NIST Office of Weights and Measures (OWM) Analysis
Specifications and Tolerances (S&T)
2022 NCWM Annual Meeting Agenda

The NIST OWM Analysis is submitted to the assist the Weights and Measures community as it deliberates on items before the Conference. OWM offers these comments and recommendations based upon information and input available as of the date of this report.

Language 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***.

For additional information or assistance please contact an OWM Technical Advisor:

Mrs. Tina Butcher, S&T Committee, **tina.butcher@nist.gov** or (301) 975-2196
Mr. Rick Harshman, S&T Committee, **richard.harshman@nist.gov** or (301) 975-8107
Mr. Jan Konijnenburg, NIST Associate, **jan.konijnenburg@nist.gov**
Ms. Diane Lee, S&T Committee, **diane.lee@nist.gov** or (301) 975-4405
Ms. Juana Williams, S&T Committee, **juana.williams@nist.gov** or (301) 975-3989

Subject Series List for the Specifications and Tolerances Committee

Table A
Table of Contents

Table 1. Acronyms and Glossary	
ABWS	Automatic Bulk Weighing System
AAR	Association of American Railroads
API	American Petroleum Institute
CNG	Compressed Natural Gas
CWMA	Central Weights and Measures Association
EPO	Examination Procedure Outline
FHWA	Federal Highway Administration
GMM	Grain Moisture Meter
GPS	Global Positioning System
HB	Handbook
LMD	Liquid Measuring Devices
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MMA	Meter Manufacturers Association
MDMD	Multiple Dimension Measuring Device
NCWM	National Conference on Weights and Measures
NEWMA	Northeastern Weights and Measures Association
NIST	National Institute of Standards and Technology
NTEP	National Type Evaluation Program
OIML	International Organization of Legal Metrology
OWM	Office of Weights and Measures
RMFD	Retail Motor Fuel Dispenser
S&T	Specifications and Tolerances
SD	Secure Digital
SI	International System of Units
SMA	Scale Manufactures Association
SWMA	Southern Weights and Measures Association
TC	Technical Committee
USNWG	U.S. National Work Group
VTM	Vehicle Tank Meter
WIM	Weigh-in-Motion

WWMA	Western Weights and Measures Association

Table 2. Reporting Structure
Source: Name and affiliation of submitter.
Purpose and Justification: The submitter's concise statement as to the intent or purpose of this proposal. The justification describes the national importance, background on the issue, and may contain references to supporting data or documents. The justification may be summarized by OWM.
OWM Executive Summary: High level points that summarize the Technical Aspects of the item and recommendations pertaining to the Item under Consideration.
Table 3. Summary of Recommendations
Item under Consideration – The latest language that the Committee has moved forward as the Item membership is considering
NIST OWM Detailed Technical Analysis – A detailed analysis with background information and recommendations from the Office of Weights and Measures (OWM)
Summary of Discussions and Actions – An OWM summary of details and discussion on this Item. This includes discussion and decisions of the Standing Committee. This may also include information from sectors, trade associations, task groups, and subcommittees.
Regional Association Reporting - Taken directly from the Regional Association Meeting finalized report. • Each region will be identified separately. • The meetings within each region will be in chronological order. • This information is taken directly from the Regional Association final report. • The Technical Advisor may reach out to the regional Chair for clarification.

Details of All Items
(In order by Reference Key)

GEN – GENERAL CODE

GEN-19.1 D G-T.5. Tolerances on Tests When Transfer Standards are Used., Appendix A, Section 3.2. Tolerances for Standards., and Appendix D – Definitions: standards, field., ~~transfer standard.~~ and standard, transfer.

This item was modified and combined with Item OTH-22.1 and is now Block 8.

GEN-22.1 V G.A.1. Commercial and Law-Enforcement Equipment.

Source: NIST Office of Weights and Measures

Purpose and Justification:
This proposed change is intended to add clarification regarding the implications of using weighing and measuring devices for transactions that may be considered by some as commercial while there is no clear guidance provided.

