysis performed by the appropriate stakeholders.

OWM provided the following written recommendations and comments to this item as feedback to the submitter and as part of its analysis of the S&T Committee's 2018 agenda items:

- The changes proposed in ABW-3, ABW-4, and OTH-6 are all related attempts to help clarify and make it easier for field officials to determine the proper HB 44 code to apply to some newer automatic weighing systems that have been introduced into the commercial arena. OWM is unable to envision, based upon its review of these three proposals, how the proposals, whether considered individually, or combined and considered as a group, will accomplish this intended outcome. Addressing these issues in a piecemeal fashion may actually result in more confusion.

- With respect to this particular item, OWM reiterates its comments included in the analysis it provided to the Committee at the January 2018 Interim Meeting. The proposed changes to the Automatic Bulk Weighing Systems (ABWS) Code would expand its application to include some newer automatic weighing systems that currently fail to meet the application of the ABWS Code (or the current HB 44 definition of an ABWS). OWM is not convinced this is a technically sound appropriate approach.

- The current ABWS Code applies to systems that automatically weigh a <u>single</u> commodity in successive drafts; yet we believe it was the submitter's intent in drafting some of the proposed changes that the code

also apply to systems that automatically weigh more than one commodity at a time in successive drafts. For example, some seed treatment systems can be programmed to weigh multiple drafts of the same recipe, which oftentimes is made up of different ingredients (commodities) that get mixed together to form the treatment for a particular seed type. The various recipes to be weighed by a system can include not only different ingredients, but also different amounts of those ingredients, both which can affect the price charged to customers. Expanding the application of the ABWS Code to address such systems may cause unnecessary confusion. For this reason, OWM prefers maintaining the current ABWS Code as is. Perhaps a better approach to addressing these systems and the resulting gaps in HB 44 requirements would be to form a small group to further study such systems and recommend Handbook 44 changes, possibly including consideration of a separate code to address these and other types of dynamic weighing systems.

The Committee agreed to carryover this item on its 2019 agenda in a Developing status and looks forward to being able to consider a final completed version.

Regional Association Comments:

WWMA 2018 Annual Meeting: Loren Minnich (KS) gave a presentation on the proposal. That proposal will be available on the Publication 15 page of the NCWM website. After clarifying with Mr. Minnich that there have been changes to the proposal, Tina Butcher (NIST OWM), noted OWM has not yet had the opportunity to review and analyze the proposal, but looks forward to doing so.

The Committee acknowledged that additional review by OWM, SMA, and others will be taking place on the revised proposal. However, having no specific suggestions for areas that need work, didn't feel it appropriate to designate it as Developing. Consequently, the Committee recommends the item be designated as a voting item.

NEWMA 2018 Interim Meeting: No comments were received. Hearing no opposition or discussion on this item, the NEWMA S&T Committee believes this item is fully developed and recommends this Item be designated a Voting Item.

SWMA 2018 Annual Meeting: The submitter gave a presentation and commented that he was trying to modernize the code with the current systems in place. Richard Suiter commended Doug Musick on his work concerning if a device returned to zero there was not a need for a no-load reference value unless it is something other than zero. The SMA had not reviewed the proposal. NIST commented that this code was written for a certain type of device and that this would disregard why this code was originally developed to apply to those unique devices and how they operate. NIST also commented that this issue could be handled in the HB44 Scale code or a new code. A representative of Growth Energy commented that the item would be reviewed by the National Feed and Grain Association. The Committee recommends the submitter work through the comments and continue to develop the language and address all concerns.

CWMA 2018 Interim Meeting: Loren Minnich (KS) gave a presentation describing the proposed changes to the ABWS Code. Richard Suiter (Richard Suiter Consulting) suggested an editorial change to the first sentence of S.1.7. to read as follows:

No Load Reference Values – An automatic bulk weighing system shall indicate and record weight values**, other than zero,** with no load in the load-receiving element.

The submitter agreed with the suggested editorial change. With this change, the Committee believes this item is fully developed and ready for voting.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

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AWS – AUTOMATIC WEIGHING SYSTEMS

AWS-3 S.3.2. Load Cell Verification Interval Value.

Background/Discussion:
Reference Handbook 44 (2018 edition), Scales Code, page 2-19, paragraph ***S.5.4. Relationship of Minimum Load Cell Verification Interval Value to the Scale Division***. Located near the bottom of this paragraph is a list of three criteria which if satisfied, removes the need to comply with the formula.

NTEP complies with this specification by not applying the formula during an NTEP evaluation providing that all 3 criteria have been satisfied. That is, the complete W/LRE or scale 1) has undergone the temperature testing as describer in T.N.8.1. and has performed within all applied tolerances; 2) has received an NTEP Certificate of Conformance; and 3) is equipped with an automatic zero tracking mechanism which cannot be inoperative in the normal weighing mode.

NTEP applies these 3 requirements to complete W/LRE and scale if the installed load cell is or is not NTEP certified.

Simply stated, the operational and performance specification are not considered if all 3 criteria are satisfied.
Discussion: I now ask you to turn to the Automatic Weighing Systems (AWS) Code, page 2-96, paragraph ***S.3.2. Load Cell Verification Interval Value***. Reviewing this specification, you will notice that the 3 exception criteria are not listed. Indicating that the v_{min} relationship formula is applied regardless if the instrument has undergone temperature testing as specified in paragraph T.7.1.

Was the act of not listing these 3 criteria intentional or was it an oversight?

Research Results:

1. The v_{min} relationship formula was adopted and added to the Scales Code in HB44 based on the adoption of S&T agenda item 320-3 during the 1993 NCWM Annual Meeting. At the time of the adoption, the three criteria were part of the adopted recommendation.
2. During the 1996 NCWM Annual Meeting the S&T Committee Agenda included a voting item **320-6 Amend S.5.4. to Exempt Complete Scale and Weighing Elements**. The amendment was to add the 3 exception criteria as shown below. The item was adopted, and the 3 criteria was added to the specification.

Recommendation: Amend Section S.5.4. Relationship of Load Cell Verification Interval Value to the Scale Division, by adding the following additional paragraph after the formulae:

This requirement does not apply to complete scales and weighing elements which satisfy the following criteria:

1. **The device has been evaluated for compliance with T.N.8.1. Temperature under the National Type Evaluation Program (NTEP);**

2. **The device has received an NTEP Certificate of Conformance; and**

3. **The device must be equipped with an automatic zero-setting mechanism which cannot be made inoperative in the normal weighing mode. (A test mode which permits the disabling of the automatic zero-setting mechanism is permissible, provided the scale cannot function normally while in this mode.)**

3. During the 1995 NCWM Annual Meeting the S&T Committee Agenda included a voting item **360-2, Automatic Weighing Systems Code**. That year the AWS Code was adopted as a Tentative Code into HB44.

4. During the 2004 NCWM Annual Meeting the S&T Committee Agenda included a voting item **324-1, Tentative Status of the Automatic Weighing Systems Code**. That year the AWS Code was adopted as a permanent Code.

Conclusion: Based on the findings of the research, and a discussion with those present during the 2018 Weighing Sector Meeting to find a technical reason that the 3 criteria were not added to the AWS Code: As no technical reason or justification was determined; It is believed that it was a simple oversight in 1996 to not amend paragraph S.3.2. of the AWS Code at the same time the Scales Code, paragraph S.5.4. was amended to add the 3 criteria.

It is the recommendation of the Weighing Sector Members that the 3 criteria be added to paragraph *S.3.2. Load Cell Verification Interval Value* of the AWS Code.

Regional Association Comments:

WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM) commented that this item was developed and submitted by the Weighing Sector and the item is ready for a vote. The Committee heard no comments in opposition to the item and recommends the item be designated as a Voting item.

NEWMA 2018 Interim Meeting: No comments were received. Hearing no opposition or discussion on this item, the NEWMA S&T Committee believes this item is fully developed and recommends this Item be designated a Voting item.

SWMA 2018 Annual Meeting: No comments where heard on this item. The Committee recognizes the work of the sector and recognizes their expertise. The Committee recommends moving this forward as a Voting item

CWMA 2018 Interim Meeting: No comments were heard. The Committee agrees this is a necessary addition to harmonize the AWS Code with other Codes, and that this item is ready for voting.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents. **Return To the Agenda Item**

WIM – WEIGH-IN-MOTION SYSTEMS USED FOR VEHICLE ENFORCEMENT SCREENING TENTATIVE CODE

WIM-1 Title of Tentative Code, S.1.7.1. Values to be Recorded., S.4.1. Designation of Accuracy., N.1. Test Procedures, T.2. Tolerance Values for Accuracy ~~Class A~~ Classes., UR.1.1. General, Table 1. Typical Class or Type of Device for Weighing Applications.

Background/Discussion:

Vehicle and axle weight screening has both safety and enforcement ramifications. Certified WIM systems for vehicle screening for enforcement decreases queues at static weigh stations with cost and efficiency benefits and provides certified WIM system for identifying cause for ensuing static weighing of potential overweight commercial vehicles.

Further, OSHA requires certified systems for establishing weights (vehicle and cargo) prior to lifting cargo from vehicles, and WIM systems are capable of providing weights at non-legal for trade tolerances, but currently are not capable of being certified.

The original tentative code was just for vehicle screening for enforcement. The proposed code widens scope of use and suggests additional accuracy classes as was originally planned. Modifying 2.25 is more efficient than suggesting adding an entirely new section (ex. 2.26) with significant overlap with 2.25.

Regional Association Comments:

WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM) pointed out that the scope of Handbook 44 as specified in the General Code does not include "not-legal-for-trade" devices. The Handbook addresses commercial weighing and measuring equipment, statistical data collection, and law enforcement purposes. Handbook 44 is commonly used by companies and individuals for not-legal-for-trade applications as a source of guidelines for their weighing or measuring applications. Those companies and individuals are free to use those portions of the Handbook that are appropriate for their specific application. It isn't necessary to modify Handbook 44 in order to use the Handbook criteria for this purpose. If the submitter is looking for standardized guidelines to apply to a given category of not-legal-for-trade applications, perhaps they might collaborate with an industry association or other organization who might have an interest in such a document.

Eric Golden (Cardinal Scale) had questioned the inclusion of different accuracy classes, particularly those designated as "TBD." Tina Butcher noted OWM had recommended the tolerance table be structured with accuracy classes during the development of the original WIM code to allow for future expansion of the code to include different tolerances for different WIM applications; however, had not intended a "not-legal-for-trade" category to be included in this table.

In its work session, the Committee found no merit in the proposal and noted that not forwarding the proposal does not preclude the use of the code in not legal-for-trade applications. Consequently, the Committee recommends this item not be forwarded to the NCWM S&T Committee and recommends this item be withdrawn from the WWMA S&T Committee Agenda.

NEWMA 2018 Interim Meeting: Eric Golden (Cardinal Scale) stated that there are many questions concerning this item and he recommends getting more information regarding the source of their tolerance numbers. The NEWMA S&T Committee believes this item requires further development by the submitter and recommends the Item be designated a Developing item.

SWMA 2018 Annual Meeting: NIST commented that a move from the tentative code would make this the only code in HB 44 that would be applied to non-commercial devices and would set a precedent that will drastically change the scope of HB44. The Committee agrees with the comments and recommends the item be Withdrawn.

CWMA 2018 Interim Meeting: Jon Arnold (Intercomp Company) provided a presentation. Based on a comment referencing G-A.1. (c), this proposal may have a place in Handbook 44. The Committee is recommending a developing status to allow for additional stakeholder input.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

BLOCK 1 ITEMS (B1) TERMINOLOGY FOR TESTING STANDARDS

B1: SCL-4 D N.2. Verification (Testing) Standards
B1: ABW-1 D N.2. Verification (Testing) Standards
B1: AWS-1 D N.1.3. Verification (Testing) Standards, N.3.1. Official Tests, UR.4. Testing Standards
B1: CLM-1 D N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards
B1: CDL-1 D N.3.2. Transfer Standard Test, T.3. On Tests Using Transfer Standards
B1: HGM-1 D N.4.1. Master Meter (Transfer) Standard Test, T.4. Tolerance Application on Test Using Transfer Standard Test Method
B1: GMM-1 D Air Oven Reference Method Transfer Standards, N.1.3. Meter to Like-Type Meter Method Transfer Standards and 5.56(b): N.1.1. Transfer Standards, T. Tolerances1
B1: LVS-1 D N.2. Testing Standards
B1: OTH-1 D Appendix A: Fundamental Considerations, 3.2. Tolerances for Standards, 3.3. Accuracy of Standards
B1: OTH-2 D Appendix D – Definitions: fifth-wheel, official grain samples, transfer standard and Standard, Field

Background/Discussion:
These items have been assigned to the submitter for further development. For more information or to provide comment, please contact:

Mr. Val Miller
NIST, Office of Weights and Measures
(301) 975-3602, val.miller@nist.gov

The term transfer standard is currently defined in HB 44 as only being applicable to the Cryogenic Liquid Measuring Devices Code. This definition should be removed as it is very limited in scope and the item termed a 'transfer standard' is in fact a robust working measurement standard used in field conditions, better termed and shortened to Field Standard. All instruments/devices used as a Field Standard in the testing of Weighing and Measuring Devices, regardless of nomenclature, must comply with the requirements of HB 44, Appendix A, Fundamental Considerations Associated with the Enforcement of Handbook 44 Codes, paragraph 3.2 Testing Apparatus, Adequacy. Using the term transfer standard as it is recently being applied in no way negates this requirement of adequacy and confuses the user as to the nature of the field standard being used.

Use of the single word 'standard' to signify use of a field standard can be confusing as there are a number of different meanings associated with 'standard'. It could be a documentary standard, i.e., HB 44; a primary standard used to realize the SI, i.e., Watt Balance; a laboratory reference standard used to ensure traceability of laboratory measurements to the SI, i.e., NIST calibrated laboratory standards; a laboratory check standard used to monitor the laboratory process. Use of the single word 'standard' requires that the reader understand completely the context of its use. Instead using the term Field Standard ensures that the reader understands that the item described is a robust working standard used in field conditions to ensure traceability of the subordinate measurements to the SI and leaves no ambiguity in its meaning.

Thus, the recommended changes to HB 44 align that document with the HB 130, removing ambiguity and adding clarity to the use of Field Standards for device testing.

Handbook 130 does NOT contain the term transfer standard in any location and already contains the definition and appropriate use of the term Field Standard in the following locations:

1.12. Standard, Field. – A physical standard that meets specifications and tolerances in NIST Handbook 105-series standards (or other suitable and designated standards) and is traceable to the reference or working standards through comparisons, using acceptable laboratory procedures, and used in conjunction with commercial weighing and measuring equipment. (Added 2005)

Uniform Weights and Measures Law

Section 3. Physical Standards

Weights and measures that are traceable to the U.S. prototype standards supplied by the Federal Government, or approved as being satisfactory by NIST, shall be the state reference and working standards of weights and measures, and shall be maintained in such calibration as prescribed by the NIST as demonstrated through laboratory accreditation or recognition. All field standards may be prescribed by the Director and shall be verified upon their initial receipt and as often thereafter as deemed necessary by the Director. (Amended 2005)

Section 12. Powers and Duties of the Director

The Director shall:

…

(h) verify the field standards for weights and measures used by any jurisdiction within the state, before being put into service, tested annually or as often thereafter as deemed necessary by the Director based on statistically evaluated data, and approve the same when found to be correct; (Amended 2005)

Uniform Regulation for the Voluntary Registration of Servicepersons and Service Agencies for Commercial Weighing and Measuring Devices

Section 1. Policy

For the benefit of the users, manufacturers, and distributors of commercial weighing and measuring devices, it shall be the policy of the Director of Weights and Measures, hereinafter referred to as "Director," to accept registration of (a) an individual and (b) an agency providing acceptable evidence that he, she, or it is fully qualified by training or experience to install, service, repair, or recondition a commercial weighing or measuring device; has a thorough working knowledge of all appropriate weights and measures laws, orders, rules, and regulations; and has possession of, or has available for use, and will use suitable and calibrated weights and measures field standards and testing equipment appropriate in design and adequate in amount. (An employee of the government shall not be eligible for registration.)

The Director will check the qualifications of each applicant. It will be necessary for an applicant to have available sufficient field standards and equipment (see Section 5, Minimum Equipment).

Section 9. Examination and Calibration or Certification of Standards and Testing Equipment All field standards that are used for servicing and testing weights and measures devices for which competence is registered shall be submitted to the Director for initial and subsequent verification and calibration at intervals determined by the Director. A registered serviceperson or registered service agency shall not use in servicing commercial weighing or measuring devices any field standards or testing equipment that have not been calibrated or verified by the Director. In lieu of submission of physical standards, the Director may accept calibration and/or verification reports from any laboratory that is formally accredited or recognized. The Director shall maintain a list of organizations from which the state will accept calibration reports. The state shall retain the right to periodically monitor calibration results and/or to verify field standard compliance to specifications and tolerances when field standards are initially placed into service or at any intermediate point between calibrations. (Added 1966) (Amended 1984, 1999, and 2005)

During the 2018 NCWM Interim Meeting opening hearings, the Committee heard comments from Mr. Dmitri Karimov (Liquid Controls), speaking on behalf of the MMA, who reporting that the MMA supports the proposed changes for the items that relate to metering.

Mr. Russ Vires (Mettler-Toledo, LLC), speaking on behalf of the SMA, reported that regarding SCL-4, ABW-1, and AWS-1, the SMA recommends these items be assigned a "Developing" status.

Mr. Henry Oppermann (Weights and Measures Consulting, LLC) representing Seraphin Test Measure Co., however, speaking on his own behalf, recommended that these items be made "Developing." Mr. Oppermann provide the Committee with written comments supporting his recommendation.

Mr. Ross Andersen (NY, retired) commented that if we take Mr. Oppermann at his word, then all of our 5-gallon provers, and our large volume provers, would fail. The standard of 1/3 is for lab testing but not field testing. Evaluation of field standards, in the field, means that all variables would have to be considered. The equipment, all individual inspectors, all individual service personnel, and the environmental factors, would all have to be evaluated.

Mr. Henry Oppermann rebutted that he did not say we had to analyze all the variables that are in the field. Rather, that you have to be sure that your standard is valid when it's used in the field. You need an accurate standard when your using it in the field. If it is not accurate, it may not be qualified as a field standard.

Mr. Michael Keilty (Endress & Hauser Flowtec AG USA) commented that he feels that the items related to measuring devices, need more work. For example, CDL-1 and CLM-1 don't say if it's a scale or a meter, so what is it? He recommends that this be a "Developing" item.

During the Committee's work session, the members of the Committee considered the comments heard on this block of items and agreed to recommend that the entire block of items move forward as "Developing." The Committee also concluded that all of the block 5 items, as well as LPG-4, and MFM-2 are related to the Block 4 items due to terminology, and that the submitter of the Block 4 items (OWM) provide detail of their developing language to the submitter of the related items (Endress & Hauser Flowtec AG USA) to prevent conflicting terms as they are considered during future meetings.

The Committee did not take comments during open hearings on Developing items at the 2018 NCWM Annual Meeting except to grant the submitter of a Developing item (or block of Developing items) an opportunity to provide an update on the progress made to further develop the item(s) since the 2018 NCWM Interim Meeting. During the S&T Committee open hearings at the 2018 Annual Meeting, Ms. Diane Lee, (NIST OWM) provided the S&T with an update on Block 4 Developing Items. She mentioned that Mr. Val Miller (NIST OWM) developed the language and has been presenting information (as noted in the background information) on this item at several of the regional meetings. She also mentioned that due to the number of comments received, OWM agreed with the "Developing" status for this item. Some of the comments received included whether or not current standards referred to as "transfer standards" should be considered "field standards" and if these standards were intended or can meet the fundamental considerations that state "when the standard is used without correction its combined error and uncertainty must be less than one-third of the applicable tolerance".

Also, in line with the discussion of field standard and the need to review data on master meters used as field standards, Ms. Lee reported that OWM will purchase six Coriolis meters for the purpose of collecting and analyzing data obtained from field testing using this method. NIST OWM will purchase the following Coriolis meters:

- Two ½ inch
- One 1-inch
- Two 1 ½ inch and
- One 3-inch, and
- ½ inch meter, specific for testing CNG.

The Committee received written comments from Seraphin Test Measure Company on all items in Block 4 and Block 5, as well as LPG-4 and MFM-2 emphasizing the need for there to be more study and discussion of the issues to assess the ramifications of all the proposed changes.

The Committee also received written comments from the SMA that it looks forward to further information on these items. It is important to be consistent in our use of terms across multiple sections of Handbook 44.

The Committee agreed to carryover this block of items on its 2019 agenda to allow for further discussion and development of these proposals.

Regional Association Comments:

WWMA 2018 Annual Meeting: The Committee believes the items in Blocks 1 and 2; Gen-4; LPG-3; and MFM-5 are related and recommends the NCWM S&T Committee combine them into a single block for the purposes of further development rather than present them in a piecemeal fashion as is currently the case with these multiple items. The commonalities in all these items is the need to ensure that terminology for testing equipment and the underlying principles align across all codes and that the criteria in the Fundamental Considerations in Appendix A of NIST Handbook 44 are considered.

Bob Murnane (Seraphin) indicated he would like to see Block 1 items remain Developing. He noted Seraphin has submitted written comments on these items (and these were made available to the WWMA). Michael Keilty (Endress + Hauser Flowtec) commented that the LPG-3 and MFM-5 have been on the agenda since 2014 and he believes they need to be made voting items; he doesn't know what more work is needed. He presented the items in Block 2 to attempt to clean up the language.

Tina Butcher (NIST OWM) referenced OWM's past analysis, which is available on the NCWM website and shared information about a project to research the use of master meters to assist states and industry and is looking for assistance from the community. Mahesh Albuquerque (CO) and Brett Gurney (UT) offered to assist in the gathering of data and noted they really want to see progress on this issue.

The Committee also recommends the submitters define the function and capabilities of the test equipment that will be used; specify the criteria it will need to meet; and then name the equipment using appropriate terminology. Definitions for any terminology not currently found in NIST Handbook 44 should be included in the final recommendation (such as is done in Gen-4). The Committee recommends this block be given Developing status.

NEWMA 2018 Interim Meeting: During its open hearing, the Committee received comments on Block 1 Items, Block 2 Items, LPG-3, GEN-4, and MFM-5 simultaneously. Bob Murnane (Seraphin, submitter of GEN-4) commented that he will work with NIST to help clarify the definitions of field standards and tolerance requirements. He is concerned that there is currently no definition for a "field standard reference meter". Mr. Murnane outlined his GEN-4 proposal and the clear definition of transfer standard. He recommends these items be further developed. His comments can be found in writing on the NCWM Pub 15 website.

Mike Sikula (NY) Stated that field standards aren't the only standards used in the field; lab standards are sometimes used on Class II scales. He believes 3.2 and 3.3 should not say "Field Standard". Mr. Sikula recommended the item to be a developing item. On item GEN-4, Mr. Sikula would like to see a solid percent number for tolerances vs. using a standard deviation calculation, due to different labs having different standard deviations which would create comparisons against varying tolerances.

The NEWMA S&T Committee recommended this expanded group of items be designated a Developing status.

SWMA 2018 Annual Meeting: NIST noted that these items were similar in purpose to the items in Block 2, Gen-4, LPG-3, MFM-5 and suggested that the proposals be combined in one block so that items may be worked on by the submitters of the items. The committee received written comment from Seraphin that the items mentioned above were similar to items but that the terminology was different. The Scale Manufactures Association looks forward to the further development of the item.