OWM Executive Summary for GEN-22.1 – G.A.1. Commercial and Law-Enforcement Equipment

OWM Recommendation: OWM believes GEN-22.1 is fully developed and recommends its' adoption along with the two companion L&R items.

- This item is intended to eliminate all ambiguity concerning the issue of whether or not NIST Handbook 44 is intended to apply to weighing and measuring equipment used solely for the purpose of charging a fee for the service of providing a weight or measure.
- This item is somewhat related to the two remaining S&T scale items in Block 6, from which this item was removed by the Committee during the 2022 NCWM Interim Meeting and made a stand-a-lone voting item. The remaining two scale items are currently developing items.
- There are also two companion items on L&R's agenda related to S&T GEN-22.1, both of which are also voting items. The L&R items are B2: WAM-22.1 and NTP-22.1. These two L&R items were developed by OWM to harmonize the language associated with the terms "commercial" and "law enforcement" in NIST Handbook 44 and NIST Handbook 130.

Table 3. Summary of Recommendations

GEN-22.1 – G.A.1. Commercial and Law Enforcement Equipment

	V	D	W	A	I	Notes*	Comments
Submitter							

Table 3. Summary of Recommendations

GEN-22.1 – G.A.1. Commercial and Law Enforcement Equipment

	V	D	W	A	I	Notes*	Comments
OWM	✓						
WWMA		✓				1	
SWMA		✓					
NEWMA	✓						
CWMA	✓					1	
NCWM		✓					

	Letters of Support	Letters of Opposition	Comments
Industry			
Manufacturers			SMA supports this item
Retailers and Consumers			

***Notes Key:**
1 – Submitted modified language
2 – Item not discussed
3 – No meeting held
4 – Not submitted on agenda
5 – No recommendation or not considered

Item under Consideration:

Amend Handbook 44, General Code as follows:

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

(1) To commercial weighing and measuring equipment; that is:

(a) To weights and measures and weighing and measuring devices commercially used or employed in:

1. 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;

2. **assessing a fee for the use of the equipment to determine a weight or measure;**

3. **determining the basis of an award using count, weight, or measure; or**

4. computing any basic charge or payment for services rendered on the basis of weight or measure.
(Amended 2008 **and 20XX**)

(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 of the device.

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

(These requirements should be used as a guide by the weights and measures official when, upon request, courtesy examinations of noncommercial equipment are made.)

NIST OWM Detailed Technical Analysis:

This item was originally a part of the Block 6 S&T items but was removed by the Committee and made a stand-alone voting item during the 2022 NCWM Interim Meeting at the recommendation of OWM and others. As a result, only two "scale" items remain in Block 6 of the Committee's 2022 Interim Meeting Report (NCWM Publication 16). Those items are SCL-22.1 and SCL-22.3 and both remain in a developing status. Refer to Block 6 of this report to view OWM's analysis of these two items.

OWM developed the proposal in GEN-22.1 and the two proposals in SCL-22.1 and SCL-22.3 to:

1. remove all ambiguity surrounding the issue of whether or not NIST Handbook 44 is intended to apply to weighing and measuring equipment used solely for the purpose of providing a weight or measure for a fee; and

2. address perceived gaps in HB 44 Scales Code requirements pertaining to the design and use of multi-independent platform vehicle scales used to charge a fee for the service of providing axle- and axle-group weights, as well as total vehicle weight to those needing them (typically commercial haulers).

These (3) proposals were developed as the result of an OWM inquiry from a state questioning the permissible use of a multi-independent platform vehicle scale system (each platform having its own A/D conversion circuitry and weight indicator) that printed total vehicle weight from summing the axle- and axle-group loads of vehicles weighed when not all parts of those vehicles were able to fit onto a live portion of the scale and be weighed simultaneously. That is, the scale was being used on occasion to "split weigh" in two different drafts the different axle and axle groups of "over-sized" coupled vehicle combinations because not all axle and axle groups would fit onto a live portion of the scale at the same time, which thus necessitated weighing those particular vehicles in multiple drafts. Even though the printed ticket provided clear indication that the total vehicle weight value recorded was "non certifiable," it is questionable whether or not the scale system would be permitted to record this weight since HB 44 Scales Code paragraph UR.3.3. Single-Draft Vehicle Weighing requires a vehicle or coupled-vehicle combination to be weighed on a vehicle scale only as a single draft.

The two scale items in Block 6 are intended to address the design and use of multi-independent platform vehicle scale systems, including the weight information that gets displayed and recorded by these systems when in use. OWM developed the GEN-22.1 proposal when it became evident from discussions with

various states that not all jurisdictions interpreted paragraph G-A.1. to mean that HB 44 was intended to apply to weighing and measuring devices and systems used solely to charge a fee for the service of providing a weight or measure and for no other purpose. Consequently, Gen-22.1 is intended to make clear the application of HB 44 to weighing and measuring equipment used to charge a fee for the service of providing a weight or measure but could also be used for commercial uses.

Based on the feedback received during the fall 2021 regional weights and measures association meetings and the 2022 NCWM Interim Meeting, OWM concluded that most everyone seemingly agrees that NIST Handbook 44 is intended to apply to weighing equipment used in assessing a fee for the service of providing a weight. It is only reasonable to expect that when a device is used for the purpose of charging a fee for a weight or measure that that weight or measure be accurate, (i.e., to within the applicable tolerances specified in HB 44), and that the device used for this service comply with all applicable HB 44 requirements. Clarifying this point was OWM's objective in proposing a change to paragraph G.A.1. Commercial and Law-Enforcement Equipment.

Summary of Discussions and Actions:

The S&T Committee agreed at the request of OWM and others during the 2022 NCWM Interim Meeting to restructure the information in the GEN-22.1 proposal from that which was initially drafted and appearing in the Committee's 2022 NCWM Interim Meeting Agenda. This restructuring was done to harmonize the GEN-22.1 item with two "companion items" on the Laws and Regulations Committee's 2022 agenda that define the term "commercial equipment." This S&T item, following its restructuring, then received widespread support from those commenting on it during open hearings.

The Specifications and Tolerances Committee and Laws and Regulations Committee agreed to meet virtually following the 2022 NCWM Interim Meeting to make any final changes necessary to harmonize the different proposals. No changes were recommended to this item during that meeting and the Committee agreed to recommend for vote the proposal as shown in the Item under Consideration of this report at the 2022 NCWM Annual Meeting.

Regional Association Reporting:

Western Weights and Measures Association

At the 2021 WWMA Open Hearings, the following comments on all three items originally in Block 6 to include GEN-22.1, SCL-22.1, and SCL-22.3 were heard:

Mr. Kurt Floren (Los Angeles County, California): He wants to offer that the last part of subsection A and breaking into bullet points. He wants to break out equipment that is commercial, then the other types. It's titled commercial and law enforcement then "other commercial" and it becomes confusing. Is it all commercial and subsect to our jurisdiction. Rephrase GA-1 : apply "to commercial equipment as follows": ... explains that everything under is commercial (strike "commercial" from A and B). Between apply and as in the first line, insert commercial equipment. Mr. Floren stated that he will submit a written statement to the Committee as presented during open hearings.

Mr. Ivan Hankins (Iowa) wants clarification as to what is being changed to make it better. It looks like it's already there, and he wants more definition on why this is changing.

Ms. Cadence Matijevich (Nevada) agrees with Kurt, but cautions that we consider how the heading reads if we add commercial to the opening statement then there might be some interpretation that what is or is not commercial law enforcement equipment. (Is there a fine assessed?) Does not want to narrow the subsection of law enforcement devices only to commercial purposes.

Mr. Kurt Floren (Los Angeles County, California): fix to Ms. Cadence Matijevich: restructure under GA-1: insert subsection under 1: commercial as follows, then insert A,B,C, then 2 for law enforcement.