CWMA 2018 Interim Meeting: Charles Stutesman (KS) commented that Blocks 1 & 2 are similar for definitions, and one will have to be chosen over the other. The committee reviewed and acknowledged comments submitted by Seraphin which are posted on the NCWM website. The Committee recommends withdrawing CLM-1, CDL-1, HGM-1 from Block 1 and moving the remainder of Block 1 to voting.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

BLOCK 2 ITEMS (B2) DEFINE "FIELD REFERENCE STANDARD"

B2: CLM-2 D N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards
B2: CDL-2 D N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards
B2: HGM-2 D N.4.1. Master Meter (Transfer) Standard Test and T.4. Tolerance Application on Test Using Transfer Standard Test Method
B2: OTH-3 D Appendix D – Definitions: field reference standard meter and ~~transfer standard~~

Background/Discussion:
These items have been assigned to the submitter for further development. For more information or to provide comment, please contact:

Mr. Michael Keilty
Endress + Hauser Flowtec AG USA
(970) 586-2122, michael.keilty@us.endress.com

During S&T open hearings discussion in July 2017 it was pointed out that the term transfer standard which is used in the proposal to amend HB44 3.37 N.3 and 3.32 N.3 Test Drafts is incorrect. The statement made also suggested that the use of transfer standard is incorrectly used in HB44 code sections 3.34, 3.38 and 3.39. It was suggested that a more appropriate term to use is field reference standard or field reference standard meter. There is no definition in OIML G18 which supports the use of the term transfer standard. There is suggestive basis to support reference standard as it is used textually in OIML G18.

NIST has no procedural documents in place to justify the revision with a definition. The definition of transfer standard is used in code sections 3.34, 3.38 and 3.39 and that those sections do not need to change.
During the 2018 NCWM Interim Meeting, open hearings, the Committee heard comments from Mr. Michael Keilty (Endress & Hauser Flowtec AG USA), submitter of this block of items. Mr. Keilty reported he had developed this proposal with help from Mr. Henry Oppermann (Weights and Measures Consulting, LLC). In written comments to the Committee by Mr. Oppermann, on another item. Mr. Oppermann opposed the term "Transfer Standard" in that it is a temporary measurement reference. Mr. Keilty stated that he agrees with this interpretation and states that what he is proposing is for a "field reference standard meter" term and recommends that the items move forward (he did not specify to what status).

Mr. Henry Oppermann (Weights and Measures Consulting, LLC) provided comments for Stand Alone Items LPG-4 and MFM-2. Mr. Oppermann agrees with Mr. Keilty that these are field standards, however, the terminology "field reference standard meter" should just be "field standard". Anything that meets the 1/3 requirement should be accepted, but currently, there is no data to prove that these can meet the 1/3 requirement. He stated that this proposal specifies that the size of the test draft be in two minutes but has no explanation for the size, and it conflicts with the previous proposal that said that larger test drafts were needed. He also stated that the definition for "field reference standard meter" is vague and insufficient, the requirements for accuracy and repeatability are not defined. He commented that a NIST 105 series handbook is not yet established for these and that there are currently no test procedures or parameters for performance requirements to demonstrate these systems can meet the requirements. The definition would apply to all codes and more study and assessment is needed. He commented that more data is needed before this is moved forward, and that the items should be given a "Developing" status.

Mr. Constantine Cotsoradis (Flint Hills Resources) provided comments, at this time, intending to address item MFM-2 (see Item MFM-2 for comments).

Mr. Michael Keilty (Endress + Hauser Flowtec AG USA), asked the Committee that it be noted that the 2 previous commenters, Mr. Oppermann and Mr. Cotsoradis, were speaking to Stand Alone Items LPG-4 and MFM-2 and not only Block-5.

Mr. Dmitri Karimov (Liquid Controls), speaking on behalf of the MMA, reported that while the MMA supports Block 4, the terminology in Block 5 conflicts with those in Block 4 and therefore recommends that the items be "Developing."

Mr. Ross Andersen (NY, retired) commented that all standards are a transfer standard, transferred from one measurement to another. He stated that what is needed is to make sure that the standard we use is accurate to 1/3 of the applied tolerance. In regard to the data that has been discussed, he asks where is the data for what we use now? There is none. It was just selected. He stated that what we need is one test method as the "referee standard" and that whatever test method is used, that it can agree with the reference.

During the Committee's work session, the members considered the comments heard on this block of items. The Committee agreed to recommend that this block of items move forward as "Developing." The Committee also agreed that all the Block 5 items, as well as LPG-4, and MFM-2 items are related to the Block 4 items due to terminology and that the submitter of Block 4 (OWM) provide detail of their developing language to the submitter of the related items (Endress & Hauser Flowtec AG USA) to prevent conflicting terms as they are considered during future meetings.

The Committee did not take comments during open hearings on Developing items at the 2018 NCWM Annual Meeting except to grant the submitter of a Developing item (or block of Developing items) an opportunity to provide an update on the progress made to further develop the item(s) since the 2018 NCWM Interim Meeting. Ms. Diane Lee (OWM) noted during her update of Block 4 agenda items that the terminology agreed to in Block 4 would impact the terminology used in Block 5 agenda items. She also reiterated NIST OWM comments on additional data needed to support the NIST Fundamental Considerations and the work that NIST will be doing to collect data on the use of master meters to include the purchase of six Coriolis meters to collect and review data. NIST will purchase the following Coriolis meters:

- Two ½ inch
- One 1-inch
- Two 1 ½ inch and
- One 3-inch, and
- ½ inch meter, specific for testing CNG.

Mr. Michael Keilty (Endress + Hauser Flowtec AG USA), the developer of this item provided comments during the NCWM annual meeting open hearings. He mentioned that this item has been before the conference since 2015. He agreed that the definitions are confusing and agrees with the work that NIST is doing to clarify the terminology. Mr. Keilty recommended that any new information be presented at the January meeting and recommends that Block 5 items move forward as Voting items at the 2019 NCWM Annual Meeting.

The Committee received written comments from Seraphin Test Measure Company on all items in Block 4 regarding transfer standards raising several concerns and recommending the items remain developmental until such time those concerns have been resolved.

OWM provided the following written recommendations and comments to this block of items as feedback to the submitter and as part of its analysis of the S&T Committee's 2018 agenda items:

> This item is closely related to items in Block 4 and LPG-4 and MFM-2. OWM believes additional work is needed on all those items; therefore, assigning the items in this block a "Developmental" status is appropriate. See also OWM's comments regarding terminology in those items.

The Committee agreed to carryover this block of items on its 2019 agenda to allow for further discussion and development of these proposals.

Regional Association Comments:

WWMA 2018 Annual Meeting: The Committee recommends this item be addressed together with the items in Block 1; Gen-4; LPG-3; and MFM-5 and designate the status as Developing. For details, see the "Comments and Justification" in Block 1.

NEWMA 2018 Interim Meeting: Please see the comments above on Block 1. This is recommended as a Developing Item and part of a group (with Block 1, LPG-3, GEN-4 and MFM-5).

SWMA 2018 Annual Meeting: NIST noted that these items were similar in purpose to the items in Block 1, Gen-4, LPG-3, MFM-5 and suggested that the proposals be combined in one block so that items may be worked on by the submitters of the items. The committee received written comment from Seraphin that the items mentioned above were similar to items but that the terminology was different. The Scale Manufactures Association looks forward to the further development of the item.

The committee does recognize that GEN-4, LPG-3 and MFM-5 are different in their purpose but use language that is common to all the proposals and is specifically focused on in Block 1 and Block 2. The Committee recommends that the submitters of these items work out the differences in terminology before moving the items forward.

CWMA 2018 Interim Meeting: Charles Stutesman (KS) commented that Blocks 1 & 2 are similar for definitions, and one will have to be chosen over the other. Doug Musick (KS) supports the use of Field Standards, but questioned what criteria they have to meet. The committee reviewed and acknowledged comments submitted by Seraphin which are posted on the NCWM website. The CWMA recommends that this be a voting item.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents. **Return To the Agenda Item**

BLOCK 3 ITEMS (B3) ADDRESS DEVICES AND SYSTEMS ADJUSTED USING A REMOVABLE DIGITAL STORAGE DEVICE

B3: GEN-2 D G-S.8.2. Devices and Systems Adjusted Using Removable Digital Device Storage
B3: SCL-5 D S.1.11. Provision for Sealing.
B3: BCS-1 D S.5. Provision for Sealing.
B3: ABW-2 D S.1.6. Provision for Sealing Adjustable Components on Electronic Devices.
B3: AWS-2 D S.1.3. Provision for Sealing.
B3: LMD-1 D S.2.2. Provision for Sealing.
B3: VTM-2 D S.2.2. Provision for Sealing.
B3: LPG-1 D S.2.2. Provision for Sealing.
B3: HGV-1 D S.2.2. Provision for Sealing.
B3: CLM-2 D S.2.5. Provision for Sealing.
B3: MLK-1 D S.2.3. Provision for Sealing.
B3: WTR-1 D S.2.1. Provision for Sealing.
B3: MFM-1 D S.3.5. Provision for Sealing.
B3: CDL-3 D S.2.5. Provision for Sealing.
B3: HGM-3 D S.3.3. Provision for Sealing.
B3: EVF-1 D S.3.3. Provision for Sealing.
B3: TIM-1 D S.4. Provision for Sealing.
B3: GMA-1 D S.2.5. Provision for Sealing.
B3: MDM-1 D S.1.11. Provision for Sealing.

Background/Discussion:

These items have been assigned to the submitter for further development. For more information or to provide comment, please contact:

Ms. Tina Butcher
NIST, Office of Weights and Measures
(301) 975-2196, tina.butcher@nist.gov

The Committee initially considered a proposal from the NTEP Grain Analyzer Sector to modify the definition for "remote configuration capability" as follows:

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

The proposal was intended to address the use of removable digital storage devices in grain moisture meters (GGMs). Removable digital storage devices can be used in GMMs as either data transfer devices that are not necessary to the operation of the GMM or as data storage devices which are necessary to the operation of the GMM. If removable data storage devices are necessary to the operation of the device, they are not covered by the current definition of remote configuration capability in HB 44.

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

Although a Secure Digital (SD) memory card could also be used as a data transfer device it is more likely to be used as a data storage device. In a typical "data storage device" application, the SD memory card stores the grain calibrations used on the GMM. The SD memory card must be plugged into an SD memory card connector on a GMM circuit card for the GMM to operate in measuring mode. To install new grain calibrations, the GMM must be turned "off" or put into a mode in which the SD memory card can be safely removed. The SD memory card can either be replaced with an SD memory card that has been programmed with the new grain calibrations or the original SD memory card can be re-programmed with the new grain calibrations in much the same way as that described in the preceding paragraph to copy new grain calibrations into a USB flash drive. In either case, the SD memory card containing the new calibrations must be installed in the GMM for the GMM to operate in measuring mode. In that regard, the SD memory card (although removable) can be considered a permanent part of the GMM in that the GMM cannot operate without it.

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

The Committee heard opposition to the proposed changes to the definition, though a number of comments indicated support for changes to adequately address security for weighing and measuring systems adjusted using removable media. Over the course of several years, multiple proposals were presented, and the Grain Analyzer Sector decided to address its concerns through implementation of other requirements specific to grain analyzers. Acknowledging the need to modify sealing requirements to better address systems adjusted using removable media, OWM requested the Committee assign responsibility for this item to OWM.

At the 2015 through 2016 Interim and Annual Meetings, OWM provided updates to the Committee on its progress developing this group of items. Mrs. Tina Butcher (NIST OWM) noted that, after analyzing the issue, OWM was concerned that proposing modifications to the existing sealing requirements might have unintended consequences for some equipment not adjusted using this type of media. Since modifications using removable media that would remain in the device during normal use had not been envisioned when the audit trail criteria were originally developed, OWM believes that it might be best to create sealing requirements that apply more specifically to this technology. At the 2015 Annual Meeting, Tina Butcher (OWM) reported that members of its LMDP developed a draft General Code paragraph they believe will address the sealing of devices using this technology to make adjustments. The LMDP requested that this draft paragraph be included in this item to begin generating feedback to assist in further development of this item and shared the proposed approach with the Committee and NTEP Sectors.

Ms. Butcher also noted that the LMDP plans to propose modifications to a number of the individual device codes in HB 44 to reference the new General Code sealing requirement and shared an example of such proposed changes in the Scales Code.

OWM also provided updates to the Committee on its progress to further develop this group of items at the 2017 NCWM Interim and Annual Meetings. At the 2017 Interim Meeting, OWM requested, and the Committee agreed, to replace the Grain Analyzer Sector's original proposal with one OWM had completed which included the new proposed General Code paragraph as well as proposed revisions to the sealing requirements in several of the individual device codes to reference the new General Code paragraph being proposed. At the Annual Meeting, OWM requested, and the Committee agreed, to replace the text for paragraph S.1.11.1. to address a concern raised by the SMA involving an industry-accepted definition of "configuration." The definition, according to the SMA, included items that should not be considered sealable.

See the Committee's 2013 - 2017 Final Reports for additional background information and to review the different proposals considered by the Committee to address security of equipment; the metrological parameters of which can be changed by use of some form of removable digital storage device.

During the 2018 NCWM Interim Meeting. The Committee received comments on this block of items from Mr. Dmitri Karimov (Liquid Controls) who spoke on behalf of the Meter Manufacturers Association (MMA). Mr. Karimov reported that the MMA believes this is a move in the right direction but may require more work. A prior concern regarding the test that had been proposed, has been addressed by OWM's new language.

Mr. Michael Keilty (Endress + Hauser Flowtech AG USA) was in opposition stating that this will make current devices using a physical seal illegal. Mr. Keilty has concerns with requiring the memory card being required to be behind the seal.

Mr. Randy Moses (Wayne Manufacturing) commented that he too opposed this item because it didn't address Category 2 devices.

Mr. Russ Vires (Mettler-Toledo, LLC) speaking on behalf of the Scale Manufacturers Association SMA, opposed the item as written. He stated it was not clear how it affects memory devices.

Mr. Louis Straub (Fairbanks Scale) suggested that the revised wording presented by OWM may address many concerns. He encouraged everyone to review the new wording.

Mr. Richard Suiter (Richard Suiter Consulting) had concerns about limitations of removable devices, and how the internet would play into this proposal.

During the Committee work session, the members agreed to maintain the "Developing" status concerning this block of items.

The Committee did not take comments during open hearings on Developing items at the 2018 NCWM Annual Meeting except to grant the submitter of a Developing item (or block of Developing items) an opportunity to

provide an update on the progress made to further develop the item(s) since the 2018 NCWM Interim Meeting. OWM, submitter of this block of items, provided the following update:

- The intent of proposed new paragraph G-S.8.2. is to address the sealing of devices and systems adjusted using a removable digital storage device that must remain in the device in order for the device to be operational. The intent of all the other items in this block is to provide an exemption to the existing sealing requirements in each of the device codes being applied when the calibration or configuration parameters are changed using a removable digital device and direct those performing the inspection to paragraph G-S.8.2.

- OWM reported in its 2018 Interim Meeting analysis of this block of items that it believed these items were fully developed and ready for vote. Shortly after the 2018 NCWM Interim Meeting, however, OWM received an inquiry from a meter manufacturer asking if connecting a laptop computer via cable to configure a device or system would be considered removable media. It was not OWM's intention that proposed paragraph G-S.8.2. apply in such situations providing the laptop gets disconnected from the device or system once the new configuration and/or calibration parameters have been loaded into memory. The intent is that this paragraph only apply to those devices or systems in which the removable digital storage devices must remain in the device (or system) in order for the device (or system) to be operational. To address this concern and better clarify the application of proposed new paragraph G-S.8.2., OWM revised the paragraph in the weeks leading up to the 2018 NCWM Annual Meeting and provided a copy of the revised version to the Committee. OWM requested that the Committee replace the existing paragraph in the Item under Consideration for Block 7 Item Gen-2 with the revised version.

In written comments to the Committee, the SMA reported it looks forward to further information on these items. The SMA appreciates the clarification of the metrological configuration parameters and the addition of a physical seal provision.

During the Committee's work session, members of the Committee agreed that the amended version of paragraph G-S.8.2. offered by OWM to address the concern raised by a meter manufacturer improved clarification. Consequently, the Committee agreed to OWM's request to replace the existing proposed paragraph G-S.8.2. with the amended version made available by OWM and as shown in Item under Consideration for this item. No other changes were made to any other item in this block and members of the Committee agreed they believe the items in this block are fully developed and should be presented for vote in the 2019 NCWM Conference cycle. Refer to the Committee's 2018 Interim Report to view the version of paragraph G-S.8.2. that was replaced by the Committee at the 2018 NCWM Annual Meeting.

Regional Association Comments:

WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM), submitter of the item, noted that the proposal was modified based on input from the Measuring Sector last fall and was modified again following the Interim Meeting to address comments made at that meeting. OWM believes the item is ready for a vote.

Michael Keilty (Endress + Hauser) commented that the Measuring Sector has not reviewed the current proposal. He also noted his equipment includes internal components such as a board that could be removed and replaced and questioned how this would apply to his equipment.

Lou Straub (Fairbanks), speaking on behalf of the SMA expressed appreciation for the changes in response to the comments; however, SMA has not had the opportunity to review the revised proposal and can't comment on the current version. He will take the revised proposal to their next meeting and ask for input.

In response to Michael's comment, Ms. Butcher commented the proposal is not intended to address the fact that all devices have parts that can be disassembled and replaced. This proposal specifically applies to devices that are designed to be configured with removable media such as memory cards, flash drives, or other media. She agreed the Measuring Sector has not seen the current proposal. The item has been included on the Sector's agenda next week under the "as time allows" section to provide the Sector the opportunity to review it, and its input is welcome.
The Committee recommends the item be designated as a Voting.

NEWMA 2018 Interim Meeting: Mike Sikula (NY) commented that today, a printer and a printed paper copy should not be a requirement and should be removed (page 14 G.S.8.2). Also, there is duplication of this from General Code to other codes that he believes is redundant.

The Committee discussed the comment received and while they believe printers will eventually be phased out of many transactions, that time has not quite arrived. The NEWMA S&T Committee recommends this Item be designated a Voting status.

SWMA 2018 Annual Meeting: The Scale Manufacturers Association looks forward to the work being done on this item. NIST provided clarification of the intent of the proposal. The submitter believes that the item is fully developed. The Committee believes there is no additional work that needs to be done on this item. They do note that in their agenda that Item MDM-1 should have been included in B3 rather than B4

CWMA 2018 Interim Meeting: No comments were heard. The committee believes this item is fully developed and recommended that it be a voting item.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents. **Return To the Agenda Item**

BLOCK 4 ITEMS (B4) AUTOMATIC TIMEOUT SPECIFICATIONS

B4: MFM-3 **S.2.9. Automatic Timeout – Pay-At-Retail Motor-Fuel Devices.**
B4: HGM-4 **S.2.8. Automatic Timeout – Pay-At-Vehicle Fuel Dispensers.**
B4: EVF-2 **S.2.8. Automatic Timeout – Pay-At-EVSE.**

Background/Discussion:

There is great concern about the proper operation of fueling systems when customers use payment cards (e.g., credit and debit) to purchase fuel and the potential for accidental or intentional fraud created by the use of this payment feature. General Code paragraph G-S.2. Facilitation of Fraud can be applied to the use of these features; however, the proposed paragraph provides more specific guidance to manufacturers, regulatory officials, and users about how this transaction feature needs to operate.

The proposed paragraph draws on interpretations and procedures used in NTEP evaluations and laid out in the NCWM Publication 14 checklists and test procedures. Although device specific design requirements for this feature are not part of NIST Handbook (HB) 44 Sections: 3.37 Mass Flow Meters Code; 3.39 Hydrogen Gas-Measuring Devices – Tentative Code; and 3.40 Electric Vehicle Fueling Systems – Tentative Code, NTEP has evaluated this feature based on interpretations of General Code, paragraph G-S.2. Facilitation of Fraud for a number of years. Although this proposal is for a nonretroactive requirement with a January 1, 2020 enforcement date; General Code paragraph G-S.2 will continue to apply to all devices, and the proposed new device specific code paragraphs will more clearly spell out options for avoiding fraudulent use of the card authorization feature for devices manufactured after the effective date.

This proposal will also align language in Sections 3.37, 3.39, and 3.40 with a time-out feature requirement that was added to the HB 44 Section 3.30 Liquid-Measuring Devices Code in 2016. A similar requirement is also included in the Vehicle-Tank Meters Code that requires an automatic end to a transaction after a specified period of inactivity (no product flow) during individual deliveries.

Other communication devices such as cell phones may be available for activation of the transaction that were not included in the proposal. This proposal is intended to more thoroughly address any card and cash activated fueling systems since this feature is already in the marketplace. The community may need additional time to assess the capabilities and operation of other technologies being used for transaction activation to ensure a full understanding of its operation and to be able to arrive at a strategy to address these next generation device features.

Regional Association Comments:

WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM) explained that this series of proposals are intended to align the codes referenced in this block with a corresponding requirement added to the Liquid-Measuring Devices Code in 2016. The proposal helps ensure a consumer's credit card does not remain activated for an indefinite period of time should the system not be used to deliver product. In reviewing this proposal prior to the WWMA meeting, OWM noticed that the LPG and Anhydrous Ammonia Liquid-Measuring Devices Code is also lacking a corresponding requirement. Should the Committee be amenable to forwarding this block of items, she suggested that the proposal include a recommendation to add a corresponding requirement to the LPG Code.

The Committee heard no comments in opposition to the item and acknowledged this block of items will serve to align the measuring codes as they apply to retail motor-fuel applications. The Committee agreed that retail motor-fuel dispensing systems that fall under the LPG and Anhydrous Ammonia Liquid-Measuring Devices Code should be subject to similar requirements to ensure consumers' cards do not remain authorized indefinitely. Consequently, the Committee recommends the following proposed paragraph be included in the block of items recommending a change to the LPG and Anhydrous Ammonia Liquid-Measuring Devices Code:

> ***S.1.5.8. Automatic Timeout – Pay-At-Pump Retail Motor-Fuel Devices. – Once a device has been authorized, it must de-authorize within two minutes if not activated. Re-authorization of the device must be performed before any product can be dispensed. If the time limit to de-authorize the device is programmable, it shall not accept an entry greater than two minutes.***
>
> ***[Nonretroactive as of January 1, 20XX]***
>
> **(Added 2016)**

With this additional paragraph, the Committee recommends this block of items be designated as a Voting item.

NEWMA 2018 Interim Meeting: Mike Sikula (NY) commented that he would like to make sure this code makes consideration for people with disabilities. Two minutes may not be enough time for a disabled person.

The Committee determined that by the time a person had exited the vehicle and swiped their card, this amount of time was a good medium to a) allow them to select a grade and remove the nozzle, or b) change their mind and leave without so much time left that another person could fraudulently use the card had it not been canceled. The NEWMA S&T Committee recommended this Item be designated a Voting status.

SWMA 2018 Annual Meeting: NIST commented that this paragraph was added into the LMD code in 2016. The submitter believes this item should be added to the LPG code and that the item was fully developed and would request that it be sent forward as a voting item. The Committee agrees with the commenter and recommends moving it forward as a Voting item.

CWMA 2018 Interim Meeting: Charles Stutesman (KS) understood making the codes uniform with the LMD code but questioned the length of the time limit and the effect it may have on the elderly and physically challenged. Michael Keilty (Endress + Hauser) stated the original proposal was three minutes, but the NCWM amended it to two minutes. The Committee recommended this item move forward as voting.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

BLOCK 5 ITEMS (B5) REPEATABILITY TESTS AND TOLERANCES

Note: This item appeared as LPG-5 in the 2018 NCWM Publication 16. It was expanded by the developer for 2019 to uniformly address the same issue across multiple Section 3 codes.

B5: LMD-2 D ~~**N.4.1.2.**~~ **N.4.6. Repeatability Tests. and T.3. Repeatability.**
B5: VTM-3 D ~~**N.4.1.2.**~~ **N.4.6. Repeatability Tests. and T.3. Repeatability.**
B5: LPG-4 D ~~**N.4.1.2.**~~ **N.4.6. Repeatability Tests. and T.3. Repeatability.**
B5: HGV-2 D ~~**N.4.1.2.**~~ **N.4.3. Repeatability Tests. and T.2. Repeatability.**
B5: CLM-3 D ~~**N.5.1.1.**~~ **N.5.3. Repeatability Tests. and T.4. Repeatability.**
B5: MLK-2 D ~~**N.4.1.1.**~~ **N.4.4. Repeatability Tests. and T.3. Repeatability.**
B5: WTR-2 D ~~**N.4.1.1.**~~ **N.4.4. Repeatability Tests.**
B5: MFM-6 D ~~**N.6.1.1.**~~ **N.6.3. Repeatability Tests. and T.3. Repeatability.**
B5: CDL-4 D ~~**N.4.1.1.**~~ **N.4.5. Repeatability Tests. and T.2.1. Repeatability.**
B5: HGM-5 D ~~**N.6.1.1.**~~ **N.6.2. Repeatability Tests. and T.3. Repeatability.**

Background/Discussion:
This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Mr. Ross Andersen (NY, retired)
(518) 869-7334, rjandersen12@gmail.com

Original Proposal (provided for reference)
The proposal is aimed to correct a number of areas of confusion. First, the inclusion of repeatability in the N.4.1. series indicates that repeatability is to be run at normal flow rates. There was some confusion if this was the actual intent when these sections were added to HB44 in multiple codes? Running the tests only at Normal flow rates is consistently how the test was typically performed in the field. The amendment to N.4.1.2. was to clarify this explicitly for field tests and type evaluation tests.

The new paragraph was added because NTEP has required repeatability on tests over the entire range of flow rates conducted under controlled conditions during type evaluation testing. This means anywhere between rated maximum and minimum flow rates. The proposed code addition would have formalized and legitimized what has been done for a long time.

Another question arose whether gross or net results could be used in repeatability tests? Obviously, you can't compare net to gross but you can compare three consecutive gross or three consecutive net results. The tolerance paragraph in the LPG Code specifies the tolerance does not apply to the test of the compensator. Also, the practice in HB44 is to test one variable at a time to the extent possible, the revision clarifies that repeatability is addressed to gross meter performance only. This can be through deactivating the ATC or just using gross values where both gross and net are available from the same test.

The original proposed changes were an attempt to clarify and maintain the status quo as the code is presently written.

Add additional text to paragraph N.4.1.2. as follows:

N.4.1.2. 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. **Repeatability tests shall be based on the uncompensated volume, e.g. with the temperature compensator deactivated. Both field tests and type evaluation tests shall be run at flow rates consistent with normal tests as specified in N.4.1.**

(amended 20XX)

Add a new Paragraph N.4.2.4. as follows:

N.4.2.4. Repeatability Tests for Type Evaluation. – 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. Repeatability tests shall be based on the uncompensated volume, e.g. with the temperature compensator deactivated. Type evaluation tests shall be run at flow rates consistent with special tests as specified in N.4.2., N.4.2.1., N.4.2.2,, or N.4.2.3. as appropriate.
(Added 20XX)

Revision for Action in 2019

In the original proposal (carried as developing item LPG-5 in 2018 L&R Report), the intent was to address only the LPG code and preserve the status quo based on what presently appears in the Handbook. It was understood that the decisions on this item would set precedents affecting all LMD codes that contained a repeatability test. After discussion at the 2018 Interim and Annual Meetings, with various Meter Manufacturers, with OWM, and with other interested parties, the original proposal is being amended. The questions being posed have been broadened to include all LMD codes. The issues in this revision can now be expressed through the following questions:

1. Should the repeatability test be conducted net (compensated) or gross (uncompensated)? Or possibly, are both allowed provided all test results are from the same mode of operation?

   Response to Issue 1.
   In developing this item I heard comments agreeing with the original proposal to use only gross results and comments differing in that either gross or net should be accepted provided all results are from the same mode. The tolerance paragraph in the LPG/NH4 code indicates the test does not apply to the test of the ATC system. It can be argued that the ATC system already has a performance requirement in T.4., requiring agreement between net and gross, i.e. compensated and uncompensated results. This tolerance reads much like the T.3. paragraph. Also, Handbook 44 precedent tends to support performing the tests in gross mode only. That precedent implies that in testing one component or variable, you attempt to hold all other components or variables constant. The revised proposal retains the limitation of performing the test using gross results (uncompensated).

   In those codes where different device applications are sometimes gross and sometimes net, it will be necessary to specify using gross results, if the device has ATC capability. It is proposed to add the following text in the note paragraph specifying the repeatability test. "For devices equipped with an automatic temperature compensator, the test results shall be based on uncompensated (gross) volume, i.e. with the temperature compensator deactivated." (or equivalent wording) In the LPG/NH4 code this change renders the extra wording in T.3. unnecessary, i.e. that the tolerance does not apply to ATC.

2. Should the repeatability test be a normal test as presently presented in the Code? That is, is the test limited to flow rates within the range of normal tests? Note that the repeatability test now appears in the Normal Test section in every affected HB44 LMD Code, Sections 3.30, through 3.39. The table below shows the history of the related sections.

Code	Note Paragraph	Tolerance Paragraph
3.30. LMD	N.4.1.2. (Added 2001)	T.3. (Added 1992) (Amended 2001 and 2002)
3.31. VTM	N.4.1.2. (Added 2001)	T.3. (Added 1992) (Amended 2001 and 2002)
3.32. LPG/NH4	N.4.1.2. (Added 2001)	T.3. (Added 1992) (Amended 1997 and 2001)
3.33. Vapor	N.4.1.2. (Added 2002)	T.3. (Added 2002)
3.34. Cryogenic	N.5.1. (Added 2001)	T.4. (Added 2001)
3.35. Milk	N.4.1.1. (Added 2002)	T.3. (Added 2002)
3.36. Water	N.4.1.1. (Added 2002)	T.1.1. (Added 2002) (Amended 2010)
3.37. Mass Flow	N.6.1.1. (Added 2001)	T.3. (Amended 1992, 1994, and 2001)

3.38. CO_2	N.4.1.1. (Added 2002)	T.2.1. (Added 2002)
3.39. Hydrogen	N.6.1.1. (Tentative Code 2010)	T.3. (Tentative Code 2010)

Response to Issue 2.

Overwhelming support has emerged for the proposition that repeatability tests may be performed at any flow rate within the legitimate operating range of the device. To accomplish this, the Note paragraph on repeatability tests must be removed from the Normal Test section of each Code and placed in its own section. In the proposed wording below, the repeatability Note was simply moved to the next available number under Testing Procedures in each Code. For example, in 3.30. LMD Code, note N.4.1.2. is proposed to be renumbered N.4.6. This results in the sequence N.4.1. Normal tests, N.4.2. Special Tests, N.4.3. Money-Value Computation Tests, N.4.4. Pour and Drain Times, N.4.5. Temperature Correction on Wholesale Meters, and N.4.6. Repeatability Tests. NIST OWM has suggested inserting it after Special Tests and renumbering N.4.3. to N.4.5. Either way accomplishes the same end. Adding at the end of the list may cause less disruption.

However, removing repeatability from the special tests now leaves the issue of flow rates for conducting the test unstated. I suggest we need to add a statement to each Note as follows: "When conducting the tests, the flow rates shall be within the minimum and maximum discharge rates as marked by the manufacturer." However, some codes use different terminology and, in some cases, minimum and maximum discharge rates are not marked like RMFD's. For these cases I propose to add an additional statement regarding minimum discharge rates and maximum discharge rates as appropriate to that code.

3. If the test may only be performed as a normal test in Issue 2, how do we legitimize the NTEP policy of applying the tolerance to repeatability tests at special test flow rates? Based on the response to Issue 2, this will be a moot issue and can be dropped moving forward.

Regional Association Comments:
WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM) noted there has been good progress on these items and the revised language will clear up confusion about how the repeatability requirements are to be applied and eliminate possible inconsistencies between Handbook 44 and NCWM Publication 14. She commented that, in researching this issue in past NCWM reports and Measuring Sector summaries, it was not clear the intent was to apply this criteria only to tests conducted at a full flow rate and that devices should be capable of repeating indications across its full flow range. Consequently, the proposed changes include moving the current repeatability paragraphs from under the heading of "Normal Tests." Brent Price (Gilbarco) questioned how the proposed changes to the current "repeatability" paragraphs are depicted in the Items Under Consideration and asked whether the existing "Repeatability Test" paragraphs are proposed to be deleted. Tina clarified that the intent is to move the current repeatability paragraphs in the proposal out from under the "Normal Tests" heading and assign a new number to them. Each newly numbered paragraph is also proposed to include some additional language from the original paragraph.

Hearing no comments in opposition to the items proposed in the block the Committee agreed the proposed changes will provide necessary clarifications to help ensure proper application of the repeatability criteria.

The Committee agreed with Mr. Price's comments regarding how the proposal is depicted. Thus, the current paragraphs should correctly appear as struck and the newly numbered paragraph denoted with bold, underlined text to depict them as new paragraphs.

In the interest of brevity, the Committee decided to illustrate how one such item should appear and ask that all remaining items in the block be revised using this formatting in the NCWM S&T Committee's agenda. An example is shown below:

Delete existing N.4.1.2. Repeatability Tests.

~~**N.4.1.2. 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 2001)**~~

Add a new paragraph N.4.6. Repeatability Tests (including content from the previous N.4.1.2. along with additional criteria):

N.4.6. 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. When conducting the tests, the flow rates shall be within the minimum and maximum discharge rates as marked by the manufacturer. For devices with no marked minimum and maximum flow rates, the minimum discharge rates shall be as specified in N.4.2.1. or N.4.2.2. and the maximum discharge rates shall be the maximum discharge rate developed under the conditions of the installation. For devices equipped with an automatic temperature compensator, the results shall be based on uncompensated (gross) volume, i.e. with the temperature compensator deactivated.

(Added 20XX)

The Committee recommended this block of items be designated as Voting items on the NCWM S&T Committee's Agenda.

NEWMA 2018 Interim Meeting: Hearing no comments or opposition, the NEWMA S&T Committee believes this item is fully developed and recommended this Item be designated a Voting status.

SWMA 2018 Annual Meeting: NIST stated that the proposal had been expanded to include other device codes in NIST HB44 and that they agreed with the changes being proposed. The Committee agrees that the item is fully developed and recommends it as a Voting item.

CWMA 2018 Interim Meeting: Charles Stutesman (KS) stated Handbook 44 allows for special tests if an issue is suspected. This proposal may not be necessary and should remain developing. The Committee recommended this item remain developing because field testing can mirror NTEP evaluation procedures, but in this case may not be appropriate.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

LMD – LIQUID MEASURING DEVICES

LMD-3 A.1. General., S.2.5. Zero-Set-Back Interlock, for Retail ~~Motor-Fuel~~ Devices., S.4. Marking Requirements., S.5. Zero-Set-Back Interlock, for Retail ~~Motor-Fuel~~ Devices., UR.2.4. Diversion of Liquid Flow. and UR.2.5. Product Storage Identification.

Background/Discussion:

Diesel exhaust fluid (DEF) is a solution of urea and deionized water. It is used as an additive to diesel exhaust systems to lower the Nitrous Oxide (NOx) concentration in the diesel exhaust emissions from diesel engines. It is sold as a packaged product or dispensed using a liquid-measuring system. When sold in direct sales to retail customers, it is often dispensed directly into the customer's vehicle using a liquid-measuring device or system similar to or identical in design to a retail motor-fuel dispenser and in the same type of retail environment. The LMD Code includes a number of paragraphs designed to help ensure transparency in transactions and deter

facilitation of fraud in the retail environment. However, many of these paragraphs are currently limited to retail "motor-fuel" applications and DEF is not a motor fuel.

These paragraphs in the LMD Code that specifically apply to retail ***motor-fuel*** devices, should also apply to DEF and possibly other retail liquid measuring devices that measure products other than motor fuels. The NCWM has already recognized that requirements designed to ensure measurement accuracy and transparency shouldn't be limited to motor-fuel applications only and similar proposals to extend some of these requirements (e.g., zero-setback interlock and timeout features) to devices in other codes have already been adopted or are being considered by the NCWM for other retail measuring applications. As such, appropriate sections of the LMD Code must be modified so that these requirements are not restricted to devices that measure motor fuel.

Many DEF dispensing applications use the same type of dispensing systems as do retail motor-fuel applications and, thus, may already comply with the proposed changes. However, there may be other types of DEF measuring systems which do not currently comply with the proposed changes. [NOTE: Information regarding this question will likely emerge during the vetting of the initial proposal and can be updated at that point. Additional concerns may also emerge during the vetting process and need to be included in this section.]

Regional Association Comments:
WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM), submitter of the item provided an overview of the item. She noted a number of requirements in the LMD Code should be applied to DEF dispensers which are used in the same type of applications as Retail Motor-Fuel Dispensers. However, DEF is not a motor fuel and the application of those requirements has been challenged.

Kurt Floren (LA County) and Brett Gurney (UT) expressed concerns that broadening these paragraphs to "retail devices" may not be appropriate because it would encompass other devices such as water dispensing systems. Mr. Gurney commented, if the intent of the original issue was to address DEF, perhaps a solution would be to add only references to DEF. Ms. Butcher questioned why those devices shouldn't be subject to the same requirements and noted the community may want to consider whether some of those requirements should be applied more broadly at some point. However, she agreed limiting the changes to specifically "DEF" would be an appropriate solution to the immediate problem.

During its work session, the Committee expressed concern about broadening these requirements to encompass all retail devices, though in some cases it may be appropriate. To avoid these concerns the Committee recommends replacing the proposal shown in the Committee's Agenda in the Item Under Consideration with the following and recommends the proposal with these modifications be designated as a Voting.

A.1. General. – This code applies to:

(a) devices used for the measurement of liquids, including **but not limited to** liquid fuels and lubricants, and
(b) wholesale devices used for the measurement and delivery of agri-chemical liquids such as fertilizers, feeds, herbicides, pesticides, insecticides, fungicides, and defoliants.
(Added 1985)

S.1.6.10. Automatic Timeout – Pay-At-Pump for Retail Motor-Fuel and Diesel Exhaust Fluid Devices. *– Once a device has been authorized, it must de-authorize within two minutes if not activated. Re-authorization of the device must be performed before any product can be dispensed. If the time limit to de-authorize the device is programmable, it shall not accept an entry greater than two minutes*
[Nonretroactive as of January 1, 2017]
(Added 2016) (Amended 20XX)

S.2.5. Zero-Set-Back Interlock, for Retail Motor-Fuel and Diesel Exhaust Fluid Devices. – A device shall be constructed so that:

(a) after a delivery cycle has been completed by moving the starting lever to any position that shuts off the device, an automatic interlock prevents a subsequent delivery until the indicating elements, and

recording elements if the device is equipped and activated to record, have been returned to their zero positions;

(b) the discharge nozzle cannot be returned to its designed hanging position (that is, any position where the tip of the nozzle is placed in its designed receptacle and the lock can be inserted) until the starting lever is in its designed shut-off position and the zero-set-back interlock has been engaged; and

(c) in a system with more than one dispenser supplied by a single pump, an effective automatic control valve in each dispenser prevents product from being delivered until the indicating elements on that dispenser are in a correct zero position.

(Amended 1981~~, and~~ 1985, and 20XX)

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 in accordance with S.4.4.2. Location of Marking Information; Retail Motor-Fuel* **and Diesel Exhaust Fluid** *Dispensers. The marked minimum discharge rate shall not exceed 20 % of the marked maximum discharge rate.*
[Nonretroactive as of January 1, 1985]
(Added 1984) (Amended 2003 and 20XX)

S.4.4.2. Location of Marking Information; for Retail Motor-Fuel Diesel Exhaust Fluid Dispensers. *– The marking information required in the General Code, paragraph G-S.1. Identification shall appear as follows:*

(a) within 60 cm (24 in) to 150 cm (60 in) from the base of the dispenser for system in a dispenser;

(b) either internally and/or externally provided the information is permanent and easily read; and

(c) on a portion of the device that cannot be readily removed or interchanged (i.e., not on a service access panel).

Note: *The use of a dispenser key or tool to access internal marking information is permitted for retail liquid-measuring devices.*
[Nonretroactive as of January 1, 2003]
(Added 2002) (Amended 2004 and 20XX)

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S.5. Totalizers for Retail Motor-Fuel and Diesel Exhaust Fluid Dispensers. *– Retail ~~motor fuel~~ dispensers shall be equipped with a non-resettable totalizer for the quantity delivered through the metering device.*
[Nonretroactive as of January 1, 1995]
(Added 1993) (Amended 1994 and 20XX)

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N.4.2.2. Retail Motor-Fuel and Diesel Exhaust Fluid Devices.

(a) Devices without a marked minimum flow-rate shall have a "special" test performed at the slower of the following rates:

(1) 19 L (5 gal) per minute; or

(2) the minimum discharge rate at which the device will deliver when equipped with an automatic discharge nozzle set at its slowest setting.

(b) Devices with a marked minimum flow-rate shall have a "special" test performed at or near the marked minimum flow rate.

(Added 1984) (Amended 2005 and 20XX)

Make no changes to UR.2.4.

UR.2.5. Product Storage Identification.

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

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(Added 1975) (Amended 1976, and 20XX)

NEWMA 2018 Interim Meeting: No comments were received. Hearing no opposition or discussion on this item, the NEWMA S&T Committee believes this item is fully developed and recommends this Item be designated a Voting item.

SWMA 2018 Annual Meeting: NIST stated that the proposal is to remove the words "Motor Fuel" to encompass products such as Diesel Exhaust Fluid or other products not named "Motor Fuel." A representative of Arkansas rose to discourage the use of acronyms in the language. (ex. DEF should read Diesel Exhaust Fluid in section N.4.2.2.) The Committee agrees with the proposal with the change: ~~DEF~~ Diesel Exhaust Fluid in the item and recommends it as a Voting item.

CWMA 2018 Interim Meeting: Charles Stutesman (KS) stated the terms Retail Motor Fuel Device and Retail Motor Fuel Dispenser need clarification. The Committee found several inconsistencies throughout the LMD Code and suggests that the term 'dispenser' be replaced with 'device' in addition to striking 'motor fuel'. There may also be an unintended consequence that would eliminate the exemption for special test tolerances for RMFD. The Committee recommends this moving forward as a developing item.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

LMD-4 Airport Refueling Systems – Agreement of Indications and Reset to Zero

Background/Discussion:
MN Weights and Measures informed NIST that, during an inspection prompted by a complaint of an overcharge, metering systems at a self-serve airport fueling facility failed to comply with NIST HB 44, Liquid Measuring Devices Code. Specifically, the systems did not comply with the following requirements in Handbook 44:

- S.2.5
- UR.3.1, and
- G-S.5.2.2.2

These systems consist of one or more stationary meters, each of which is equipped with an individual analog indicator to register the fuel as it is delivered. These analog metering systems are interfaced with a central controller (typically located adjacent to the meters), which is used by the customer to activate an individual meter using a

payment card such as a credit or debit card. The controller is also an indicator. After activating the transaction with a payment card, the customer delivers fuel using one of the individual metering systems interfaced to the controller. Each metering system is equipped with a mechanical reset, which is used by the customer to return the indications to a zero condition prior to delivery. Typically, customers will fill one receiving tank on an airplane and then, prior to filling the next tank on the plane, will use this reset feature to reset the indications to zero. This resetting action is not tracked by the controller.

When the customer is finished delivering product to all receiving tanks, he or she prints a receipt using the controller. The controller is not capable of ***indicating*** the quantity for either individual drafts or the total quantity delivered over the course of the transaction. The controller is not capable of ***printing*** the quantity for ***individual*** drafts; however, it does ***print*** the ***total*** quantity delivered over the course of the transaction and it calculates a total sale amount based on this quantity and a preprogrammed unit price. As a result, at the end of a delivery, if the customer has reset the analog meter indications during the course of the total delivery, the indicated quantity on the meter does not agree with the total quantity printed on the receipt.

After MN W&M rejected one of these systems for failing to comply with the provisions of NIST Handbook 44, the MN Department of Transportation (DOT) contacted both MN Weights and Measures (W&M) and NIST, OWM to ask for assistance in addressing these systems. Numerous systems of this type were installed as part of a grant to establish a network of fueling points across a geographic area. A key purpose was to provide a safety net, which allows pilots to more readily access fueling points in the event of low fuel. Thus, the operation of these systems represents a significant safety issue. Changes to these systems to gain compliance could prove so costly as to result in closure of many of these sites. Having just become aware of the requirements in HB 44 after the action by MN, MN DOT asked for assistance in developing proposed changes to HB 44 which might allow these systems to continue to operate.

MN DOT, MN Weights and Measures and OWM held a teleconference to review the requirements of Handbook 44 and the impact on these devices and agreed that a proposal with a developing status should be drafted and submitted for discussion at the 2018-2019 Regional meetings and the NCWM Interim meeting. OWM agreed to champion the item in its developing stage to help gather input which will help develop proposed changes to HB 44 that will best meet the needs of the community. A key goal is to identify requirements for how such systems need to operate to provide clear and transparent transaction information, without interrupting the service needed by consumers. A possible approach is to develop nonretroactive requirements which will apply to new systems and develop other requirements which will help existing systems move closer to compliance without significant cost or interruption to service.

In its review of this issue, NIST identified multiple other paragraphs in H44 which need to be considered as this proposal is developed. These include:

- G.S.2.
- S.1.6.3.
- S.1.6.5.6. (a)
- S..1.6.10.

NIST is still discussing options for these changes and are specifically discussing how to address systems currently in use and systems installed after a specific date. NIST, OWM has not developed a specific proposal, but wants to begin sharing this situation with officials, manufacturers, and users and allow an opportunity for input and discussion, beginning with the regional weights and measures associations and industry groups such as the Meter Manufacturers Association.

Plans are to have MN DOT available to provide information, and possibly a short presentation, on these devices at some of the Regional Weights and Measures Association meetings and/or the NCWM Interim Meeting. OWM's initial thoughts are to provide requirements such that:

(1) Indicated and recorded representations are able to display quantity of individual drafts and the total quantity dispensed for the transaction and each clearly identified (e.g., "draft 1", "draft 2," "draft 3," etc. along with "total quantity."

(2) Permit use in self-serve operations.

(3) Include individual and totalized displays which are visible to the customer during the transaction.

(4) Ensure clear instructions are provided (possibly elaborating on current instructions).

(5) Ensure agreement between printed ticket and primary indicator.

(6) Ensure quantities are appropriately identified (e.g., "total quantity" vs. "draft 1").

In addition, consideration might be given to applying all these requirements to new systems while allowing current systems to only meet some of them (e.g., items 2, 3, and 4,) or to be given an extended time frame after which they must meet all requirements. This could be done with a combination of nonretroactive and retroactive requirements.
The State of Minnesota inspected these systems because of a complaint from a customer who stated that 8 gallons of fuel was purchased but he was charged for 12 gallons. Allowing continued operation without changes to the systems or which exempt them from all current requirements for agreement and clarity might result in additional complaints and customer confusion and, thus may lead to possible safety concerns.

Providing exemptions to current requirements for these systems may be perceived as unfair treatment to other systems used in similar applications. For example, retail motor-fuel dispensers in a service station interfaced with a console/controller; vehicle-mounted metering systems interfaced with a controller, and loading-rack metering systems interfaced with a centralized controller.

Pilots represented by the Aircraft Owners and Pilot Associations (AOPA), State Aviation Administrations, FAA, Operators of small regional airports, particularly businesses, do not necessarily oppose the requirements of NIST Handbook 44 or good measurement practices, but they are very concerned that the cost of any corrections should not be so large that it forces small airports to abandon fueling services thereby threatening the network of regional airports which support small aircraft. These airports provide a safety net in case of emergencies. Additionally, for physical and environmental safety, having aviation fuel stored and dispensed through a central service at small airports is preferable to pilots bringing fuel into airports or storing it in their hangars.