Ms. Cadence Matijevich (Nevada) stated that Mr. Floren is much better at this, and his fix is good.

Mr. Lou Straub (Fairbanks Scales): agrees with Mr. Hankins, that the original language is satisfactory. Language needs to say that its NTEP approved and meets handbook requirements.

Mr. Eric Golden (Cardinal Scale): Does a commercial transaction include just getting a weight: he says yes. Change the wording that that transaction is commercial. No suggestions at this time. Kurt missed a typo: in B2: "Basis".

Mrs. Tina Butcher (NIST OWM): their office submitted this. Wanted to clarify commercial transactions. Agrees with previous testimony. They have submitted other proposals to amend method of sale reg. and uniform law. They have determined that HB 44 and 2 sections in HB 130 are slightly different. Uniform Reg. for service persons also needs to be aligned. Wants this to remain developing so that they can continue to align the language and make it more uniform.

Mr. Russell Vires (Scale Manufactures Association): This is a new item, the SMA has not vetted this yet. They will do so at November meeting. This should remain developing so that there's no unintended consequences.

Mrs. Tina Butcher (NIST OWM): In the agenda, this is blocked with two other "companions". She feels that the block should continue, however, if others think that other items in the block are ready (SCL-22.1 and SCL-22.3) those items can move forward.

Mr. Don Onwiler (NCWM): SCL-22.3 is the name of the next item.

Mr. Russell Vires (Scale Manufactures Association): he is looking at it as a block and is commenting as an entire block. Wants all 3 to remain developing so that they can research.

Mr. Lou Straub (Fairbank Scales): SCL-22.1: concern about the second sentence: talking about the entire truck on the scale = not legal for trade: this is ok. Second part about axle identifications (axle groups) this gets difficult to identify group notifications. Wants the ticket that has already been marked as not legal for trade to not have to identify all axels. Wants this re-worded. They will put down axle weight and gross weight. Preprinted labels don't allow enough space.

Mr. Eric Golden (Cardinal Scales): agrees with Mrs. Butcher to split the items. "Blow the block apart." The second two items introduce additional items and topics. Wants to pull the second two items out.

The WWMA S&T Committee recommends that this be assigned a Developmental status. The Committee recommends following the submitter's request to remove GEN-22.1 from the Block. Based on testimony heard the Committee agreed to submit the following language for item GEN-22.1. The Committee notes that SCL-22.1 (UR.3.3.) item was reassigned as SCL-22.3.

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

(1) To commercial weighing and measuring equipment

(a) ~~To commercial weighing and measuring equipment; that is,~~ ~~t~~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 **and 20XX**)

(b) **To ~~other commercial~~ weighing and measuring equipment:**

i. when there is a fee assessed for the use of the equipment to determine a weight or measure;

ii. used to determine the bases of an award using count, weight, or measure; or

iii. used in computing any basic charge or payment for services rendered on the basis of weight or measure

(Added 20XX)

(**~~b~~c**) 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 of the device.

(**~~cd~~)(2)** To weighing and measuring equipment in official use for the enforcement of law or for the collection of statistical information by government agencies.

(These requirements should be used as a guide by the weights and measures official when, upon request, courtesy examinations of noncommercial equipment are made.)

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing Mr. Russ Vires (Mettler Toledo), stated that this item needs work on the wording and further review by stakeholders. Its current language could have unintended consequences, and recommended it continue with a Developing Status.

This Committee would like clarification on the purpose and use of axle weight scale values allowed by this proposal beyond law enforcement use.

This Committee recommends that this item move forward with a Developing status.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.
GEN-22.1
Mr. Rick Harshman (NIST OWM) commented that the language is in-need of some changes and NIST will be providing changes for the NCWM. Mr. Eric Golden (Cardinal Scale) supports the intent of this item,

but it may need some wordsmithing. Mr. Lou Straub (SMA), Ms. Cheryl Ayer (New Hampshire), and Mr. John McGuire (New Jersey) all support this as a developing item.