Regional Association Comments:
WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM), submitter of the item, explained the issue and outlined the key concerns involved.

Paul Jordan (Ventura County CA) questioned if, rather than modifying the Handbook, there could be a change in how the systems are operated. Steven Harrington (OR) indicated in his view the proposed item is attempting to solve a local enforcement issue by changing the Handbook and, more significantly, the General Code. There others questioning why an exemption should be permitted when every other measuring system would be required to meet agreement requirements. Dick Suiter (Richard Suiter Consulting), speaking as a pilot, noted most pilots would not reset the indications between drafts. He suggested AOPA might be a good resource to consult for assistance in developing this item.

During its work sessions, the Committee noted the device is being used in a manner that doesn't comply with the current provisions of the Handbook. If a user or operator can re-zero the indications in the middle of the dispensing operation without having this reflected in the total sale, this is a problem and could potentially lead to fraudulent use. Based on the comments heard in the open hearings and its discussions, the Committee doesn't believe exemptions are warranted in NIST Handbook 44.

The Committee believes this is a local issue and there is no justification to include exemptions in NIST Handbook 44. The current systems could possibly be used appropriately by completing a sale after filling one wing and reauthorizing the system for a second transaction. Alternately, instructions that prohibit rezeroing the mechanical

indicator between drafts could be posted on the dispensing system. Additionally, instructions should be provided to the device owner regarding proper operation of the systems by the user. The Committee strongly recommends future installations use equipment that meets all provisions of NIST Handbook 44. There are already devices commercially available that can meet these requirements. Based on discussions and the rationale above, the Committee decided to withdraw this item from its agenda and not forward it to NCWM.

NEWMA 2018 Interim Meeting: No comments were received. During the work session, the Committee determined that the item may not accomplish its intended goals and requires further development by the submitter. The NEWMA S&T Committee recommends this Item be designated a Developing item.

SWMA 2018 Annual Meeting: Richard Suiter stated that these devices are being used after hours and there is currently not a specific proposal. A representative of NIST stated the item was in reference to a consumer complaint that the device caused and issue with agreement of indications within the system. The Committee believes that a proposal should be developed prior to the item being considered. The Committee recommends this item be Withdrawn.

CWMA 2018 Interim Meeting: Julie Quinn (MN) explained the history of this proposal. Michael Keilty (Endress + Hauser) stated that the Measuring Sector summarized the issue as a mechanical and electronic interface issue. They agreed that this system as described will not comply. An exception would not be appropriate. The system would need to be re-equipped to be brought into compliance. The Committee supports the further development of this item.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents. **Return To the Agenda Item**

LMD-5 UR.3.4. Printed Ticket

Background/Discussion:

The 2019 nonretroactive amendment corrected devices for the future, however it does not correct devices that are currently in use or existence. Making the requirement retroactive as of January 1, 2023 will allow users time to up-grade their current devices, either with software or machinery to meet this requirement. The 2019 nonretroactive requirement gives industry time to make the necessary changes to their software and devices. Once this has been accomplished, the same corrections can be made to existing devices currently in use. The addition of the single dispenser language will exempt small establishments from meeting the requirement because there would be no confusion from which dispenser the product was delivered.

Implementation of this requirement to dispensers in existence or currently in use is no different from the upgrades required when the cost of fuel jumped requiring both analog and digital dispensers to be able to calculate gas at a higher price per gallon.

This will make identification of dispensers in question easier for the customer, operator and the weight & measures official when

determining which dispenser may be in error during a complaint investigation. In discussions with a dispenser manufacturer, the addition of a retroactive clause and proposed time frame will not be a problem for them to meet the requirement.

Possible problems occurring from meeting this requirement: Small establishments with at least 2 dispensers may argue that the cost to upgrade software or devices may be cost prohibitive and/or requiring that hand writing the designation will slow down business as the customer will have to enter the establishment to have the attendant mark the receipt. Manufacturers may argue that the up-grade of current devices are not be possible due to age of the device hardware or restrictions of current programming capabilities of the software.

Regional Association Comments:
WWMA 2018 Annual Meeting: The Committee heard no comments on this item during its open hearings. During its work session, the Committee shared concerns that this appears to be attempting to provide an exemption from the provisions of paragraphs S.1.6.7. and S.1.6.8. which currently require the pump number be included on receipts for equipment installed as of 2021. The Committee believes additional work is required on this item to ensure there is no confusion about the application of the proposed requirements. Consequently, the Committee recommends this be designated as a Developing item.

NEWMA 2018 Interim Meeting: Walt Remmert (PA)commented that a paperless option for a receipt should be considered. The Committee believes this item has merit but that the submitter should take regional comments in to consideration and continue developing. The NEWMA S&T Committee recommends this Item be designated a Developing item.

SWMA 2018 Annual Meeting: Arkansas commented that dispensers were not required to be numbered so this would prevent this from being practical. The Committee agrees with the comments and recommends the item be withdrawn.

CWMA 2018 Interim Meeting: Tom Konst (Carroll County, OH) explained this item and requested that the item be amended as follows:

> **UR.3.4. Printed Ticket**. – The total price, the total volume of the delivery, the price per liter or gallon, *and a corresponding alpha or numeric dispenser designation shall be shown*, either printed by the device or in clear hand script, on any printed ticket issued by a device and containing any one of these.
> (Amended, 2001 and 2019) (*Nonretroactive as of January 1, 2021* **becoming Retroactive as of January 1, 2023**)
>
> **Establishments with a single dispenser having multiple meters or not more than one individual dispenser with a single meter for each product delivered are exempt from the dispenser designation requirement.**
> **(Retroactive as of January 1, 2023~~23~~XX.)**
> **(Added 2020)**

The Committee recommends voting.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

VTM – VEHICLE TANK METERS

VTM-1 S.3.1.1. Means for Clearing the Discharge Hose and UR.2.6. Clearing the Discharge Hose.

Background/Discussion:
The following includes background from the original submitter of this item (NY).

> Manifold flush systems are typically used on VTM's with multiple compartments, delivering multiple products through a single hose. The purpose of the system is to allow the driver a means of clearing the hose of product prior to delivery (e.g. clearing the hose of diesel fuel before delivering clear kerosene). These types of systems are often marketed as a safety feature in that it eliminates the need for the driver to climb on top of the truck to clear the hose. Such systems are also useful in helping avoid cross-

contamination. Typically, the driver attaches the nozzle to the manifold and pumps product back into the supply tank via the manifold until the previous product is flushed from the hose. There is often a sight gauge which allows the driver to tell when the product is flushed.

The obvious concern is that this makes it very easy for the driver to circulate product through the meter prior to delivery which goes against S.3.1. It should be noted that it also goes against S.3.1. when the driver climbs on top of the tanker and clears the hose. The distance between the flush system and the hose reel is also a factor in how easy it is for the driver to facilitate fraud.

Manifold flush systems are available from OEMs and can be found in various catalogs. Looking on multiple websites, these systems are being installed across the country and for some manufacturers seem to be standard equipment for new trucks. NY has also seen these systems installed on trucks that are for sale where the seller notes the system as a selling point. NY foresees these systems being mandated in the future as a safety requirement and would like W&Ms to have a clear policy before that happens.

Another concern is with systems that are fabricated onsite. These systems are often difficult to distinguish and installed in an inconspicuous manner. While NY has ordered many of these systems out-of-service until repaired, it can be frustrating for the owner because the truck was used in another state for years and approved by W&Ms. This lack of uniformity is problematic for both W&Ms and private industry.

NY (as the original submitter of a proposal to address these systems) is not aware of any jurisdictions that prohibit such systems and believes they are valuable for safety. NY also does not think it would be appropriate to require multiple meters and hoses due to cost and safety concerns for driver safety. It would be acceptable to have the meter automatically print a flush ticket, but the submitter questions whether this can be done, especially for systems that have been in the marketplace for many years.

At the 2018 NCWM Annual Meeting, the Committee adopted changes to S.3.1. Diversion of Measured Liquid to provide exemptions for metering systems with multiple compartments delivering multiple products through a single discharge hose, provided those systems met the provision of a newly added paragraph S.3.1.1. Means for Clearing the Discharge Hose. The NCWM also adopted a new user requirement to address the maintenance of records when product is flushed between deliveries of different product types.

OWM and others have raised concerns about how such systems can, without additional safeguards, facilitate fraud. Over the past few years, at the 2018 Interim Meeting, and leading up to the 2018 NCWM Annual Meeting OWM had proposed additional requirements to help address those concerns; however, those changes could not be included at the 2018 meeting without delaying voting on the remaining portion of the proposal. The Committee, with support from NY (as the original submitter), OWM, MMA, and others, decided to move forward with a portion of the proposal for a vote and carry the remaining portion of OWM's suggested changes over as an item on the Committee's agenda. NY and OWM agreed to assume joint responsibility for this carryover item.

The changes proposed in this carryover item are intended to ensure such systems are designed such that they do not facilitate fraud; help ensure owners understand their responsibilities when installing such a system; and ensure uniformity in enforcement throughout the country. The changes reflect suggested language from OWM's previous analyses of this issue and incorporate comments received from the MMA and others during the 2018 NCWM Annual Meeting. The submitter has suggested some of these changes may need to be made "nonretroactive" to allow time for manufacturers of flush systems to incorporate the safeguards into their system. NY and OWM welcome comments as this item is further considered.

The Committee's intent in creating this carryover item is to allow additional time for review and comment on the proposed changes, with the goal of moving these changes forward for a vote in 2019.

Regional Association Comments:

WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM), co-submitter of the item, outlined the history of the proposal, noting the proposed changes are a follow-on to the related item adopted at the 2018 NCWM Annual Meeting to address the appropriate use of these systems. At that meeting, NIST OWM recommended additional changes as shown in the current proposal to help ensure systems are designed with features that help minimize the

potential for fraud when these manifold systems are in use and to ensure owners/operators understand what criteria they must adhere to when using the device. The two submitters of this item (OWM and NY) believe these changes are ready for consideration as Voting items.

Hearing no other comments from the body on this item, the Committee recommends the item be designated as a Voting item.

NEWMA 2018 Interim Meeting: Mike Sikula (New York) expressed support for the direction of this proposal. He is not aware of any flush systems that communicate with a metering system at this time and recommends this item continue as an Informational item in order to gather more information from meter manufacturers. The NEWMA S&T Committee recommends this item remain with an Informational item.

SWMA 2018 Annual Meeting: A representative of Florida stated that he understands this proposal was submitted to allow companies to purge similar products but warned of cross-contamination of non-compatible products (Diesel and Gasoline) when a single hose and single meter was used for a multiple compartment truck. NIST believes the item to be fully developed. The Committee would like for the proposal to state this was meant for heating oil product applications only. With this addressing the heating oil application they are recommending it be a Voting item.

CWMA 2018 Interim Meeting: No comments were heard. The Committee recommends this be a voting item with clarification of when this will be implemented, and what requirements are Non-retroactive.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents. **Return To the Agenda Item**

LPG – LPG AND ANHYDROUS AMMONIA LIQUID-MEASURING DEVICES

LPG-2 D S.2.5. Zero-Set-Back Interlock, Stationary and Vehicle Mounted Meters, Electronic

Background/Discussion:
This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Mr. Joe Eccleston
Maryland Department of Agriculture
(410) 841-5790, joseph.eccleston@maryland.gov

This specification has been in place for VTMs for many years. Its purpose is to prevent a second party from being charged for product delivered to the first party. However, there is no requirement for interlocks in the LPG Code, other than the requirement added in 2016 for stationary retail motor fuel devices. Currently, the only protection is provided by two User Requirements paragraphs, UR.2.5. Ticket in Printing Device, which prohibits the "riding of tickets" (having a ticket in the printer while the vehicle is moving from one location to another) and UR.2.1. Return of Indication and Recording Element to Zero, which requires the indications to be set to zero before a delivery. Both of these requirements are extremely difficult, if not impossible to enforce where printers are frequently mounted in the cab of the vehicle and are not visible to an observer outside the vehicle.

In addition, electronic registers used in stationary applications shall not be exempt from this requirement due to the possibility of a second party being charged for product delivered to the first party in this scenario as well.

This requirement for electronic indicators already exists in the VTM Code and being as the majority of electronic registers are used in both applications, I cannot see any objections as to why this requirement should be added to the LPG and Anhydrous Ammonia Liquid-Measuring Device Code.

During the 2018 NCWM Interim Meeting, the Committee received the following comments on this item during the open hearings:

Mr. Ken Ramsburg (MD) stated that he believes this is "harmonizing the VTM Code."

Mr. Dmitri Karimov (Liquid Controls), speaking on behalf of the Meter Manufacturers Association (MMA), stated that the MMA supports and agrees with the proposed NIST language.

Mr. Mike Sikula (NY), stated that he supports the proposal even though he hasn't seen the NIST language.

The proposed new paragraph is intended to be nonretroactive, although the submitter of the item did not propose an effective date.

During the Committee's work session, members of the Committee felt that the nonretroactive date needed to be included before the item could be advanced to a "Voting" status. The Committee elected to maintain the item on its agenda as "Developing" pending agreement of an effective date.

The Committee did not take comments during open hearings on Developing items at the 2018 NCWM Annual Meeting except to grant the submitter of a Developing item (or block of Developing items) an opportunity to provide an update on the progress made to further develop the item(s) since the 2018 NCWM Interim Meeting. There were no comments or updates provided on this item by the submitter at the Annual meeting.

OWM provided the following written recommendations and comments to this item as feedback to the submitter and as part of its analysis of the S&T Committee's 2018 agenda items:

> OWM reiterates its comments included in the analysis it provided to the Committee at the January 2018 Interim Meeting. OWM agrees with the submitter that additional requirements should be added to the LPG Code for a zero-set-back interlock for electronic stationary (other than stationary retail motor fuel dispensers) and vehicle-mounted meters. OWM recommends adding a parenthetical to the title to limit the application of the new paragraph to stationary meters that are not used in retail motor-fuel applications; this will eliminate redundancy and help avoid confusion over how the **existing** paragraph S.2.5. Zero-Set-Back Interlock for Stationary Retail Motor-Fuel Devices (which includes similar requirements to the proposed new paragraph) would apply.
>
> The last sentence of proposed **new** paragraph S.2.5. (S.2.5. Zero-Set-Back Interlock, Stationary (other than Stationary Retail Motor-Fuel Dispensers) and Vehicle-Mounted Meters, Electronic) includes a time-out limit. We agree a time-out specification is appropriate; however, we suggest that it be addressed in a separate paragraph. During our analysis, we noted that a new paragraph (S.1.6.10. Automatic Timeout, Pay-at-Pump Retail Motor-Fuel Devices) was added to the LMD Code in 2017 specifying an automatic timeout for retail motor-fuel applications where payment is rendered via a card at the dispenser; however, a corresponding paragraph to address LPG systems used in RMFD applications was not added at the same time. In keeping with the S&T Committee's past efforts to align requirements for RMFDs in the LMD Code and the LPG & Anhydrous Ammonia Liquid-Measuring Devices Code, we suggest the Committee consider adding another paragraph to the proposal to mirror this requirement in the LMD Code. By moving the timeout limit in the proposed **new** paragraph S.2.5. into a separate paragraph (S.2.6. Automatic Timeout, Stationary (Other than Stationary Retail-Motor Fuel Dispensers), the format of requirements for (1) zero-set-back interlock requirements and (2) timeout provisions will be consistent for stationary retail motor-fuel dispensers and other types of stationary devices.
>
> Thus, OWM offers the following alternate proposal for the submitter's consideration as the item is further developed. OWM concurs with comments from the 2018 Interim Meeting regarding the need to propose a specific nonretroactive date to allow for interested parties the opportunity to consider the effective date.
>
> **S.2.5. *Zero-Set-Back Interlock, Stationary (Other than Stationary Retail Motor-Fuel Dispensers) and Vehicle-Mounted Meters, Electronic. - A device shall be so constructed that after an individual or***

multiple deliveries at one location have been completed, an automatic interlock system shall engage to prevent a subsequent delivery until the indicating and, if equipped, recording elements have been returned to their zero position.
(Added 20XX) (Nonretroactive as of 20XX)

S.2.6. Automatic Timeout, Stationary (Other than Stationary Retail Motor-Fuel Dispensers) and Vehicle-Mounted Meters, Electronic. For individual deliveries, if there is no product flow for three minutes the transaction must be completed before additional product flow is allowed. The 3-minute timeout shall be a sealable feature ~~on~~ of an indicator.
(Added 20XX) (Nonretroactive as of 20XX)

S.2.7. Zero-Set-Back Interlock for Stationary Retail Motor-Fuel Devices. *– A device shall be constructed so that:*

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S.2.8. ***Automatic Timeout Pay-at-Pump Retail Motor-Fuel Devices. – Once a device has been authorized, it must de-authorize within two minutes if not activated. Re-authorization of the device must be performed before any product can be dispensed. If the time limit to de-authorize the device is programmable, it shall not accept an entry greater than two minutes.***
(Added 20XX) (Nonretroactive as of 20XX)

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Renumber remaining paragraphs.

After a brief discussion, the Committee felt the item was important to harmonize the LPG requirements between measuring codes and agreed to carryover this item on its agenda as a Developing item.

Regional Association Comments:

WWMA 2018 Annual Meeting: The Committee heard no comments on this item during its open hearings. During its work session, the Committee questioned whether equipment is available to meet this requirement in stationary applications. While it is appropriate to apply this requirement to electronic vehicle-mounted systems as is done in the Vehicle-Tank Meters Code, the Committee questions the impact on stationary devices currently in the field and believes the reference to "stationary" should be struck. The Committee believes additional input and possible modification is needed before recommending this item for Voting. Consequently, the Committee recommends this item be designated as Developing.

NEWMA 2018 Interim Meeting: No comments were received. Hearing no opposition or discussion on this item, the NEWMA S&T Committee believes this item is fully developed and recommends this Item be designated a Voting item.

SWMA 2018 Annual Meeting: The submitter requested this be a Voting item. A representative of Arkansas stated he would like to see the auto time out set to 2 minutes to be in harmony with other codes. The submitter agreed to that change. The Committee recommends this as a voting item with the time changed from 3 minute to 2 minutes.

CWMA 2018 Interim Meeting: No comments were heard. The Committee recommends this item be developing with clarification of the reasoning of the three-minute time out versus the two-minute.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

LPG-3 D N.3. Test Drafts.

Background/Discussion:
These items have been assigned to the submitter for further development. For more information or to provide comment, please contact:

Mr. Michael Keilty
Endress + Hauser Flowtec AG
(970) 586-2122, michael.keilty@us.endress.com

The use of transfer standards is recognized in Code sections 3.34 Cryogenic Liquid-Measuring Devices Code and 3.38 Carbon Dioxide Liquid-Measuring Devices Code and 3.39 Hydrogen Gas-Measuring Devices – Tentative Code. Transfer standard is only defined for testing cryogenic liquid measuring devices. It has been pointed out that the term transfer standard is not correct and that field reference standard meters may be more appropriate. See new the item under consideration, updated on September 8, 2017.

Field evaluation of LPG meters and CNG dispensers and LNG dispensers is very difficult using volumetric and gravimetric field standards and methods. The tolerances for these applications are such that using field reference standard meters are more efficient and safer. With CNG and LNG and LPG applications, the field reference standard meters are placed in-line with the delivery system as it is used to fill tanks and vehicles. The use of field reference standard meters eliminates return to storage issues. The use of field reference standard meters is easier and faster compared to the use of traditional field standards. The cost of using field reference standard meters and transporting them is much less than the cost of traditional field provers and standards.

Recognition in Handbook 44 will enable States to allow field reference standard meters to place systems into service and for field enforcement.

Volumetric field provers and gravimetric field proving are susceptible to environmental influences. The State of Colorado uses a field reference standard meter to test propane delivery truck meters. The State of Nebraska has used a field reference standard meter to test agricultural chemical meters. Other States have asked that there be recognition in HB44 in order for their State to allow the use of field reference standard meters.

In some applications, field reference standard meters are not more accurate than the meters used in the application. For that reason, longer test drafts and possibly more tests may need to be run.
The State of California is purported to have conducted a short study of field reference standard meters in the past. The conclusion did not lead to wide adoption of the practice.

Section 3.37 Mass Flow Meters user requirement U.R.3.8. Return of Product to Storage, Retail Compressed Natural Gas Dispensers requires that the natural gas which is delivered into the test container must be returned to storage. This is difficult and most often not complied with when the test vessel contents are released to atmosphere. States often have difficulties in remote locations finding suitable field reference equipment.

The Committee initially considered a proposal to modify paragraph N.3. Test Drafts and to add a new paragraph N.3.2. Transfer Standard Test as shown below. Note that, in Fall 2016, Mr. Keilty provided an update to this proposal as shown in the Item Under Consideration above.

N.3. Test Drafts. –

N.3.1 Minimum Test - Test drafts should be equal to at least the amount delivered by the device in one minute at its normal discharge rate.
(Amended 1982)

N.3.2. Transfer Standard Test. – When comparing a meter with a calibrated transfer standard, the test draft shall be equal to at least the amount delivered by the device in 2 minutes at its maximum discharge rate.

The submitter recommended that NIST update EPO 28 for CNG dispensers and EPO 26 for LPG Liquid Measuring Systems to include transfer standard meter tests. NIST Handbook 105-4 should also be revised to specifically address the transfer standard meter and the requirements for use.

The S&T Committee might also consider amending Sections 3.30 Liquid-Measuring Devices Code and 3.31 Vehicle-Tank Meters Code to allow transfer standard meters.

At the 2015 NCWM Interim and Annual Meetings, the Committee received comments both in support of and in opposition to the proposal outlined in this item and a corresponding item in the Mass Flow Meters Code. Mr. Mike Keilty (Endress + Hauser Flowtec AG USA), submitter of these two items, outlined the benefits of using a master meter as a standard in testing application such as CNG, LNG, and LPG. The Committee heard comments in opposition to the proposal from Mr. Henry Oppermann (Weights and Measures Consulting, LLC), speaking on behalf of himself, as well as Seraphin Test Measure, Co. Mr. Oppermann noted there are significant differences between a transfer standard and a field standard. Mrs. Tina Butcher (NIST OWM) acknowledged the advantages to identifying and developing alternate test methods such as this but noted that simply adding the proposed language doesn't address the multiple other elements that need to be in place to ensure traceability; OWM provided a list of those elements along with other suggestions. OWM noted that the USNWG on Alternative Test Methods might be a better venue to develop the elements to support the use of these devices. This was echoed by Mr. Dmitri Karimov (Liquid Control, LLC) who also commented that the regulatory authority must assess the suitability of a given standard. The Committee also heard from Ms. Kristin Macey (CA) who commented that if the proposal were adopted, it would allow use of a transfer standard and California would not be able to fully support it, citing results of comparison testing conducted by CA in which the master meter performed worst of the three methods examined. Mr. Keilty, in response to Mrs. Butcher's and Mr. Oppermann's comments, stated that he agreed completely and noted that adding the paragraph to these two codes is a step towards allowing the use of transfer standards and it's understood that there are many things that would need to be in place in order that they be considered suitable for use in testing. The Committee also heard other comments from regulators and industry supporting the continued development of this issue. The Committee agreed that the item has merit but needs further development and suggested the submitter work with OWM by providing data for the USNWG to consider.

See the Committee's 2015 Final Report for details.

At the 2016 NCWM Interim and Annual Meetings, the Committee again heard comments both in support of and in opposition to this item and the corresponding item in the Mass Flow Meters Code. Mr. Michael Keilty (Endress + Hauser Flowtec), the submitter, stated that he supported this item as a Voting item as did Alan Walker (FL). Others expressed support of the item but noted the need for additional development. The Committee heard again from Mrs. Tina Butcher and Mr. Henry Oppermann, who reiterated their 2015 detailed comments regarding the tasks that need to be completed before considering changes to Handbook 44. Both echoed the need to collect data in order to properly evaluate whether or not a master meter could be considered a suitable standard.