SCL 22.1
Mr. Eric Golden (Cardinal Scale) supports this item moving forward as developing. Mr. Lou Straub (Fairbanks Scale) agrees with language in general. But questions the benefit of including all the language on a scale ticket and the large amount of information would be difficult to fit on the ticket. Mr. Eric Golden (Cardinal Scale) and Ms. Cheryl Ayer (New Hampshire) agree with comments from Mr. Straub. Mr. John McGuire (New Jersey) recommends keeping this item in Developing status.

SCL 22.3
Mr. Eric Golden (Cardinal Scale) suggested to strike "non-commercial" and additional wordsmithing to align with paragraph UR3.4. Mr. John McGuire (New Jersey) supports keeping this item in developing status.

The NEWMA Specifications and Tolerances Committee recommends that this item be given a Developing Status.

During NEWMA's 2022 Annual Meeting Open Hearings, the following comments were heard:

Mrs. Tina Butcher (NIST OWM) commented that the intent is to remove ambiguity as there is an expectation for customers to receive an accurate weight when not used as a typical commercial device. She believes the item is ready as presented and language aligns with L&R items with terms "commercial" and "law enforcement". Mr. Russ Vires (SMA) commented that SMA supports the item as voting as it provides clarity of what constitutes a commercial transaction. Mr. John McGuire (NJ) commented as the NCWM L&R Chair and indicated that both NCWM L&R and S&T committees met in February 2022 to align this item with the L&R items.

Upon hearing these comments, the Committee considered the item to be fully developed and recommended that the item retains Voting status.

Central Weights and Measures Association

During the 2021 CWMA Interim Meeting the committee heard comments from the floor on all three items originally in Block 6 to include GEN-22.1, SCL-22.1, and SCL-22.3 as follows:

Mr. Loren Minnich (Kansas) suggested change he sent to the committee (in green).

> **B6: GEN-22.1 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 **and 20XX**)
>
> (c) **To other commercial weighing and measuring equipment:**

i. when there is a fee assessed for the use of the equipment to determine a weight or measure;

ii. ~~used to determine the bases of an award using count, weight, or measure~~ when using weight, measure, or count as the basis to determine an award; or

iii. used in computing any basic charge or payment for services rendered on the basis of weight or measure

(Added 20XX)

Mr. Loren Minnich (Kansas) also asked NIST for clarification on G-A.1. because different states already interrupt rule different ways. Ms. Diane Lee (NIST) agreed with Mr. Minnich and suggested it be Developing. Mr. Eric Golden (Cardinal Scales) agreed with the spirit of the proposal; it is indeed a "commercial transaction" to charge a person a fee solely for the purpose of obtaining a weight of a vehicle – it is not required to have to undergo a sales transaction of weighed product in order for it to be considered a commercial transaction. Mr. Golden also recommended striking out the following (in red) stating the reasoning behind this is by leaving the "non-commercial" language in the proposal, it defeats the purpose of the proposal, which is to officially clarify what a non-commercial transaction is.

B6: SCL-22.1 S.1.14. Recorded Representation of Axle or Axle Group Weights

S.1.14. Recorded Representation of Axle or Axle Group Weights. – The recorded representation of weights from individual axle or axle group weights shall clearly be identified as "not legal for trade~~" or "non-commercial" weight values~~ unless the entire vehicle is positioned on live elements of a multiple-platform vehicle scale and where all axles/axle groups are weighed simultaneously. All recorded weights of axles/axle groups shall be identified as representing only a portion of the vehicle's total gross weight (e.g., by axle groupings such as: "axle group 1," "axle group 2," "axle group 3," or by individual axle description such as: "steering axle," "drive axles," "trailer axles").

Any total gross weight of the vehicle included in the recorded representations determined by summing axle weights shall be clearly identified as "not-legal-for trade" ~~or "non-commercial"~~ unless those axle weights were recorded when all parts of the vehicle rested simultaneously on live portions of the scale, or the individual components were uncoupled, positioned completely on the live elements, and weighed separately on the scale.

Mrs. Tina Butcher (NIST OWM) agreed G-A.1. needed more work and had no objection to Mr. Golden's suggestion of splitting SCL-22.1 and SCL-22.3. Mr. Lou Straub (Fairbanks) said current G-A.1. is already correct. He also agreed with Mr. Golden from Cardinal Scales on SCL 22.1. Mr. Doug Musick (Kansas) agreed with Mr. Straub. He said that the item is not practical for all vehicles out there. Keep as Developing. Mr. Ivan Hankins (Iowa) felt that G-A.1. is already correct. Mr. Charles Stutesman (Kansas) stated original language is good as written.

CWMA S&T Committee recommends that GEN 22.1 be withdrawn and SCL-22.1 and SCL 22.3 remain Developing.

During the 2022 CWMA's Annual Meeting Open Hearings, the following comments were heard:

Mr. Jan Konijnenburg (NIST OWM) stated fully developed and ready for a vote. Mr. Russ Vires (SMA) supported the item. Mr. Konrad Crockford (North Dakota) supported the item. Mr. Charles Stutesman

(Kansas) believed final determination of a device should be decided by the local jurisdiction and item should not move forward. Mr. Doug Musick (Kansas) said the word commercial should be stricken from Line 13 on page 149 as well as Line 6 on page 150.

The CWMA S&T Committee believes this item is fully developed and should remain a voting item with the following changes: Page 149 Line 13, **(1) To ~~commercial~~ weighing and measuring equipment; that is:**

Scale Manufacturers Association (SMA-Fall 2021 Meeting)

The SMA offered the following technical positions from its November 2021 Meeting on the three items originally in Block 6 to include GEN-22.1, SCL-22.1, and SCL-22.3 as follows**:**

The SMA recommends that Block 6 be broken apart into three (3) individual items because each of these items deals with a separate topic that needs to be discussed individually.

B6: GEN-22.1 G.A.1. Commercial and Law-Enforcement Equipment

The SMA supports this item. The proposed item provides clarity to define what constitutes a "commercial transaction."

B6: SCL-22.1 S.1.14. Recorded Representation of Axle Group Weights

The SMA supports this item with the following changes (shown as shaded and struck-through text):

S.1.14. Recorded Representation of Axle or Axle Group Weights. – The recorded representation ~~of weights from individual axle or axle group weights~~ shall clearly be identified as "not legal for trade" ~~or "non-commercial" weight values~~ unless the entire vehicle is positioned on live elements of a multiple-platform vehicle scale and where all axles/axle groups are weighed simultaneously. ~~All recorded weights of axles/axle groups shall be identified as representing only a portion of the vehicle's total gross weight (e.g., by axle groupings such as: "axle group 1," "axle group 2," "axle group 3," or by individual axle description such as: "steering axle," "drive axles," "trailer axles").~~

Any total gross weight of the vehicle included in the recorded representations determined by summing axle weights shall be clearly identified as "not-legal-for trade" ~~or "non-commercial"~~ unless those axle weights were recorded when all parts of the vehicle rested simultaneously on live portions of the scale, or the individual components were uncoupled, positioned completely on the live elements, and weighed separately on the scale.

Rationale: The item attempts to define what constitutes a "commercial transaction", but the words "non-commercial" reduces its clarity. Secondly, it is not necessary to label each weight value of axle/axle group weights as "not legal for trade"; putting the words "not legal for trade" on the recorded representation once is adequate.

B6: SCL-22.3 UR.3.3. Single-Draft Vehicle Weighing, and UR.3.4. Axle and Axle Group Weight Values

Position: The SMA supports this item.

SMA-Spring 2022 Meeting

Position: The SMA supports this item (i.e., GEN-22.1.).

Rationale: The proposed item provides clarity to define what constitutes a "commercial transaction."