During its Interim Meeting work session, the Committee acknowledged comments suggesting the need for additional test data. It was also acknowledged that there was a lot of support for the proposal. Those supporting the proposal had indicated that using a transfer standard is much easier and faster than testing gravimetrically and eliminates the need to discharge product from a prover into the atmosphere, which is viewed by many as a safety concern. Given that the addition of the proposed language would not dictate the method of testing and the decision on whether or not to use a particular method of testing would remain with each jurisdiction, the Committee agreed to present both items for vote at the Annual Meeting.

At the 2016 NCWM Annual Meeting, the Committee received numerous comments from industry and regulators alike, predominantly in support of the proposals. These comments cited benefits such as safety; faster and more efficient testing; and lack of problems with using master meters. Mr. Marc Buttler (Emerson Process Management – Micro Motion) also expressed supports of the items but suggested replacing the words "maximum discharge rate" with "maximum test rate" in proposed paragraph N.3.2.; the submitter agreed with the suggestion.

The Committee also heard comments in opposition to the item and comments emphasizing the need for further development and data. A new comment offered by Mrs. Tina Butcher (NIST OWM) noted that the proposed new

paragraph N.3.1. would create a conflict with the minimum test procedures outlined in the NIST EPO for CNG dispensers since tests conducted at the MMQ and at some other quantities are frequently completed in less than one minute. There was also some debate regarding the application of the Fundamental Considerations with regard to the allocation of error and uncertainty associated with a given test method and Mr. Henry Oppermann clarified the proper application of these criteria. Mr. Oppermann noted that transfer standards, in some cases, are no more accurate than the meter being tested and that the proposals lack a specification associated with the performance of the standard. He recommended the items be downgraded to Informational or Developmental.

During the Committee's work session, members of the Committee agreed that the comments received during the open hearings were mostly in support of the two proposals. The Committee discussed the proposed changes to the text, including the errors in the transcription of the text in the Item Under Consideration. The Committee discussed the potential impact on testing CNG dispensers, acknowledging that the proposed requirement cannot be met by someone wanting to apply the procedures in the NIST EPO (which were developed through a work group comprised of industry and regulatory officials). Some Committee members familiar with CNG testing concurred that a test run typically takes less than one minute to complete. The Committee was concerned with the potential conflict and questioned whether the submitter had fully considered the impact of the proposed language. These discussions led the Committee to decide to change the status of the item from Voting to Developmental and return them to the submitter for further development.

See the Committee's 2016 Final Report for details.

Just prior to the 2017 NCWM Interim Meeting, the Committee agreed to amend the proposal in Agenda Item 3302-1 to that shown in Item under Consideration of the Committee's 2017 Final Report at the request of Mr. Michael Keilty (Endress & Hauser Flowtec AG USA), submitter of the item. The Committee chairman, Dr. Matthew Curran (FL) announced during open hearings of the Committee at the 2017 NCWM Interim Meeting that the proposal had been changed and that the revised version had been posted on NCWM's website.

During the 2017 NCWM Interim Meeting, the Committee grouped Agenda Item 3302-1 and 3307-2 together and took comments on these items simultaneously because it considered these items related.

Mr. Michael Keilty (Endress + Hauser Flowtec AG USA), submitter of the item, commented that this was a Voting item at the 2016 NCWM Annual Meeting during, where it was downgraded to a Developing status. He further offered the opinion that there was not a good mechanism for relaying back to the submitter what an item needs in the way of development. Having now submitted the item with amended language, he said that he would like to see this item put to a vote.

As was the case during open hearings of the Committee in 2015 and 2016, similar comments were received both in support of and in opposition to this item and the corresponding item in the Mass Flow Meters Code in 2017.

Ms. Tina Butcher (NIST OWM) spoke of the need for standards used in testing to comply with the tolerances for standards specified in HB 44 Appendix A - Fundamental Considerations which, she noted, requires the combined error and uncertainty of any standard used without correction to be less than one-third the applicable device tolerance. She also made evident the potential for more than one type of standard to be used in testing, noting that the tolerances specified the Carbon Dioxide Liquid-Measuring Devices Code of HB 44 increase for different test methods. She stated that the proposal seemed to address only one particular type of transfer standard, i.e., a master meter, and, as a result, the proposal could have a very limiting effect on the types of transfer standards that can be used. She also questioned the use of the term "transfer standard" and suggested that the term, "field standard" may be a more appropriate term. As a final comment, she reiterated a previous OWM comment that more data is needed of comparisons to known standards.

Mr. Bruce Swiecicki (National Propane Gas Association), Mr. Constantine Cotsoradis (Flint Hills Resources), and Mr. Hal Prince (Florida), commented in support of the item and requested the item move forward.

Mr. Ross Andersen (NY, retired) gave an example of alternative test methods being used for like applications, such as what the ASTM does. He stated that different test methods will have different results and that variables of those methods need to be evaluated. He commented that we are currently evaluating only one variable.

In consideration of the comments received on these two items, the Committee agreed to present them for vote at the 2017 NCWM Annual Meeting.

At the 2017 NCWM Annual Meeting, the Committee again grouped this item with Agenda Item 3307-2 and took comments on the two items at the same time. Several industry and regulatory officials voiced support to presenting the two items for vote. Some of those speaking in support of the items acknowledged that a lot of additional work still needed to be completed to confirm the adequacy of alternative test measures, such as a master meter, for use as a standard in testing commercial devices. The Committee was urged by some, however, to present the items for vote, noting that some states are already using alternative standards for testing and that the additional work needed to confirm their adequacy can be completed post adoption of the proposals.

There were also several who spoke in favor of maintaining the Developing status of the items. Mr. Steve Harrington (OR), for example, reported that the State of Oregon is pursuing the use of a mass flow meter standard for use in testing LPG meters. He noted that additional work is needed to develop procedures that will confirm the adequacy of the mass flow meter (standard) for use in testing LPG meters used in commercial applications. He recommended maintaining the Developing status of the items.

Ms. Tina Butcher (NIST OWM) reported that OWM believes the proposed changes are premature. More work is needed and OWM recommends maintaining the items as Developing. Mrs. Butcher provided an update on some ongoing work relating to alternative test methods and the current proposals under consideration as follows:

- The NTEP Measuring Sector is developing guidelines for type-evaluation laboratories when conducting type evaluation using alternative types of standards.

- NIST OWM has established a USNWG to examine alternative test methods.
    - The USNWG subgroup has been working to establish uncertainties for select test methods and examining data from some field tests.
    - The Group has developed guidelines for collecting measurement data.
    - The guidelines can be used by equipment manufacturers and/or W&M jurisdictions to collect data to examine different test methods and types of test standards.
    - Guidelines include tasks such as:
        - Developing a test protocol for collecting data and for identifying testing factors that may contribute the largest uncertainties in testing;
        - Following guidelines for data collection;
        - Collecting sufficient data under a similar variety of user conditions;
        - Identifying the major factors that could affect test results and contribute the largest uncertainties in testing;
        - Ensuring that Handbook 44 and EPOs are updated and available for its use;
        - Making all results and assessments accessible to States and other enforcement agencies; and
        - Publish an updated NIST 105 Series and calibration procedures, if not available.

- OWM is in the process of developing a proposal to address the use of the term “transfer standard” throughout HB44. According to NIST HB 130, the International Vocabulary of Metrology, and references in HB 44 Fundamental considerations, the reference in the current proposals should be “field standard.” OWM plans to submit the proposal for consideration during the 2018 NCWM cycle.

Ms. Butcher also noted that OWM has a significant concern with the proposal in Agenda Item 3307-2 because proposed new paragraph N.3.1. conflicts with the minimum test of a CNG RMFD being performed today in accordance with the NIST EPO. A test conducted at the MMQ typically takes far less than a minute to complete. Additionally, the test drafts performed at one-third, two-thirds, and three-thirds test tank capacity often are completed in less than a minute’s time.

Ms. Butcher also reiterated many of the points OWM had provided in previous NCWM Meetings relating to these two proposals. The following is a short summary of these points:

- The development of alternative methods of testing commercial metering systems is an important issue. Many applications, in which using currently recognized test methods, may be not be feasible because of product characteristics, safety, cost, access to equipment, and other factors.

- Modifying HB 44 as proposed doesn't ensure approval of any proposed test method. The decision on whether or not to accept a particular test method rests with the regulatory authority.

- Many things must be considered when selecting and determining the suitability of field standards to provide traceable measurements. These are sometimes referred to as the "essential elements of traceability." The following are some examples:
  - accuracy of a particular test standard relative to the applicable tolerance;
  - demonstrated reliability of the device over time;
  - device repeatability;
  - how well it duplicates actual use;
  - existence of documentary standards for the test equipment;
  - availability of equipment/facilities within a state lab to test the equipment; and
  - whether training has been provided for the lab staff, field officials, and users of the equipment.

- NIST HB 44 Fundamental Considerations, Section 3.2. Tolerances for Standards, specify that when a standard is used without correction, its combined error and uncertainty must be less than one-third of the applicable tolerance.

- The current proposal seems to simply borrow from other codes without technical rationale. There is a potential for more than one type of alternative test method. The current proposal may unintentionally limit other types.

- Even within the category of "master meters," different requirements may be needed for different master meter technologies in order to comply with this requirement.

- Should consideration be given to providing a larger tolerance when conducting tests using a particular test method as is done in the carbon dioxide and hydrogen codes? Testing would need to be conducted to demonstrate the magnitude of the additional tolerance.

- W&M needs a system that results in:
  - manufacturers knowing the requirements for the design of the standard;
  - systematic and appropriate collection of measurement data on proposed standards; and
  - states (regulatory authority) having access to the measurement data;
  - side-by-side testing to compare results with existing test methods.

- Additional data and analysis is needed prior to recommending specific language for adoption in HB 44.

Mr. Henry Oppermann, (Weights and Measures Consulting, LLC) speaking on his own behalf, as well as consultant for Seraphin Test Measure, Co. stated there is no clear understanding of the terms "field standard" and "transfer standard." Any standard proposed for use in testing must meet the tolerances for standards specified in the Fundamental Considerations (Appendix A) of HB 44 and there must be proof that the standard is able to comply with the tolerance over a range of field conditions. He raised the question, "without data to support the accuracy of a standard, how do you know it is accurate enough to use in testing a commercial device?" Mr. Oppermann expressed the need for the development of a test method (or procedures) that can be used to identify meters that perform well enough that they can be used as a standard in testing. Mr. Robert Murnane (Seraphin Test Measure, Co.) stated that he echoed Mr. Oppermann's comments. He acknowledged the existence of the national work group

that NIST had created for the purpose of identifying the variables and parameters over which a proposed alternate standard must be tested and evaluated to ensure that the methodologies and standards facilitate measurements that have metrological traceability. He noted also that jurisdictions could already use alternative standards if controls are in place to validate their traceability. Mr. Oppermann and Mr. Murnane both forwarded written comments to the Committee in advance of the meeting opposing the adoption of these two items and recommending their status be changed from Voting to Developing.

Mr. Michael Keilty (Endress + Hauser Flowtec AG USA) stated that he would entertain a change to the terminology (transfer standard) in his proposals. He reported that some jurisdictions will not allow the use of a transfer standard unless it is mentioned in HB 44. He said that he agreed with Mr. Murnane and Ms. Butcher that procedures would still need to be in place to ensure the adequacy of that standard for use in testing a commercial device. He recommended the Committee present the two items for vote.

Based on the concerns raised by numerous members during the open hearings and recommendations from all four regional associations, the Committee felt the two items in the group had merit, but more work is necessary to move them forward and the Committee agreed to downgrade them to a Developing status.

During the 2018 NCWM Interim Meeting, the Committee heard from Mr. Michael Keilty (Endress + Hauser Flowtec AG USA), submitter of the item, that he originally proposed this item in 2014. The item went to a vote and was pulled back due to objections. He stated that there has been widespread support for the use of these meters in the meter manufactures meetings. The proposed language was modified to "field reference standard meter test" in consideration of Mr. Oppermann's letter in regard to "transfer standards." An additional change was to amend the time, with respect to the minimum amount delivered, from 2 minutes to 1 minute. He mentioned that the OWM's analysis said that Mr. Val Miller (OWM) was assigned to look into this item but he had not heard from him. Mr. Keilty feels that the language in the proposal is appropriate and asked that this item be moved forward as a "Voting" item.

Mr. Henry Oppermann (Weights and Measures Consulting, LLC) speaking on his own behalf, as well as representing Seraphin Test Measure Co., commented during Block 5's open hearings, to address this Item. He spoke to the letter that he submitted and recommended that the item remain "Developing."

During the Committee's work session, the members considered the comments heard on this item. The Committee agreed to recommend that this item remain "Developing." The Committee also agreed that items LPG-4, MFM-2, and all Block 5 items are related to the Block 4 items due to terminology. The Committee recommends that the submitter of the Block 4 items (OWM) provide detail of their developing language to the submitter of the related items (Endress + Hauser Flowtec AG USA) to prevent conflicting terms as they are considered during future meetings.

The Committee did not take comments during open hearings on Developing items at the 2018 NCWM Annual Meeting except to grant the submitter of a Developing item (or block of Developing items) an opportunity to provide an update on the progress made to further develop the item(s) since the 2018 NCWM Interim Meeting. At the 2018 NCWM Annual Meeting, the Committee received comments from the submitter of this item, Mr. Michael Keilty (Endress + Hauser Flowtec AG USA). Mr. Keilty reported he had proposed this item in 2014 to allow flow meters to be used as field reference standards. Mr. Keilty indicated he believes the item is ready to be presented for vote. He stated there was a question in terms of the time of delivery specified in the proposal, i.e., "in one minute," but this is a minimum amount of time. More time could be used. The only thing that might be questionable is the terminology. NIST's terminology difference could be an editorial change.

OWM provided the following written recommendations and comments to this item and item MFM-2, which OWM considers similar, as feedback to the submitter and as part of its analysis of the S&T Committee's 2018 agenda items:

> Since 2015, the S&T Committee has had items LPG-4 N.3. Test Drafts and MFM-2 Test Drafts (previously numbered 3302-1 and 3307-1 and 332-5 and 337-3) on its agenda related to the use of what are being referenced as "transfer standards" (also referred to as "master meters" by many). OWM recognizes many in

the weights and measures community, regulators and service companies alike, would like to use "master meters" for testing products such as LPG and compressed natural gas (CNG). OWM believes using such test equipment, if appropriately verified, may offer advantages in terms of: (1) practicality for some types of measurements; (2) cost effectiveness; (3) saving time; and (4) increasing safety. However, simply adding a paragraph to the notes sections of these two codes does not ensure that the use of such devices as a standard for testing is appropriate. OWM offers three vital points for the community's consideration as it deliberates on modifying handbook codes to recognize the use of alternate test apparatus. Work to establish uniform specifications and terminology for test standards is still needed in, as a minimum, the following areas:

1. Requirements and guidelines for using "legal-for-trade" devices as field test standards, particularly when using commercially available, "legal-for-trade" devices.

2. Adding delivery time requirements when based on adequate data that supports the requirement.

3. Use the term "field standard" to replace terms such as "transfer standard," "master meter," and other terms used to describe a standard used to test legal-for-trade devices. These standards would be used to evaluate the performance of devices for type approval and use in field applications. This related issue remains a Developing item on the Committee's agenda.

OWM offers the following technical comments on each of these points.

1. **Requirements for "legal-for-trade" devices used as standards.**

When standards are used to test legal-for-trade devices, it is crucial that there be data available to support the NIST HB 44 Appendix A, Fundamental Consideration for testing apparatus; this section states that when the standard is used without correction, its combined error and uncertainty must be less than one-third of the applicable device tolerance.

In previous reviews of these items and comments to the S&T Committee as part of its regular "analysis of issues," OWM provided a list of the different "essential elements of traceability" that need to be in place before such testing equipment can be recognized as a "standard." These elements are listed below.

A thorough evaluation of the standard must be conducted that includes:

- collection of data from the use of the standard over wide environmental conditions (since this standard will be used in various locations throughout the U.S.);
- demonstration of its reliability and repeatability over time; and
- determination that its design is suitable so that tests can be conducted under conditions of actual use of the device.

In addition, prior to acceptance of field standards, there are necessary components that should be in place at multiple levels in the weights and measures infrastructure such as:

- Laboratory testing to verify the standard, including:
  - Adequate equipment and facilities for testing the standards in the laboratory.
  - Documented criteria for the standards.
    - For example, a NIST 105 or other document outlining requirements and other criteria.
  - Documented and accepted procedures for testing the standards.
  - Training for laboratory staff.
- Field Testing
  - Training for field staff (service person and regulatory officials).
  - Documented test procedures for use of the standards.
    - For example, an EPO or other documented procedure.
  - Documentary standards to support the use of the standards
    - For example, changes needed (if any) to address the use of the standards to test a particular type of measuring system.

- Other Issues
  - Assessment of the appropriateness of the standard for use in testing commercial measuring (or weighing) systems.
  - Plans for implementation of standards and test procedures and associated training to ensure common understanding and application.

A system is needed for acceptance of field standards that results in the following:

- Manufacturers knowing and applying the requirements for the design of the standard;
- Systematic and appropriate collection of measurement data on proposed new standards;
- States (regulatory authority) having access to the measurement data to determine whether or not a standard meets the requirements; and
- Proper training and procedures for field use of the standards.

OWM developed general guidelines for use in collecting data that States, interested in verification of standards used in field evaluation, may use to collect data. OWM is also working with the Alternative Test Methods Work Group in efforts to analyze and review data collected that can be shared with States.

In addition, OWM recognizes the need to assess the appropriateness of the use of "master meters" as field standards and the need to control the variables associated with using a meter as a field standard. To help the community begin addressing this current gap, OWM is doing work to analyze the issues involved in establishing traceability of such systems to assist jurisdictions in investigating the possibility of using such systems. As part of this work, OWM is purchasing six Coriolis meters as follows to test refined fuels, LPG, and CNG:

- Two ½-inch Coriolis meters
- One 1-inch Coriolis meter
- Two 1½-inch Coriolis meters
- One 3-inch Coriolis meter, and
- One ½-inch meter specifically designed as a master meter to test CNG

OWM will work with states and industry to collect field data to determine if these standards will meet the Fundamental Considerations Section 3.2 in NIST HB 44.

2. Adding "delivery time" requirements when the specified "delivery time" is based on adequate data that supports the requirement.

In its previous analyses, OWM pointed out data needs to be provided to ensure an appropriate time is specified in the requirements for N.3.2. Field Reference Standard Meter Test for delivery of a sufficient test draft. Including a specified time helps ensure a fair test of the device's performance and must take into account the design/technology of test equipment used to test a commercial device. OWM has questioned the basis for the minimum delivery times proposed in the current and earlier versions of the Items LPG-4 and MFM-2 and continues to note no justification has been provided for either the specific time limit suggested or the need for this additional paragraph.

In the most recent version of the proposed N.3.2., the time limit is proposed as one minute "*at the flow rate being tested*" as opposed to one minute at the "*normal discharge rate*" of the device being tested. OWM questions the rationale behind establishing the time frame based on different criteria.

The recommended minimum test procedures specified in NIST EPOs for metering systems requires the following two tests:

(1) a "normal" test (sometimes referred to as a "fast" test) conducted at the normal discharge rate of the meter in the installation. and
(2) a "special" test (sometimes referred to as a "slow" test) conducted at a flow rate slightly above the marked minimum discharge rate.

These two tests allow the inspector to assess: (1) the condition of the meter; (2) the maintenance of the metering system; and (3) the use of adjustments. In making this analysis, it is essential that the only variable that change is the flow rate.

For example, the minimum tests for an LPG metering system equipped with an automatic temperature compensating (ATC) system includes:

(1) Normal (fast flow) with ATC activated
(2) Normal (fast flow) with ATC de-activated
(3) Special (slow flow) with ATC de-activated

The test draft size and other conditions such as temperature and pressure must be as similar as possible for the three tests.

For tests (1) and (2), the flow rate, draft size, and other conditions such as temperature and presser are the same; the only variable that is the activation/de-activation of the ATC system. Examining the results of the first two tests together allows for an assessment of how the ATC is functioning and whether adjustments to the ATC may have been used to (inappropriately) make adjustments to compensate for meter wear.

For tests (2) and (3), the activation/de-activation of the ATC system, draft size, and other conditions such as temperature and presser are the same; the only variable is the flow rate. Examining the results of the second and third tests together allows for an assessment of the meter's condition and whether or not adjustments may have been used inappropriately to mask extreme wear in the meter as opposed to bringing the meter as close to zero error as possible.

Thus, if a test conducted at a slower flow rate is of a *different draft size*, as outlined in the proposal, the results of that test cannot be used to make the latter assessment. OWM is concerned that the proposed change to N.3.2. might be misinterpreted by inspectors and service personnel and result in unnecessary additional testing.

3. Using the term "field standards" to replace terms such as "transfer standards," "master meter," and other terms used to describe a standard used to test legal-for-trade devices.

OWM notes items N.3.2. LPG-4 and MFM–2 use the terminology "Field Reference Standard Meter Test." There are other proposals on the Committee's agenda currently addressing the need to review and revise terminology used for standards and test equipment used in the testing of commercial weighing and measuring systems.

In Block 4 of the Committee's report, OWM submitted proposed changes to the following sections of NIST Handbook under the general heading of "Terminology for Testing Standards."

- Scales Code
- Automatic Bulk Weighing Systems Code
- Automatic Weighing Systems Code
- Cryogenic Liquid-Measuring Devices Code
- Carbon Dioxide Liquid-Measuring Devices Code
- Hydrogen Gas-Measuring Devices Code
- Grain Moisture Meters Code,
- Electronic Livestock, Meat, and Poultry Evaluation Systems and/or Devices Code
- Appendix A
- Appendix D

The changes proposed in the Block 4 items are intended to standardize Handbook 44 terminology for standards used in testing commercial weighing and measuring systems. In those items OWM proposes the use of the term "field standard" to describe these standards.

Endress+Hauser Flowtec submitted similar proposals under Block 5 Define "Field Reference Standards" to add a definition for field reference standard and delete the use of transfer standards in the following Handbook 44 codes.

- Cryogenic Liquid-Measuring Devices Code
- Carbon Dioxide Liquid-Measuring Devices Code
- Hydrogen Gas-Measuring Devices Code

To allow for the opportunity to incorporate comments received on its Block 4 items, OWM continues to recommend those items be designated as "Developing" items. OWM expects to make progress on addressing those comments between now and the fall 2018 regional weights and measures association meetings. OWM believes the proposals in Block 5 should also remain Developing to help ensure alignment across Handbook 44 and a common understanding of what constitutes a "field standard."

As work progresses on Block 4 and 5 items, we acknowledge there may be a need to define other commonly used terms such as "master meter" in the context of "field standards" to help ensure a consistent understanding of: (1) the terms; and (2) the elements that need to be addressed to establish the traceability of any standard within the requirements laid out in the Fundamental Considerations.

Items LPG-4 and MFM-2 is directly impacted by the discussion on terminology in Blocks 4 and 5, but most importantly they will be impacted by the definitions of what is needed to establish an artifact or system as a "field standard."

In consideration of the comments from the submitter, and the analysis from OWM, the Committee agreed that the terminology in this item should align with the terminology that will be used in the NIST OWM's Block 4 items (B4) that are still being developed. The Committee agreed that the item should remain a Developing item and recommends that the OWM provide detail on their Developing items in Block 4 to the submitter so that they can better align

Regional Association Comments:

WWMA 2018 Annual Meeting: The Committee recommends this item be addressed together with the items in Blocks 1 and 2; Gen-4; and MFM-5 and designate the status as Developing. For details, see the "Comments and Justification" in Block 1.

NEWMA 2018 Interim Meeting: See the comments above on Block 1. This is recommended as a Developing Item and part of a group (with Block 1, Block 2, GEN-4 and MFM-5).

SWMA 2018 Annual Meeting: NIST stated that this item should be included in a block with items Block 1, Block 2, GEN-4 and MFM-5. Seraphin commented that this item had different test drafts than were included in Block 2. The Committee encourages the submitters of these items to work to a common proposal.

CWMA 2018 Interim Meeting: The submitter has agreed to harmonize language previously discussed in this agenda (Block 1 & OTH-2) and the Committee believes this item is ready to be elevated to a voting status.
Written comments from Seraphin and others are available on the NCWM website as noted below.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

MFM – MASS FLOW METERS

MFM-2 S.1.3.3. Maximum Value of Quantity-Value divisions.

Background/Discussion:

In 2016, the NCWM concluded three years of discussions about HB 44 Mass Flow Meters Code applications that address the sale of natural gas as a vehicle fuel. At that time, the NCWM agreed to eliminate the unit of "gasoline liter equivalent (GLE)." Although the GLE was removed from paragraphs S.1.3.1.1. Compressed Natural Gas Used as an Engine Fuel and S.5.2. Marking of Gasoline Volume Equivalent Conversion Factor, the unit was inadvertently overlooked for removal from paragraph S.1.3.3.(b) Maximum Value of Quantity-Value Divisions.

Also in 2016, the NCWM agreed to recognize mass; a *new* unit of measurement the diesel gallon equivalent (DGE); and sales of the commodity "liquefied natural gas (LNG)" for indicated deliveries. The DGE is an approximate volume unit derived from the energy content of a gallon of diesel fuel. Unlike all other vehicle fuel quantity units in HB 44 no requirement was published establishing a suitable limit on the maximum division value for indicated or recorded deliveries of CNG and LNG in DGE units. The maximum quantity value division is prescribed for retail vehicle fuel deliveries in units of the gallon, the kilogram or pound, as well as the gasoline gallon equivalent or GGE (i.e., in increments not greater than 0.001) in HB44. The factor specified for converting LNG and CNG mass to volume equivalent units is fixed and assigned a numerical value out to three decimal places.

A 0.001 increment needs to be assigned as the maximum allowable value of the DGE to avoid difficulties in calculating the total sale for each transaction. During the exhaustive deliberations and poring through countless pages documenting these discussions, an agreement on the maximum value for the DGE's quantity-value division was inadvertently overlooked. Consequently, this proposal is being submitted to clarify and limit the maximum value of the quantity division for indicated and recorded deliveries in the DGE to a 0.001 increment.

None at this time since both modifications to paragraph S.1.3.3.(b) are considered housekeeping items. One that removes a unit of measurement that ceased to be recognized for natural gas sales; and one that corrects the omission of a specification that specifies the maximum quantity value for the DGE as one of four measurement units recognized for natural gas vehicle fuel applications in the Mass Flow Meters Code.

Regional Association Comments:

WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM) provided an overview of the item and its purpose noting its intent is to clean up some gaps in the language. Hearing no additional comments and no comments in opposition to the proposal, the Committee recommends this item be designated as a Voting item.

NEWMA 2018 Interim Meeting: No comments were received. Hearing no opposition or discussion on this item, the NEWMA S&T Committee believes this item is fully developed and recommends this item be designated a Voting item.

SWMA 2018 Annual Meeting: NIST stated that the item was housekeeping in nature and ready to be a voting item. The Committee agrees that this item is ready for a vote.

CWMA 2018 Interim Meeting: No comments were heard. The Committee recommends this as a voting item.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

MFM-4 S.5.1. Location of Marking Information; Retail Motor-Fuel Dispensers.

Background/Discussion:

General Code paragraph G-S.1. Identification specifies that required markings must be visible after installation. A provision in the Liquid-Measuring Devices Code provides an exception that permits the use of a dispenser key or tool to access internal marking information. This provision was extended to the LPG and Anhydrous Ammonia Liquid-Measuring Devices Code and the Mass Flow Meters (MFM) Code in 2005. However, as currently written, the corresponding paragraph in the MFM Code appears to restrict this provision to only "liquid" retail dispenser fueling applications. The intent of the proposed modification is to permit the exception to include dispensers used to deliver compressed natural gas (CNG).

While it is possible that the exception was intentionally limited to liquid fuels in the MFM Code, there is no evidence of this in the background and history. The 2005 action to extend this exception to other measuring codes was intended to align requirements for all retail vehicle fueling applications.

Regional Association Comments:

WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM) provided an overview of the item, noting its intent is to extend the requirement, which presently only addresses liquids to include compressed gas dispensers. Hearing no additional comments and no comments in opposition to the proposal, the Committee recommends this item be designated as a Voting item.

NEWMA 2018 Interim Meeting: No comments were received. Hearing no opposition or discussion on this item, the NEWMA S&T Committee believes this item is fully developed and recommends this Item be designated a Voting item.

SWMA 2018 Annual Meeting: NIST stated that the item was housekeeping in nature and ready to be a voting item. The Committee agrees that this item is ready for a vote.

CWMA 2018 Interim Meeting: No comments were heard. The Committee recommends this as a voting item.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

MFM-5 D N.3. Test Drafts.

Background/Discussion:

This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Mr. Michael Keilty
Endress + Hauser Flowtec AG USA
(970) 586-2122, michael.keilty@us.endress.com

The use of transfer standards is recognized in Code sections 3.34 Cryogenic Liquid-Measuring Devices Code and 3.38 Carbon Dioxide Liquid-Measuring Devices Code and 3.39 Hydrogen Gas-Measuring Devices – Tentative Code. Transfer standard is only defined for testing cryogenic liquid measuring devices. It has been pointed out that the term transfer standard is not correct and that field reference standard meters may be more appropriate. See new the item under consideration, updated on September 8, 2017.

Field evaluation of LPG meters and CNG dispensers and LNG dispensers is very difficult using volumetric and gravimetric field standards and methods. The tolerances for these applications are such that using field reference standard meters are more efficient and safer. With CNG and LNG and LPG applications, the field reference standard meters are placed in-line with the delivery system as it is used to fill tanks and vehicles. The use of field reference

standard meters eliminates return to storage issues. The use of field reference standard meters is easier and faster compared to the use of traditional field standards. The cost of using field reference standard meters and transporting them is much less than the cost of traditional field provers and standards.

Recognition in Handbook 44 will enable States to allow field reference standard meters to place systems into service and for field enforcement.

Volumetric field provers and gravimetric field proving are susceptible to environmental influences. The State of Colorado uses a field reference standard meter to test propane delivery truck meters. The State of Nebraska has used a field reference standard meter to test agricultural chemical meters. Other States have asked that there be recognition in HB44 in order for their State to allow the use of field reference standard meters.

In some applications, field reference standard meters are not more accurate than the meters used in the application. For that reason, longer test drafts and possibly more tests may need to be run.

The State of California is purported to have conducted a short study of field reference standard meters in the past. The conclusion did not lead to wide adoption of the practice.

Section 3.37 Mass Flow Meters user requirement U.R.3.8. Return of Product to Storage, Retail Compressed Natural Gas Dispensers requires that the natural gas which is delivered into the test container must be returned to storage. This is difficult and most often not complied with when the test vessel contents are released to atmosphere. States often have difficulties in remote locations finding suitable field reference equipment.
In the fall of 2016, Mr. Keilty provided an update to the Item under Consideration. That update appears in the agenda. The previous proposed Item under Consideration was as follows:

N.3. Test Drafts. –

N.3.1 Minimum Test - Test drafts should be equal to at least the amount delivered by the device in one minute at its normal discharge rate.
(Amended 1982)

N.3.2. Transfer Standard Test. – When comparing a meter with a calibrated transfer standard, the test draft shall be equal to at least the amount delivered by the device in 2 minutes at its maximum discharge rate.

The submitter recommends that NIST update EPO 28 for CNG dispensers and EPO 26 for LPG Liquid Measuring Systems to include transfer standard meter tests. NIST Publication R 105-4 should also be revised to specifically address the transfer standard meter and the requirements for use.

The S&T Committee might also consider amending Sections 3.30 Liquid-Measuring Devices Code and 3.31 Vehicle-Tank Meters Code to allow transfer standard meters.

At the 2015 NCWM Interim and Annual Meetings, the Committee heard comments both in support of and in opposition to the proposal outlined in this item and a corresponding item in the LPG and Anhydrous Ammonia Liquid-Measuring Devices Code. Mr. Mike Keilty (Endress + Hauser Flowtec AG USA), submitter of these two items outlined the benefits of using a master meter as a standard in testing application such as CNG, LNG, and LPG. The Committee heard comments in opposition to the proposal from Henry Oppermann (Weights and Measures Consulting, LLC and speaking on behalf of Seraphin Test Measure, Co) noted there are significant differences between a transfer standard and a field standard. Mrs. Tina Butcher (NIST OWM) acknowledged the advantages to identifying and developing alternate test methods such as this but noted that simply adding the proposed language doesn't address the multiple other elements that need to be in place to ensure traceability; OWM provided a list of those elements along with other suggestions. OWM noted that the USNWG on Alternative Test Methods might be a better venue to develop the elements to support the use of these devices. This was echoed by Mr. Dmitri Karimov (Liquid Control, LLC) who also commented that the regulatory authority must assess the suitability of a given standard. The Committee also heard from Ms. Kristin Macey (CA) who commented that if the proposal were

adopted, it would allow use of a transfer standard and California would not be able to fully support it, citing results of comparison testing conducted by CA in which the master meter performed worst of the three methods examined. Mr. Keilty, in response to Mrs. Butcher's and Mr. Oppermann's comments, stated that he agreed completely and noted that adding the paragraph to these two codes is a step towards allowing the use of transfer standards and it's understood that there are many things that would need to be in place in order that they be considered suitable for use in testing. The Committee also heard other comments from regulators and industry supporting the continued development of this issue. The Committee agreed that the item has merit but needs further development and suggested the submitter work with OWM by providing data for the USNWG to consider.

See the Committee's 2015 Final Report for details.

At the 2016 NCWM Interim and Annual Meetings, the Committee again heard comments both in support of and in opposition to this item and the corresponding item in the LPG and Anhydrous Ammonia Liquid-Measuring Devices Code. Mr. Michael Keilty (Endress + Hauser Flowtec), the submitter, stated that he supported this item as a Voting item as did Alan Walker (FL). Others expressed support of the item but noted the need for additional development. The Committee heard again from Mrs. Tina Butcher and Mr. Henry Oppermann, who reiterated their 2015 detailed comments regarding the tasks that need to be completed before considering changes to Handbook 44. Both echoed the need to collect data in order to properly evaluate whether or not a master meter could be considered a suitable standard.

During its Interim Meeting work session, the Committee acknowledged comments suggesting the need for additional test data. It was also acknowledged that there was a lot of support for the proposal. Those supporting the proposal had indicated that using a transfer standard is much easier and faster than testing gravimetrically and eliminates the need to discharge product from a prover into the atmosphere, which is viewed by many as a safety concern. Given that the addition of the proposed language would not dictate the method of testing and the decision on whether or not to use a particular method of testing would remain with each jurisdiction, the Committee agreed to present both items for vote at the Annual Meeting.

At the 2016 Annual Meeting, the Committee received numerous comments from industry and regulators alike, predominantly in support of the proposals. These comments cited benefits such as safety; faster and more efficient testing; and lack of problems with using master meters. Mr. Marc Buttler (Emerson Process Management – Micro Motion) also expressed supports of the items but suggested replacing the words "maximum discharge rate" with "maximum test rate" in proposed paragraph N.3.2.; the submitter agreed with the suggestion.

The Committee also heard comments in opposition to the item and comments emphasizing the need for further development and data. A new comment offered by Mrs. Tina Butcher (NIST OWM) noted that the proposed new paragraph N.3.1. would create a conflict with the minimum test procedures outlined in the NIST EPO for CNG dispensers since tests conducted at the MMQ and at some other quantities are frequently completed in less than one minute. There was also some debate regarding the application of the Fundamental Considerations with regard to the allocation of error and uncertainty associated with a given test method and Mr. Henry Oppermann clarified the proper application of these criteria. Mr. Oppermann noted that transfer standards, in some cases, are no more accurate than the meter being tested and that the proposals lack a specification associated with the performance of the standard. He recommended the items be downgraded to Informational or Developmental.

During the Committee's work session, members of the Committee agreed that the comments received during the open hearings were mostly in support of the two proposals. The Committee discussed the proposed changes to the text, including the errors in the transcription of the text in the Item Under Consideration. The Committee discussed the potential impact on testing CNG dispensers, acknowledging that the proposed requirement cannot be met by someone wanting to apply the procedures in the NIST EPO (which were developed through a work group comprised of industry and regulatory officials). Some Committee members familiar with CNG testing concurred that a test run typically takes less than one minute to complete. The Committee was concerned with the potential conflict and questioned whether the submitter had fully considered the impact of the proposed language. These discussions led the Committee to decide to change the status of the item from Voting to Developmental and return them to the submitter for further development.

See the Committee's 2016 Final Report for details.

During the 2017 NCWM Interim Meeting, the Committee grouped Agenda Item 3302-1 and 3307-2 together and took comments on these items simultaneously because it considered these items related.

Mr. Michael Keilty (Endress + Hauser Flowtec AG USA), submitter of the item, commented that this was a Voting item at the 2016 NCWM Annual Meeting during, where it was downgraded to a Developing status. He further offered the opinion that there was not a good mechanism for relaying back to the submitter what an item needs in the way of development. Having now submitted the item with amended language, he said that he would like to see this item put to a vote.

As was the case during open hearings of the Committee in 2015 and 2016, similar comments were received both in support of and in opposition to this item and the corresponding item in the Mass Flow Meters Code in 2017.

Ms. Tina Butcher (NIST OWM) spoke of the need for standards used in testing to comply with the tolerances for standards specified in HB 44 Appendix A - Fundamental Considerations which, she noted, requires the combined error and uncertainty of any standard used without correction to be less than one-third the applicable device tolerance. She also made evident the potential for more than one type of standard to be used in testing, noting that the tolerances specified the Carbon Dioxide Liquid-Measuring Devices Code of HB 44 increase for different test methods. She stated that the proposal seemed to address only one particular type of transfer standard, i.e., a master meter, and, as a result, the proposal could have a very limiting effect on the types of transfer standards that can be used. She also questioned the use of the term "transfer standard" and suggested that the term, "field standard" may be a more appropriate term. As a final comment, she reiterated a previous OWM comment that more data is needed of comparisons to known standards.

Mr. Bruce Swiecicki (National Propane Gas Association), Mr. Constantine Cotsoradis (Flint Hills Resources), and Mr. Hal Prince (Florida), supported the item and requested it move forward.

Mr. Ross Andersen (NY, retired) gave an example of alternative test methods being used for like applications, such as what the ASTM does. He stated that different test methods will have different results and that variables of those methods need to be evaluated. He commented that we are currently evaluating only one variable.

In consideration of the comments received on these two items, the Committee agreed to present them for vote at the 2017 NCWM Annual Meeting.

At the 2017 NCWM Annual Meeting, the Committee again grouped this item with Agenda Item 3307-2 and took comments on the two items at the same time. Several industry and regulatory officials voiced support to presenting the two items for vote. Some of those speaking in support of the items acknowledged that a lot of additional work still needed to be completed to confirm the adequacy of alternative test measures, such as a master meter, for use as a standard in testing commercial devices. The Committee was urged by some, however, to present the items for vote, noting that some states are already using alternative standards for testing and that the additional work needed to confirm their adequacy can be completed post adoption of the proposals.

There were also several who spoke in favor of maintaining the "Developing" status of the items. Mr. Steve Harrington (OR), for example, reported that the State of Oregon is pursuing the use of a mass flow meter standard for use in testing LPG meters. He noted that additional work is needed to develop procedures that will confirm the adequacy of the mass flow meter (standard) for use in testing LPG meters used in commercial applications. He recommended maintaining the "Developing" status of the items.

Mrs. Tina Butcher (NIST OWM) reported that OWM believes the proposed changes are premature. More work is needed and OWM recommends maintaining the items as Developing. Mrs. Butcher provided an update on some ongoing work relating to alternative test methods and the current proposals under consideration as follows:

- The NTEP Measuring Sector is developing guidelines for type-evaluation laboratories when conducting type evaluation using alternative types of standards.

- NIST OWM has established a USNWG to examine alternative test methods.
    - The USNWG subgroup has been working to establish uncertainties for select test methods and examining data from some field tests.
    - The Group has developed guidelines for collecting measurement data.
    - The guidelines can be used by equipment manufacturers and/or W&M jurisdictions to collect data to examine different test methods and types of test standards.
    - Guidelines include tasks such as:
        - Developing a test protocol for collecting data and for identifying testing factors that may contribute the largest uncertainties in testing;
        - Following guidelines for data collection;
        - Collecting sufficient data under a similar variety of user conditions;
        - Identifying the major factors that could affect test results and contribute the largest uncertainties in testing;
        - Ensuring that Handbook 44 and EPOs are updated and available for its use;
        - Making all results and assessments accessible to States and other enforcement agencies; and
        - Publish an updated NIST 105 Series and calibration procedures, if not available.

- OWM is in the process of developing a proposal to address the use of the term "transfer standard" throughout HB44. According to NIST HB 130, the International Vocabulary of Metrology, and references in HB 44 Fundamental considerations, the reference in the current proposals should be "field standard." OWM plans to submit the proposal for consideration during the 2018 NCWM cycle.

Ms. Butcher also noted that OWM has a significant concern with the proposal in Agenda Item 3307-2 because proposed new paragraph N.3.1. conflicts with the minimum test of a CNG RMFD being performed today in accordance with the NIST EPO. A test conducted at the MMQ typically takes far less than a minute to complete. Additionally, the test drafts performed at one-third, two-thirds, and three-thirds test tank capacity often are completed in less than a minute's time.

Ms. Butcher also reiterated many of the points OWM had provided in previous NCWM Meetings relating to these two proposals. The following is a short summary of these points:

- The development of alternative methods of testing commercial metering systems is an important issue. Many applications, in which using currently recognized test methods, may be not be feasible because of product characteristics, safety, cost, access to equipment, and other factors.

- Modifying HB 44 as proposed doesn't ensure approval of any proposed test method. The decision on whether or not to accept a particular test method rests with the regulatory authority.

- Many things must be considered when selecting and determining the suitability of field standards to provide traceable measurements. These are sometimes referred to as the "essential elements of traceability." The following are some examples:
    - accuracy of a particular test standard relative to the applicable tolerance;
    - demonstrated reliability of the device over time;
    - device repeatability;
    - how well it duplicates actual use;
    - existence of documentary standards for the test equipment;
    - availability of equipment/facilities within a state lab to test the equipment; and
    - whether training has been provided for the lab staff, field officials, and users of the equipment.

- NIST HB 44 Fundamental Considerations, Section 3.2. Tolerances for Standards, specify that when a standard is used without correction, its combined error and uncertainty must be less than one-third of the applicable tolerance.

- The current proposal seems to simply borrow from other codes without technical rationale. There is a potential for more than one type of alternative test method. The current proposal may unintentionally limit other types.

- Even within the category of "master meters," different requirements may be needed for different master meter technologies in order to comply with this requirement.

- Should consideration be given to providing a larger tolerance when conducting tests using a particular test method as is done in the carbon dioxide and hydrogen codes? Testing would need to be conducted to demonstrate the magnitude of the additional tolerance.

- W&M needs a system that results in:
  - manufacturers knowing the requirements for the design of the standard;
  - systematic and appropriate collection of measurement data on proposed standards; and
  - states (regulatory authority) having access to the measurement data;
  - side-by-side testing to compare results with existing test methods.

- Additional data and analysis is needed prior to recommending specific language for adoption in HB 44.

Mr. Henry Oppermann, (Weights and Measures Consulting, LLC) speaking on his own behalf, as well as consultant for Seraphin Test Measure, Co. stated there is no clear understanding of the terms "field standard" and "transfer standard." Any standard proposed for use in testing must meet the tolerances for standards specified in the Fundamental Considerations (Appendix A) of HB 44 and there must be proof that the standard is able to comply with the tolerance over a range of field conditions. He raised the question, "without data to support the accuracy of a standard, how do you know it is accurate enough to use in testing a commercial device?" Mr. Oppermann expressed the need for the development of a test method (or procedures) that can be used to identify meters that perform well enough that they can be used as a standard in testing. Mr. Robert Murnane (Seraphin Test Measure, Co.) stated that he echoed Mr. Oppermann's comments. He acknowledged the existence of the national work group that NIST had created for the purpose of identifying the variables and parameters over which a proposed alternate standard must be tested and evaluated to ensure that the methodologies and standards facilitate measurements that have metrological traceability. He noted also that jurisdictions could already use alternative standards if controls are in place to validate their traceability. Mr. Oppermann and Mr. Murnane both forwarded written comments to the Committee in advance of the meeting opposing the adoption of these two items and recommending their status be changed from Voting to Developing.

Mr. Michael Keilty (Endress + Hauser Flowtec AG USA) stated that he would entertain a change to the terminology (transfer standard) in his proposals. He reported that some jurisdictions will not allow the use of a transfer standard unless it is mentioned in HB 44. He said that he agreed with Mr. Murnane and Mrs. Butcher that procedures would still need to be in place to ensure the adequacy of that standard for use in testing a commercial device. He recommended the Committee present the two items for vote.

Based on the concerns raised by numerous members during the open hearings and recommendations from all four regional associations, the Committee felt the two items in the group had merit, but more work is necessary to move them forward and the Committee agreed to downgrade them to a Developing status.

During the 2018 NCWM Interim Meeting, the Committee heard comments from Mr. Michael Keilty (Endress & Hauser Flowtec AG USA), submitter of the item, stating his comments in item LPG-4, apply to this item as well and asks that this item be moved to a "Voting" status.

Mr. Henry Oppermann (Weights and Measures Consulting, LLC) stated that his comments provided during the open hearing on all items in Block 5, also apply to this item. He spoke to the letter that he submitted and recommended and that the item remain "Developing."

Mr. Constantine Cotsoradis (Flint Hills Resources) commented that he agrees with the comments Mr. Oppermann, provided in his letter, that more data is needed but encourages the use of "field reference standard meters", or whatever they ultimately are called, because they provide a better test than the currently accepted practice of a vehicle scale being used for reference He feels this method has too many uncertainties.

During the Committee's work session, the members considered the comments heard on this item. The Committee agreed to recommend that this item remain "Developing." The Committee also agreed that items LPG-4, MFM-2, and all Block 5 items are related to the Block 4 items due to terminology. The Committee recommends the submitter of the Block 4 items (OWM) provide detail of their developing language to the submitter of the related items (Endress + Hauser Flowtec AG USA) to prevent conflicting terms as they are considered during future meetings.

The Committee did not take comments during open hearings on Developing items at the 2018 NCWM Annual Meeting except to grant the submitter of a Developing item (or block of Developing items) an opportunity to provide an update on the progress made to further develop the item(s) since the 2018 NCWM Interim Meeting. At the 2018 NCWM Annual Meeting, the Committee received an update from the submitter of this item, Mr. Michael Keilty (Endress + Hauser Flowtec AG USA). Mr. Keilty stated that the item is, "ready to go" (i.e., fully developed) and urged the Committee to present this item for a vote in 2019.

OWM provided joint written recommendations and comments to this item and item LPG-4, which OWM considers similar, as feedback to the submitter and as part of its analysis of the S&T Committee's 2018 agenda items. Refer to Item LPG-4 of this report to view OWM's analysis for these two items.

In consideration of the update provided by the submitter, and the analysis from OWM, the Committee agreed that the terminology in this item should align with the terminology that will be used in the NIST OWM's Block 4 items (B4) that are still being developed. The Committee agreed that the item should remain a Developing item on its agenda in 2019 and recommends that the OWM provide detail on its Developing items in Block 4 to the submitter so that they can better align.

Regional Association Comments:

WWMA 2018 Annual Meeting: The Committee recommends this item be addressed together with the items in Block 1 and 2; and MFM-2; LPG-3 and designate the status as Developing. For details, see the "Comments and Justification" in Block 1.

NEWMA 2018 Interim Meeting: See the comments above on Block 1. This is recommended as a Developing Item and part of a group (with Block 1, Block 2, LPG-3 and GEN-4) on the NCWM agenda.

SWMA 2018 Annual Meeting: The SWMA heard comment that this should be included in a block with Block 1, Block 2, GEN-4 and LPG-3. NIST also notes that there was concern raised with the appropriateness of the minimum delivery time. The Committee encourages this item be included in the block and consider the minimum delivery time as it is being developed.

CWMA 2018 Interim Meeting: The submitter has agreed to harmonize language previously discussed in this agenda (Block 1 & OTH-2) and the Committee believes this item is ready to be elevated to a voting status.
Written comments from Seraphin and others are available on the NCWM website as noted below.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

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HGM – HYDROGEN GAS-MEASURING DEVICES

HGM-6 Tentative Code Status and Preamble., A.2.(c) Exceptions., N.2 Test Medium., N.3. Test Drafts., N.4.1. Master Meter (Transfer) Standard Test., N.4.2. Gravimetric Tests., N.4.3 PVT Pressure Volume Temperature Test., N.6.1.1. Repeatability Tests., T.3. Repeatability., T.6. Tolerance –Minimum Measured Quantity (MMQ). and Appendix D. Definitions where applicable.

Background/Discussion:

NIST Handbook (HB) 44 Section 3.39 Hydrogen Gas-Measuring Devices – Tentative Code, was adopted by NCWM in 2010 and first published in 2011, with only a trial and experimental status. Since 2012, the California Division of Measurement Standards (CA DMS) has conducted five successful type evaluations of hydrogen dispensers, and California state and county officials have performed initial verifications and/or annual examinations of dispensers at the 36 retail stations throughout the state. In 2016, changes were made to NIST HB 44 Section 3.39 to expand the device tolerances from 1.5 % and 2.0 % to 5.0 % and 7.0 %, based upon CA DMS' test data. Today, CA DMS believes the code with the adoption of the proposed amendments is ready for permanent status. There are other jurisdictions that have hydrogen dispensers with the potential for commercial operation, most notably in the U.S. northeast (CT, MA, NJ, NY, RI) where industry is supporting the development of a "hydrogen highway." Additionally, NIST HB 44 Section 3.39 is generally compatible with the 2018 version of the corresponding international standard, Organization of International Legal Metrology Recommendation 139 (OIML R 139) - Compressed gaseous fuel measuring systems for vehicles.

The following are specific justifications for the eleven proposed amendments to Section 3.39. Hydrogen Gas-Measuring Devices - Tentative Code:

(1) Section 3.39. Hydrogen Gas-Measuring Devices - Tentative Code

CA DMS proposes that this title be removed and replaced with Section 3.39. Hydrogen Gas-Measuring Devices without the words "Tentative Code." This change is necessary because a tentative code has only trial or experimental status and is not enforceable. Removal of these words will make clear that NIST HB 44 3.39 is the basis of enforcement for hydrogen gas-measuring devices in the U.S. Additionally, CA DMS proposes to remove the preamble as it would be unnecessary in a code with permanent status.

(2) 3.39. Hydrogen Gas-Measuring Devices. A.2. Exceptions (c)

CA DMS proposes that this requirement be amended. Current language is not specific as to what is meant by the "concentrations of specified impurities that exceed level limits." This is because at the time the tentative code was drafted, limits for certain constituents had not been finalized and there wasn't a recognized national fuel quality standard for hydrogen fuel. Since then, SAE International has approved and published a specification for hydrogen for use in fuel cell vehicles, SAE J2719. (Note: This SAE standard is also codified in NIST HB 130, Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Regulation, paragraph 2.17. Hydrogen Fuel.)

(3) N.2 Test Medium.

CA DMS proposes that the Note be deleted. In NIST HB 130, Uniform Engine Fuels and Automotive Lubricants Regulation, SAE International J2719 is referenced in paragraph 2.17. Hydrogen Fuel. This fuel quality specification was first published in 2011, after Section 3.39. Hydrogen Gas-Measuring Devices - Tentative Code was adopted by NCWM.

(4) N.3. Test Drafts.

CA DMS proposes that this be amended to increase the size for the minimum test draft used when verifying that a hydrogen gas-measuring device meets the minimum tolerances and specifications. The test draft size in NIST Handbook 44 is too small and creates increased measurement uncertainty. The proposed minimum test draft size

also aligns with OIML R 139 - *Compressed gaseous fuel measuring systems for vehicles*. The second draft test size reduction to five times the minimum measured quantity from ten times accommodates the physical limitations of hydrogen dispenser testing equipment (currently less than 5.0 kg. but greater than 4.0 kg).

(5) N.4.1. Master Meter (Transfer) Standard Test.

CA DMS proposes that this be amended to increase the size for the minimum test draft used when verifying that a hydrogen gas-measuring device meets the minimum tolerances and specifications. The test draft size in NIST Handbook 44 is too small and creates increased measurement uncertainty. The proposed minimum test draft size also aligns with OIML R 139 - *Compressed gaseous fuel measuring systems for vehicles*. The second draft test size reduction to five times the minimum measured quantity from ten times accommodates the physical limitations of hydrogen dispenser testing equipment (currently less than 5.0 kg. but greater than 4.0 kg).

(6) N.4.2. Gravimetric Tests.

CA DMS proposes that this be amended to increase the size for the minimum test draft used when verifying that a hydrogen gas-measuring device meets the minimum tolerances and specifications. The test draft size in NIST Handbook 44 is too small and creates increased measurement uncertainty. The proposed minimum test draft size also aligns with OIML R 139 - *Compressed gaseous fuel measuring systems for vehicles.* The second draft test size reduction to five times the minimum measured quantity from ten times accommodates the physical limitations of hydrogen dispenser testing equipment (currently less than 5.0 kg. but greater than 4.0 kg).

(7) N.4.3. PVT Pressure Volume Temperature Test.

CA DMS proposes that this be amended to increase the size for the minimum test draft used when verifying that a hydrogen gas-measuring device meets the minimum tolerances and specifications. The test draft size in NIST Handbook 44 is too small and creates increased measurement uncertainty. The proposed minimum test draft size also aligns with OIML R 139 - *Compressed gaseous fuel measuring systems for vehicles*. The second draft test size reduction to five times the minimum measured quantity from ten times accommodates the physical limitations of hydrogen dispenser testing equipment (currently less than 5.0 kg. but greater than 4.0 kg).

(8) N.6.1.1. Repeatability Tests.

CA DMS proposes that this paragraph be amended to specify the size of the test draft used when verifying a hydrogen dispenser. If the proposed test draft size is too small, it will not be possible to get a measurement that is both reliable and repeatable. Also, if the test draft size is too small, it is difficult to verify compliance using the equipment presently available to officials and service agencies that inspect and/or repair these devices.

(9) T.3. Repeatability.

CA DMS proposes that this paragraph be amended. This section references N.6.1.1. which specifies that the test drafts be of approximately the same size, but it has no requirement for the minimum weight of the test draft. The test draft size must be sufficiently large to obtain a measurement that is both reliable and repeatable. If the test draft size is too small, it is difficult to verify compliance using the equipment presently available to officials and service agencies that repair hydrogen gas-measuring devices. This proposed tolerance also aligns with the OIML R 139 - *Compressed gaseous fuel measuring systems for vehicles*.

(10) T.6. Tolerance – Minimum Measured Quantity (MMQ).

CA DMS proposes that this paragraph be added. It is necessary to adopt a different tolerance for the minimum measured quantity because the test draft size in NIST HB 44 Section 3.39. is so small that it creates increased measurement uncertainty. Increasing the tolerance also eliminates the need for more precise testing equipment. This proposed tolerance also aligns with

OIML R 139 - *Compressed gaseous fuel measuring systems for vehicles*.

(11) Appendix D. Definitions

When the tentative code is upgraded to a permanent status, the definitions listed at the end of the tentative code should be deleted and added to NIST HB 44 Appendix D. Definitions, to reference Section "3.39" where applicable. In addition to the definitions listed in the tentative code, the following terms should also have "3.39" added: configuration parameter, commercial equipment, and unit price.

Regional Association Comments:
WWMA 2018 Annual Meeting: Clark Cooney (CA DMS) outlined the California proposal to upgrade this code. CA has done testing both in type evaluation and in field applications of devices covered by this code and believes it is time to change the status of the code from "tentative" to permanent status. In conducting this testing, CA has identified changes as outlined in the background and justification in the Committee's agenda to improve the application of the code to equipment in the field. CA believes, with these changes, the proposal to upgrade the code to a permanent status is ready for a vote. Mr. Cooney emphasized the importance to CA and other states who are anxious to facilitate the integration of these alternative fuel metering systems into the marketplace of upgrading the code to a permanent status and making changes to reflect equipment capabilities and use.

Tina Butcher (NIST OWM) commented OWM concurs with CA that the code is ready to be upgraded to a permanent status and is pleased to see progress in this regard. She noted Juana Williams (OWM) has been collaborating with experts at CA DMS, including Kevin Schnepp, Kristin Macey, and Clark Cooney to discuss some of the changes proposed by CA as outlined in the proposal and numbered (1) through (12). Given the very tight timing between the submittal of the proposal and the WWMA meeting, OWM has had limited time to study the proposal. Tina outlined OWM's responses to the changes proposed by CA, noting OWM agrees with the bulk of these changes, with some small adjustments in places (a copy of this summary was described in the open hearings and a hard copy provided to the Committee). However, for the changes described in CA's points (4) through (10) (see the Committee's agenda) OWM has identified some concerns regarding the testing at the MMQ, the test draft size for repeatability, and the proposed change in tolerance for the MMQ test. OWM acknowledged obtaining adequate test equipment can be a challenge, but it is important to ensure that inspectors are not precluded from testing quantities at the MMQ since these devices will likely be commonly used for small quantity deliveries.

The Committee also heard comments from Michael Keilty (Endress + Hauser Flowtec) during the open hearings; Michael objected to moving the code to a permanent status, citing concerns over sections of the code that make reference to transfer standards. He commented that, since objections to this terminology and test criteria were raised with other items on the Committee's agenda, it would create a non-level playing field to allow this code to be upgraded to permanent with this language remaining in the code. He also questioned the inclusion of the Pressure-Volume-Temperature method in the testing criteria, noting the USNWG on Hydrogen had specifically opposed this method. Tina Butcher confirmed the USNWG had raised questions about the PVT method, but the concern was not related to the test method; the concern was regarding the use of this method for the determination of the commercial quantity because of the practicality of validating the volume of the receiving container. The reference to the ***use of PVT as a test method only*** was included in the code based on recommendations of the USNWG.

During the WWMA meeting, OWM and CA DMS collaborated on OWM's open hearing comments and brought back a revised recommendation for the Committee to consider as outlined below. OWM believes the additional modifications are appropriate, though has some remaining questions about the 1000-division draft size for repeatability. OWM is confident that, with additional input and discussion from the community, ***this point can be resolved without delaying action on this proposal***. Thus, rather than delay progress on upgrading this code, OWM believes it appropriate and expedient to move the item forward for a vote and, should an alternative solution present itself between now and the 2019 Interim Meeting as a result of collaboration between CA and OWM (along with any other input received) that alternative could be presented to the NCWM S&T Committee at that time.

The Committee considered the comments received. The Committee acknowledged the points raised by Michael Keilty regarding the references to "transfer standards" in the current code. The Committee noted these references have been in the code since its inception and are presently in multiple other codes including the Cryogenic LMD Code, Carbon Dioxide LMD Code, EVSE Code, and others. The proposals referenced in Blocks 1 and 2; Gen-4; LPG-3; and MFM-5 (which the Committee has recommended grouping together) have raised the question of the appropriateness of the terminology of the test equipment used in this item. However, those proposals do not

currently recommend removing the paragraphs using that terminology from those codes. Should the work in that grouped item result in recommended changes to those references, the Committee would expect that such recommendations would apply universally to all those codes, including the Hydrogen Gas-Measuring Devices Code. The Committee did not feel it would be appropriate to single out this code in advance of such recommendations.

The Committee agreed that the code is ready to upgrade to a permanent status with the revisions proposed by CA in the Committee's Agenda and the additional changes outlined in the attached updated version of its proposal. During the Committee's work session, the Committee identified a term that needed clarification in paragraph N.6.1.1. Repeatability Tests and T.3. Repeatability. A summary of the changes proposed to the code are shown below, including that change made by the Committee. The Committee recommends this item be forwarded to the NCWM S&T Committee with these changes and designated as a Voting item on the NCWM S&T Committee Agenda.

Section 3.39. Hydrogen Gas-Measuring Devices ~~– Tentative Code~~
~~This tentative code has trial or experimental status and is not intended to be enforced. The requirements are designed for study prior to the development and adoption of a final code. Requirements that apply to wholesale applications are under study and development by the U.S. National Working Group for the Development of Commercial Hydrogen Measurement Standards. Officials wanting to conduct an official examination of a device or system are advised to see paragraph G-A.3. Special and Unclassified Equipment. (Tentative Code Added 2010)~~
The status of Section 3.39. Hydrogen Gas-Measuring Devices was changed from "tentative" to "permanent" effective January 1, 2020.
(Code Added 2010 and Upgraded 2019)

A.2. Exceptions. -
(c) Devices used for dispensing a hydrogen gas with a hydrogen fuel index lower than 99.97 % and concentrations of specified impurities that exceed level limits **in the ~~most current~~ latest version of SAE International J2719.**

N.2. Test Medium. – The device shall be tested with the product commercially measured except that, in a type evaluation examination, hydrogen gas as specified in NIST Handbook 130 shall be used.
~~Note: Corresponding requirements are under development and this paragraph will be revisited.~~

N.3. Test Drafts. –The minimum test shall be one test draft at the declared minimum measured quantity and one test draft at approximately ~~ten~~ **five** times the minimum measured quantity or ~~1~~ **4** kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed. (See T.3. Repeatability)

The test draft shall be made at flows representative of that during normal delivery. The pressure drop between the dispenser and the proving system shall not be greater than that for normal deliveries. The control of the flow (e.g., pipework or valve(s) size, etc.) shall be such that the flow of the measuring system is maintained within the range specified by the manufacturer.

N.4.1. Master Meter (Transfer) Standard Test. –When comparing a measuring system with a calibrated transfer standard, the minimum test shall be one test draft at the declared minimum measured quantity and one test draft at approximately ~~ten~~ **five** times the minimum measured quantity or ~~1~~ **4** kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed.

N.4.2. Gravimetric Tests. – The weight of the test drafts shall be equal to at least the amount delivered by the device at the declared minimum measured quantity and one test draft at approximately ~~ten~~ **five** times the minimum measured quantity or ~~1~~ **4** kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed

N.4.3 PVT Pressure Volume Temperature Test. – The minimum test with a calibrated volumetric standard shall be one test draft at the declared minimum measured quantity and one test draft at approximately ~~ten~~ **five** times the minimum measured quantity or ~~1~~ **4** kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed.

N.6.1.1. Repeatability Tests. –Tests for repeatability should include a minimum of three consecutive test drafts of approximately the same size **with ~~no less than~~ a minimum of 1000 ~~scale intervals (~~increments on the device under test~~),~~** and be conducted under controlled conditions where variations in factors are reduced to minimize the effect on the results obtained.

N.7. Density. - N.7. Density. – Temperature and pressure of hydrogen gas shall be measured during the test for the determination of density or volume correction factors when applicable. For the thermophysical properties of hydrogen the following publications shall apply: for density calculations at temperatures above 255 K and pressures up to 120 MPa, a simple relationship may be used that is given in the publication of Lemmon et al., J. Res. NIST, 2008. Calculations for a wider range of conditions and additional thermophysical properties of hydrogen are available free of charge online at the "NIST Chemistry WebBook, NIST Standard Reference Database Number 69" https://webbook.nist.gov/chemistry, or available for purchase from NIST as the computer program NIST Standard Reference Database 23 "NIST Reference Fluid Thermodynamic and Transport Properties Database (REFPROP): Version ~~8~~ **10.0**" https://www.nist.gov/srd/~~nist23.cfm~~**refprop**. These calculations are based on the reference Leachman, J.W., Jacobsen, R.T, Lemmon, E.W., and Penoncello, S.G. "Fundamental Equations of State for Parahydrogen, Normal Hydrogen, and Orthohydrogen" to be published in the Journal of Physical and Chemical Reference Data (~~http://www.nist.gov/manuscript-publication-search.cfm?pub_id=832374~~ (**https://www.nist.gov/publications/fundamental-equations-state-parahydrogen-normal-hydrogen-and-orthohydrogen?pub_id=832374**). More information may be obtained from NIST at ~~http://www.boulder.nist.gov/div838/Hydrogen/Index.htm~~ **https://www.nist.gov/publications/fundamental-equations-state-parahydrogen-normal-hydrogen-and-orthohydrogen.**

T.3. Repeatability. – When multiple tests are conducted at approximately the same flow rate and draft size **greater than 1000 ~~scale intervals (~~increments on the device under test~~)~~**, the range of the test results for the flow rate shall not exceed 40 % of the absolute value of the maintenance tolerance and the results of each test shall be within the applicable tolerance. (Also see N.6.1.1. Repeatability Tests.)

Appendix D. Definitions

Instructions:

(A) Take all the definitions from the 3.39. Hydrogen Gas-Measuring Devices – Tentative Code and replace the current definitions in NIST HB 44 Appendix D. Definitions, and

(B) Add **3.39** to these definitions in NIST HB 44 Appendix D. Definitions:

configuration parameter. – Any adjustable or selectable parameter for a device feature that can affect the accuracy of a transaction or can significantly increase the potential for fraudulent use of the device and, due to its nature, needs to be updated only during device installation or upon replacement of a component, e.g., division value (increment), sensor range, and units of measurement. [2.20, 2.21, 2.24, 3.30, 3.37, **3.39,** 5.56(a)]

equipment, commercial. – Weights, measures, and weighing and measuring devices, instruments, elements, and systems or portion thereof, used or employed in establishing the measurement or in computing any basic charge or payment for services rendered on the basis of weight or measure. As used in this definition, measurement includes the determination of size, quantity, value, extent, area, composition (limited to meat and poultry), constituent value (for grain), or measurement of quantities, things, produce, or articles for distribution or consumption, purchased, offered, or submitted for sale, hire, or award. [1.10, 2.20, 2.21, 2.22, 2.24, 3.30, 3.31, 3.32, 3.33, 3.34, 3.35, 3.38, **3.39,** 4.40, 5.51, 5.56.(a), 5.56.(b), 5.57, 5.58, 5.59]

unit price. – The price at which the product is being sold and expressed in whole units of measurement. [1.10, 3.30, **3.39**] (Note: The Specifications and Tolerances Committee may wish to check other code sections to add for reference to this definition.)

NEWMA 2018 Interim Meeting: Mike Sikula (NY) reported that a HGM system was tested in New York and appeared to test successfully. The system was tested by Air Liquid and witnessed by W&M. Walt Remmert (PA) commented that most states will find the test equipment cost prohibitive and feels that W&M will not be testing these systems. Jim McEnerney (CT) stated that Connecticut has a HGM but it is not being used due to it being new

to the market. The NEWMA S&T Committee believes this item should be upgraded from tentative code and recommends itbe designated a Voting item.

SWMA 2018 Annual Meeting: The SWMA heard that an agreement has been reached on the proposal that has been recommended by the Western Weights and Measures Association and appears in their report which was provided to the Committee. NIST considers the WWMA revised version of this proposal to be fully developed. The committee agrees that the WWMA proposal should be used going forward and recommends it as a voting item.

CWMA 2018 Interim Meeting: No comments were heard. The Committee recommends this as a voting item.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

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EVF – ELECTRIC VEHICLE FUELING SYSTEMS

EVF-3 S.3.5. Temperature Range for System Components. and S.5.2. EVSE Identification and Marking Requirements.

Background/Discussion:

In 2012 the U.S. National Work Group (USNWG) began work to develop legal metrology standards for electricity measuring systems used in both electric vehicle fueling and submetering applications under a single code. The USNWG's first draft standard was based on the California Code of Regulation (CCR) Article 2.2 Electric Watthour Meters Section 4027. Initially the temperature range requirements for the operation of metering components and marking the equipment covered the same range and were taken verbatim from CCR Section 4027.2 paragraphs S.4.(o) Meter Identification and Marking Requirements and paragraph S.12. Temperature Range for Metering Components. Both requirements specified a temperature range of – 20 °C to + 50 °C.

The USNWG has also harmonized wherever possible with ANSI C12.1-2014 Electric Meters-Code for Electricity Metering and ANSI C12.20-2015 Electricity Meters 0.1, 0.2 and 0.5 Accuracy Classes. In 2014 the USNWG agreed to widen the temperature range in NIST HB 44 3.40 paragraph S.3.5. for systems components to – 40 °C to + 85 °C based on input that the wider range is an ANSI standard commercial temperature range. This range was adopted in 2015 and appears in the current NIST HB 44. However, only in ANSI C12.1 Section 4 in 4.7.3.16 Test Number 30 Effect of Operating Temperature is – 30 °C specified as the lowest minimum temperature limit and in 4.7.3.17 Test Number 31 Effects of Relative Humidity is + 85 °C specified as the maximum temperature limit.

Electric Vehicle Service Equipment (EVSE) must be capable of operating accurately over the temperature range specified in Section 3.40 Electric Vehicle Fueling Systems – Tentative Code or marked accordingly. Paragraph S.3.5. Temperature Range for Systems Components specifies that an EVSE not capable of operating over the specified temperature range of – 40 °C to + 85 °C (− 40 °F to 185 °F) must be marked with its narrower temperature range. The submitter is working to ensure there are no inconsistencies between the temperature range requirements specified for the EVSE's operation and the requirement in paragraph S.5.2. EVSE Identification and Marking Requirements that specify an EVSE must be marked with its temperature limits when they are narrower than and within – 20 °C to + 50 °C (− 4 °F to 122 °F).

Although the submitter has suggested this proposal as a developing item it may be possible to clarify the intended temperature range(s) specified for the operation and marking of an EVSE by late 2018. If this occurs there will be the opportunity for the community to consider an upgrade in the status of the proposal. This would allow for full implementation of these requirements for this rapidly emerging technology.

Regional Association Comments:

WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM), submitter of this item, commented that this proposal was brought forward as a result of a discrepancy identified by the California Division of Measurement Standards

who noted conflicts in temperature ranges in two sections of the code. OWM is attempting to identify which of the two ranges is appropriate and is seeking input from manufacturers and others in the community on this point. She asked that the item be designated as a Developing item to allow an opportunity for OWM to identify an appropriate recommendation. Consequently, the Committee agreed to recommend this be included as a Developing item.

NEWMA 2018 Interim Meeting: During its open hearing, the committee heard relative discussion on this topic and EVF in general. The general consensus was that more information on this topic is required before proceeding. The NEWMA S&T Committee recommends this Item be designated a Developing item.

SWMA 2018 Annual Meeting: NIST reported that the working group was developing a proposal to align the temperatures with ANSI requirements. The Committee recommends this as a developing item until a specific proposal is brought forward.

CWMA 2018 Interim Meeting: No comments were heard. The committee noted that the submitter requested at the WWMA meeting that this item remain as a developing item. The Committee recommends this remain developing.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents. **Return To the Agenda Item**

EVF-4 Appendix D – Definitions: power factor (PF). (in reference to 3.40. Electric Vehicle Fueling Systems)

Background/Discussion:

The USNWG on Electric Vehicle Fueling & Submetering's Electric Watthour Subgroup (EWH SG) has developed a proposal to for a new provision in NIST Handbook 130's Uniform Regulation for the Method of Sale (MOS) of Commodities to address the sale of electrical energy through electric watt hour meters. In the process of developing this draft (and a still-under-development NIST Handbook 44 code for these devices), the SG developed a definition for "power factor" that differs from the definition currently included in Section 3.40. Electric Vehicle-Fueling Systems – Tentative Code.

The SG, which includes many of the same experts involved in the development of Section 3.40 and which consulted other industry standards in the development of this proposal, believes the definition shown in the "proposal" section of this form is equivalent to that in the current Section 3.40. However, the new definition is simpler and eliminates possible confusion about its application in instances in which there are negative values. To avoid confusion about whether the two definitions are equivalent, it is desirable to align the definitions in Section 3.40 with that in the draft MOS proposal (and ultimately any definition proposed in a future code for electric watt hour meters).

Regional Association Comments:

WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM), submitter of this item, commented that the Electric Watthour Meter Subgroup of the USNWG on Electric Vehicle Fueling and Submetering (EVFS) developed a proposed Method of Sale requirement on the L&R Agenda. That proposal includes a definition that varies from what is currently in the NIST Handbook 44 EVFS Tentative Code. This proposal EVF-4 is intended to align the definition in the HB 44 code with the new definition. The new definition was viewed by the EWH SG as more concise. The Committee heard no comments or opposition to the proposal and recommends it be designated at as Voting Item.

NEWMA 2018 Interim Meeting: No comments were received. Hearing no opposition or discussion on this item, the NEWMA S&T Committee believes this item is fully developed and recommends this Item be designated a Voting item.

SWMA 2018 Annual Meeting: NIST stated that this was simply adding a definition of the term "power factor" that was used in the code and recommended the item to be voting. The Committee recommends this as a Voting item.

CWMA 2018 Interim Meeting: No comments were heard. The Committee recommends this as a voting item.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

TXI – TAXIMETERS

TXI-1 N.1.3.2. Taximeters Using Other Measurement Data Sources.

Background/Discussion:

Existing Taximeters Code paragraph N.1.3.2.1. Roads requires that all testing of taximeters be performed on public roads. This requirement does not allow regulatory officials to conduct official examinations in locations not accessible to the public that may have been designated as preferable test courses or specifically designed and created for testing and which may provide more suitable conditions for testing purposes. Measured courses have customarily been established by regulatory agencies at locations including large privately-owned paved lots, airports, and other non-public locations where the flow of traffic is not a major concern and impediment to the conduct of official tests. These types of non-public locations are also desirable since safety concerns related to the general traffic in congested areas can be reduced or eliminated.

Some transportation-for-hire systems that use a measurement of distance traveled derived from sources external to the vehicle may also use mapping services to more accurately determine the positioning of the vehicle while traveling. These mapping services may not include roadways that are not accessible to the general public and therefore, may not be useful in assisting to more accurately determining the position of the vehicle and the route taken.

The providers of transportation-for-hire systems that utilize mapping services to enhance the calculation of distance traveled may therefore oppose this item.

Regional Association Comments:

WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM) explained that this item came from the USNWG on Taximeters which proposed the change to address the fact that some jurisdictions have test courses laid out on non-public roads. Kurt Floren (LA County) raised a question regarding how testing would be done on a non-public road in situations where a network system doesn't include mapping for that area. Stan Toy (Santa Clara County) noted the proposed change wouldn't create a conflict in that case. If the area wasn't covered by the system under test, a different testing location would need to be used. He noted that this issue was discussed by the WG and supports the change. Paul Jordan (Ventura County) suggested rather than deleting the language, perhaps the word "shall" could simply be changed to "may." Mr. Toy acknowledged this would be an acceptable alternative. Based on the comments received the Committee recommends the item be designated as a Voting item.

NEWMA 2018 Interim Meeting: No comments were received. Hearing no opposition or discussion on this item, the NEWMA S&T Committee believes this item is fully developed and recommends this Item be designated a Voting item.

SWMA 2018 Annual Meeting: A representative of the work group commented that they would like the requirement removed. The Committee believes this item is fully developed and recommends it as a Voting item.

CWMA 2018 Interim Meeting: No comments were heard. The Committee recommends this as a voting item.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

GMA – GRAIN MOISTURE METERS 5.56 (A)

GMA-2 Table S.2.5. Categories of Devices and Methods of Sealing.

Background/Discussion:

Currently two active NTEP Grain Analyzer Certificates of Conformance allow physical seals. One of those only allows it on a single model within a model family consisting of four distinct models. The original evaluations for these two currently active certificates were conducted in 1994 and 1997 with many amendments to each made thereafter. Since 1997 all new makes and models submitted for NTEP evaluation have utilized audit trails which meet the Category 3 Methods of Sealing. Recognizing audit trails can be a more effective means of sealing devices and that most manufacturers have already moved in that direction we are recommending all future devices manufactured after January 1, 20XX be required to utilize Category 3 methods of sealing. Further discussion can be found in the 2016 and 2018 Grain Analyzer Sector Summaries.

This will require an update to the sealing methods for two models of grain analyzers. This may not be feasible for those models. Additionally, some Weights and Measures jurisdictions do not recognize audit trails for sealing (e.g. electronic seals).

Regional Association Comments:

WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM) provided an overview of the item, noting it originated from the NTEP Grain Analyzer Sector. Hearing no additional comments and no comments in opposition to the proposal, the Committee recommends this item be designated as a Voting item.

NEWMA 2018 Interim Meeting: No comments were received. Hearing no opposition or discussion on this item, the NEWMA S&T Committee believes this item is fully developed and recommends this Item be designated a Voting item.

SWMA 2018 Annual Meeting: A representative from Kansas commented that only one manufacturer still uses a hard seal and that a hard date should be given when it is passed. The Committee believes the item is fully developed and recommends this as a Voting item.

CWMA 2018 Interim Meeting: Doug Musick (KS) commented on this proposal. The Committee believes this item is fully developed and recommends this as a voting item.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

GMA-3 Table T.2.1. Acceptance and Maintenance Tolerances Air Oven Method for All Grains and Oil Seeds.

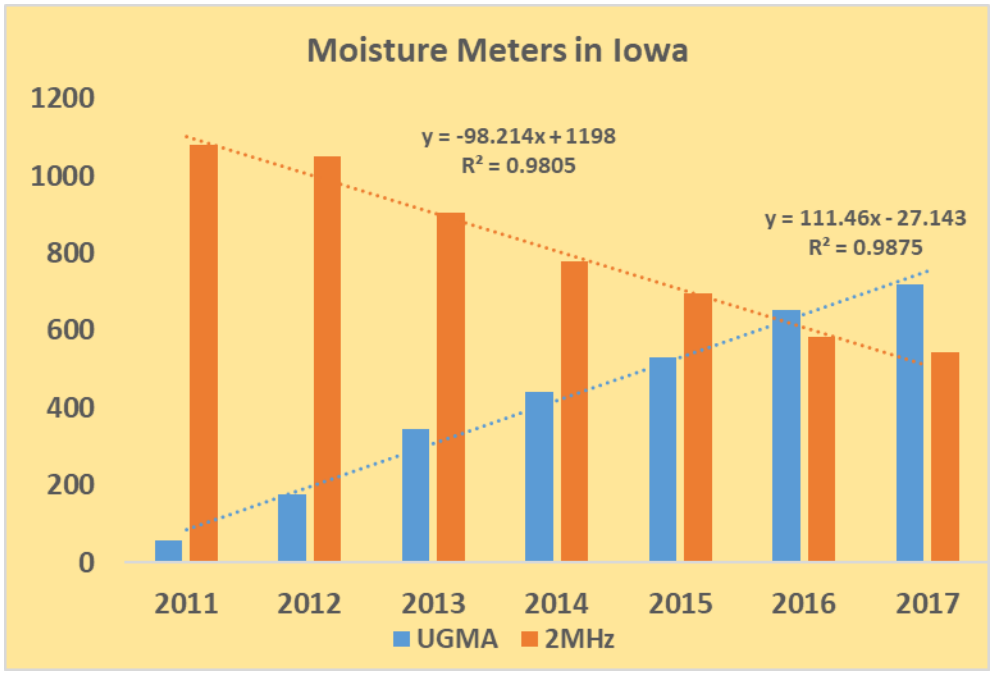
Background/Discussion:

Prior to the 2016 Grain Analyzer Sector meeting, NIST received requests for copies of the annual request for grain samples and list of grains that AMS, FGIS request from States to include in their ongoing calibration program. States and other interested parties wanted to verify that corn samples from their State were included in the calibration data for NTEP meters because of variations States reported seeing between UGMA meter and other meter technologies on corn samples.

During the 2016 Grain Analyzer Sector Meeting, Jess McCluer reported that there were numerous reports of inconsistent moisture meter measurements involving grain shipments from U.S. interior facilities to U.S. export port facilities. Mr. McCluer further stated that if the UGMA can make better measurements, then the sector should consider reducing the tolerances in NIST HB 44. At the 2016 and 2017 Grain Analyzer Sector meetings Mr. Charlie Hurburgh agreed to chair a task group to review the current NIST HB 44 tolerance with both UGMA meters and

Non-UGMA meters. During the 2018 meeting Mr. Hurburgh reported that based on data he analyzed from Iowa State Weights and Measures Grain Inspection reports, UGMA meters read closer to the reference air oven moisture results than non-UGMA meters. See data below. The Y-axis on the chart below represents the number of meters (UGMA and 2MHz meters).

Iowa Moisture Meter Inspection Results				**2014-2017**	
			Average Result on Inspector Sample		
Year	Tech	Number of	Corn 1	Corn 2	Soybean
		Meters	Meter-Std (% pts)	Meter-Std (% pts)	Meter-Std (% pts)
2014	UGMA	440	-0.02	0.02	-0.01
2015	UGMA	531	0.04	-0.06	-0.02
2016	UGMA	654	0.05	-0.06	0.01
2017	UGMA	720	-0.18	-0.06	-0.05
	Avg		**-0.03**	**-0.04**	**-0.02**
2014	2MHz	679	-0.25	0.04	-0.07
2015	2MHz	595	-0.29	-0.38	0.02
2016	2MHz	483	-0.28	-0.42	0.04
2017	2MHz	445	-0.15	-0.35	-0.01
	Avg		**-0.24**	**-0.28**	**0.00**
Different samples each year for Corn 1, Corn 2, Soy					



It was also noted during the 2018 Grain Analyzer Sector meeting that the current tolerances were developed in 1991 and have not changed with the change in technology for these devices; and is needed for grain industry risk management.

Regional Association Comments:

WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM) provided an overview of the item, noting it originated from the NTEP Grain Analyzer Sector. Hearing no additional comments and no comments in opposition to the proposal, the Committee recommends this item be designated as a Voting item.

NEWMA 2018 Interim Meeting: No comments were received. Hearing no opposition or discussion on this item, the NEWMA S&T Committee believes this item is fully developed and recommends this Item be designated a Voting item.

SWMA 2018 Annual Meeting: The SWMA heard that the table currently in use was obsolete and that the tolerances needed to change to match new technology. The Committee recommends this as a Voting item.

CWMA 2018 Interim Meeting: Doug Musick (KS) commented on this proposal. The Committee believes this item is fully developed and recommends this as a voting item.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

MDM – MULTIPLE DIMENSION MEASURING DEVICES

MDM-2 S.1.7. Minimum Measurement

Background/Discussion:

The 12 d minimum measurement is designed for instruments that use an internal rounding function to round the actual measurement up or down to the nearest value of d before being displayed. For measurement of 12 d, or less, the potential error in the measurement is considered too large and therefore the specification of the 12 d minimum measurement is in place.

Measurements below 12 d are commonplace when using a mobile tape (tape measure) type of device for determining measurements. An accepted practice for this type of device is for the Measurement to be rounded up to the nearest whole unit of measurement (e.g. 1 inch) before being used to calculate any charges.

Regional Association Comments:

WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM) questioned whether the Multiple Dimension Measuring Devices Work Group (MDMD) had reviewed the proposal. Dick Suiter (Richard Suiter Consulting), WG member noted the item has not been reviewed by the WG. Although the Committee heard no additional comments, Committee members weren't clear on the purpose of the proposed exemption or its potential impact. Within input from the MDMD WG, the Committee was reluctant to recommend additional action on the item. Consequently, the Committee recommends this be designated as a Developing item on the NCWM S&T Committee's Agenda and recommends the submitter seek input from the MDMD WG to obtain the benefit of that group's expertise.

NEWMA 2018 Interim Meeting: Walt Remmert (PA) stated that these systems are not reliable, and more data is needed. The NEWMA S&T Committee believes the submitter should further develop this item, including adding supporting data and consulting with the MDMD workgroup. The Committee recommends this item be designated a Developing item.

SWMA 2018 Annual Meeting: Richard Suiter commented that this item was not brought through the workgroup and believed that would be the appropriate place to develop this item. The Committee has no expertise in this field to make a decision as to how to handle this proposal, and therefore would agree with the comments. The Committee believes the item should be Withdrawn.

CWMA 2018 Interim Meeting: Richard Suiter stated this item was not brought through the work group and recommended this item be withdrawn. The Committee recommends this item be withdrawn.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

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TNS – TRANSPORTATION NETWORK SYSTEMS

TNS-1 A.4. Type Evaluation.

Background/Discussion:

The addition of paragraph A.4. "Type Evaluation" is needed to facilitate the application of the NIST Handbook 44 TNMS Code during type evaluation by NTEP expressly to those devices/systems in compliance with all requirements of that code. The proposal to add the new paragraph, A.4. to Handbook 44, Section 5.60. is submitted to amend the code to conform with the protocol for the type evaluation process as specified by NTEP and aligns this code with multiple other HB 44 Codes that have a similar reference.

Regional Association Comments:

WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM), submitter of the item, provided an overview of its purpose, noting that NTEP had identified this paragraph (which appears in a number of other codes) is missing from the EVFS code and noted it is needed to assist in the evaluation of devices submitted for NTEP evaluation. In its work session, the Committee noted the language could use some improvement since it appears contradictory in nature; however, such changes should be recommended (in a separate proposal) across all codes that include this paragraph. The Committee acknowledged the paragraph is intended to assist NTEP in applying the provisions of a tentative code when companies challenge the application of the code to their equipment. The Committee heard no other comments on this item and recommends the item be designated as a Voting Item on the NCWM S&T Committee Agenda.

NEWMA 2018 Interim Meeting: Mike Sikula (NY) commented in strong support of this item. The NEWMA S&T Committee believes this item is fully developed and recommends this it be designated a Voting item.

SWMA 2018 Annual Meeting: NIST commented that this item would allow systems to be tested by NTEP. Richard Suiter commented that the language is confusing and should be clarified. The Committee understands that this language is used throughout the handbook in tentative codes and understands it facilitates the submission of devices for NTEP evaluation and moves it forward as a Voting item.

CWMA 2018 Interim Meeting: The Committee thinks the language may need to be reviewed for improvement, but recommends this item be voting based on its inclusion in other codes.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

OTH – OTHER ITEMS

OTH-4 D Electric Watthour Meters Code under Development

Background/Discussion:
This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Electric Vehicle Refueling Subgroup:
Tina Butcher, Chairman
NIST Office of Weights and Measures
P: (301) 975-2196
Email: tbutcher@nist.gov
Or
Juana Williams, Technical Advisor
NIST Office of Weights and Measures
P: (301) 975-2196
Email: juana.williams@nist.gov

Electric Watthour Meters Subgroup:
Lisa Warfield, Chairman
NIST Office of Weights and Measures
P: (301) 975-3308
Email: lisa.warfield@nist.gov
Or
Tina Butcher, Technical Advisor
NIST Office of Weights and Measures
P: (301) 975-2196
Email: tbutcher@nist.gov

The creation of Developing Items on both the L&R and S&T Committee agendas will provide for a venue to allow the USNWG to update the weights and measures community on continued work to develop test procedures and test equipment standards. This item will also provide a forum for reporting on work to develop proposed method of sale requirements for electric watthour meters and a tentative device code for electric watthour meters in residential and business locations and serve as a placeholder for eventual submission of these proposals for consideration by NCWM.

The Committee received an update on this item from Mrs. Tina Butcher (OWM), Chairman of the USNWG on Electric Refueling & Submetering at the 2016 and 2017 NCWM Interim and Annual Meetings. See the Committee's 2016 and 2017 Final Report for details of those updates.

During the 2018 NCWM Interim Meeting, no comments were heard on this item and the Committee agreed to maintain its "Developing" status.

The Committee did not take comments during open hearings on Developing items at the 2018 NCWM Annual Meeting and agreed to allow only the submitter of a Developing item (or block of Developing items) to provide an update on the progress made to further develop the item(s) since the 2018 NCWM Interim Meeting. The Committee received the following update on this item from Mrs. Tina Butcher (OWM), Chair of the USNWG on Electric Refueling & Submetering:

- The Electric Watthour Meter Subgroup (SG) of the USNWG on Electric Vehicle Fueling & Submetering held several in-person meetings since the 2017 NCWM Annual.

- Meetings included web conferencing to help those who cannot attend in person.

- The SG has developed a proposed addition to NIST Handbook 130's Uniform Regulation for the Method of Sale of Commodities to specify a method of sale for electrical energy sold through watthour type submeters under W&M jurisdiction.

- The proposal will be presented for consideration by the Regional W&M Associations and the NCWM in the 2019 NCWM cycle.

- The SG looks forward to comments on the proposed language as it moves through the process.

- Some technical and editorial changes may be needed to address comments received; however, the SG expects the proposal will be ready for NCWM vote in 2019.

- The SG is steadily working on a proposed code for NIST Handbook 44 to address specifications, tolerances, and other requirements for metering systems.

- The SG expects to have a draft HB 44 code ready for the 2020 NCWM cycle.

- The SG will meet for a short web-conference on August 29, 2018 and is planning its next in-person meeting for February 2019 in Sacramento, CA.

- Those interested in participating in this work should contact Subgroup Chairman, Ms. Lisa Warfield, (OWM) or Subgroup Technical Advisor, Mrs. Tina Butcher (OWM).

The Committee agreed to carryover this item on its agenda for consideration in the 2019 NCWM Conference cycle.

Regional Association Comments:

WWMA 2018 Annual Meeting: Tina Butcher (NIST OWM) provided a status report on the work of the USNWG on Electric Vehicle Fueling and Submetering Electric Watthour (EWH) Meter Work Group, noting that the EWH hopes to have a draft code on EWHs for consideration by the weights and measures community in fall 2019. This item is included to keep the community apprised of this work; the EWH welcomes input and participation in this work. The Committee recommends this be maintained as a Developing item on the NCWM S&T Committee's agenda.

NEWMA 2018 Interim Meeting: No comments were received. The committee noted that NIST OWM reported at the WWMA meeting that the EWH Meter Workgroup hopes to have a draft code for consideration for fall of 2019. The NEWMA S&T Committee recognizes that there is work currently being done on this item and recommends a Developing item.

SWMA 2018 Annual Meeting: A representative of the work group said they expected a tentative code by the 2020 cycle. The Committee encourages keeping it as a Developmental item until a code is developed.

CWMA 2018 Interim Meeting: No comments were received. The Committee recommends this item be developing and appreciates the work of NIST in developing this item.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

Return To the Agenda Item

OTH-5 D Appendix D – Definitions: Batch (Batching)

Background/Discussion:
This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Mr. Loren Minnich
Kansas Department of Agriculture
(785) 209-2780, Loren.minnich@ks.gov

When batching occurs during and as part of the weighing or measuring process special considerations should be made to ensure equity is preserved. This definition will help manufacturers, users, and regulators determine when batching is metrologically significant.

Batch or batching are terms used to define devices in Sections 2.20, 3.36, and in several definitions in Appendix D yet there is no guidance for the regulatory official to determine what constitutes a "batch" or "batching" operation. Section 2.20 Scales has a specification, *S.1.2. Value of Scale Division Units,* and a tolerance, T.3. Sensitivity Requirement, Equilibrium Change Required. (c) Scale with a Single Balance Indicator and Having a Nominal Capacity of 250 kg (500 lb) or Greater., that are applied differently to batching scales. Section 3.36 Water Meters has a specification, test procedure, and user requirement that are specifically for batching meters. Having a definition will promote consistency in the way the devices are evaluated.

To many weights & measures officials, it may seem obvious what is implied by the terms batch or batching. As the number of devices that don't conform to the common conception of what a batching device is increases, there is a greater need for defining what the term means.

During the 2018 NCWM Interim Meeting, the Committee heard from Mr. Loren Minnich (KS) advising the Committee members that an amended definition of 'batching' had been provided to the Committee for consideration. Mr. Minnich recommended the Committee replace the definition in the current proposal with the amended version provided. If the Committee could not agree to replace the definition, he asked the Committee to continue maintaining the item on its agenda.

Mr. Russ Vires (Mettler-Toledo, LLC) speaking on behalf of the Scale Manufacturers Association (SMA) stated that the SMA was opposed to the item and that "batching" is not a commercial application.

Mr. Richard Suiter (Richard Suiter Consulting) stated that the item is required, that batching is often a commercial application and that the item should be moved forward to a "Voting" status.

During the Committees work session, the members considered the amended definition, provided by Mr. Minnich, and agreed to replace the definition in the proposal with that shown in item under consideration.
The following definition represents the version of the definition that was replaced by the Committee.

> **batch (batching). - The separate weighment or measurement of two or more products consecutively, using the same load receiving or measuring element, without emptying or re-zeroing the device between weighments or measurements. Batching may be performed by many kinds of devices including but not limited to Scales and Automatic Bulk Weighing Systems.**

The Committee felt it was inappropriate to have two items (see ABW-4) dealing with the same subject moved forward as Voting. Considering the comments from the original submitter, the Committee agreed to maintain the items as Developing.

The Committee did not take comments during open hearings on Developing items at the 2018 NCWM Annual Meeting and agreed to allow only the submitter of a Developing item (or block of Developing items) to provide an update on the progress made to further develop the item(s) since the 2018 NCWM Interim Meeting. There was no

update provided by the submitter of this Developing item during the Committee's open hearings at 2018 NCWM Annual Meeting.

The Committee received written comments in favor of item OTH-6 from Mr. Henry Oppermann (Weights and Measures Consulting) supporting the definition for batching scales. Mr. Oppermann stated that this definition correctly and specifically describes the operation of the scales that should be classified as batching scales.

Members of the Committee agreed to carryover this item on its 2019 agenda as a Developing item. The Committee looks forward to the further development of this item by the submitter.

Regional Association Comments:

WWMA 2018 Annual Meeting: Loren Minnich (KS), submitter of the item, reviewed the history and intent of the item. Dick Suiter (Richard Suiter Consulting) spoke in support of the proposal. Lou Straub (Fairbanks), speaking on behalf of the SMA commented that SMA does not support the item because these are not commercial devices. During its work session the Committee discussed the item and acknowledged different jurisdictions treat devices used in these applications in different ways. The Committee recommends the item be designated as a Voting item on the NCWM S&T Committee's agenda.

NEWMA 2018 Interim Meeting: The Committee received no comments during its open hearings, however the SMA provided written comments in opposition of this item. The NEWMA S&T Committee believes that as written, there will not be agreement between the SMA and submitter of the item. The Committee would like to see if this item could be further developed to gain a more general agreement on its usefulness and recommends a Developing status on the NCWM S&T Committee agenda.

SWMA 2018 Annual Meeting: SMA commented that these were not commercial devices. Richard Suiter echoed his comments from earlier meetings that the devices were commercial, and he supported the items. A representative of Kansas stated the devices should be considered commercial and believed it was fully developed. The Committee believes this item to be fully developed and recommends it as a Voting item.

CWMA 2018 Interim Meeting: Loren Minnich (KS, the submitter) stated this item is fully developed and ready for voting. Richard Suiter (Richard Suiter Consulting) agreed with Mr. Minnich. The Committee feels this item is fully developed and recommends this as a voting item.

Additional letters, presentation and data may have been submitted for consideration with this item. Please refer to https://www.ncwm.net/meetings/interim/publication-15 to review these documents.

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