SCL – SCALES

SCL-20.9 W S.1.1.3. Zero Indication, Load Receiving Elements Separate from Weighing Elements. And Appendix D – Definitions: no load reference value

Note: *This item was carried over from the 2020 Interim Meeting however, it was not a Voting item and therefore not discussed during the continuation of the 2020 Annual Meeting. Instead, the item was placed on the 2021 Interim Meeting's agenda and was discussed during that meeting.*

The original 2021 Interim Meeting Report did not include the updated Item Under Discussion. It was corrected for Publication 16 on May 27, 2021.

Source: Kansas Department of Agriculture

Purpose and Justification:
This item is intended to be applied to weighing devices utilizing a hopper that, once programmed, weigh in multiple drafts to complete the weighing cycle (automatic operation) and that in the course of the normal weighing cycle may not return to zero because of material remaining in the hopper.

OWM Executive Summary for SCL-20.9 – S.1.1.3. Zero Indication, Load Receiving Elements Separate from Weighing Elements. And Appendix D – Definitions: no load reference value
OWM Recommendation: No recommendation. This item was withdrawn at the 2022 Interim Meeting.

Table 3. Summary of Recommendations

SCL -20.9 – S.1.1.3 Zero Indication, Load Receiving Elements Separate from Weighing Elements, Appendix D – Definitions: no load ref value

	V	D	W	A	I	Notes*	Comments
Submitter							
OWM			✓				
WWMA		✓					
SWMA		✓					
NEWMA		✓					
CWMA			✓				
NCWM							

Table 3. Summary of Recommendations							
SCL -20.9 – S.1.1.3 Zero Indication, Load Receiving Elements Separate from Weighing Elements, Appendix D – Definitions: no load ref value							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**

***Notes Key:**
1 – Submitted modified language
2 – Item not discussed
3 – No meeting held
4 – Not submitted on agenda
5 – No recommendation or not considered

Item under Consideration:

Amend Handbook 44, Scales Code as follows:

S.1.1.2. No-Load Reference Value. –

S.1.1.2.1. Single Draft Manually Operated Receiving Hopper.- On a single draft manually operated receiving hopper scale installed below grade, used to receive grain, and utilizing a no-load reference value, provision shall be made to indicate and record the no-load reference value prior to the gross load value.
(Added 1983)

S.1.1.2.2. Digital Indicating Hopper Scales Designed for Automatic Operation- Provisions shall be made to indicate and record a no-load reference value on both sides of zero
(Nonretroactive as of January 1, 20XX)

S.2.1. Zero-Load Adjustment.

S.2.1.7. Digital Indicating Hopper Scales Designed for Automatic Operation. – The weighing system shall be equipped with semiautomatic means by which the zero-load may be adjusted when the indication is stable within plus or minus 1.0 scale division and the weighing cycle is not in operation.

Automatic zero-tracking and automatic zero-setting mechanisms shall not operate during the weighing cycle.
(Nonretroactive as of January 1, 20XX)

S.2.6. Weighing and Recording Sequence for Digital Indicating Hopper Scales Designed for Automatic Operation

S.2.6.1. Weighing Sequence. – For weighing systems used to receive (weigh in), the no-load reference value shall be determined and recorded only at the beginning of each weighing cycle. For systems used to deliver (weigh out), the no-load reference value shall be determined and recorded only after the gross load reference value for each weighing cycle has been indicated and recorded.
(Nonretroactive as of January 1, 20XX)

S.2.6.2. Recording Sequence. – Provision shall be made so that all weight values are indicated until the completion of the recording of the indicated value.
(Nonretroactive as of January 1, 20XX)

S.3.4. Interlocks and Flow Control-Digital Indicating Hopper Scales Designed for Automatic Operation.

S.3.1. Flow Control. – Provision shall be made to clearly indicate to the operator the status of product flow to and from the weigh hopper.

S.3.2. Interlocks. – Each 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 cannot print a weight if either of the flow control mechanism leading directly to or from the weigh hopper is operating.

(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.

S.3.5. Overfill Sensor.

(a) The load-receiving element shall be equipped with an overfill sensor which will cause the flow control mechanism filling the load-receiving element to become inactive, activate an alarm, and inhibit weighing until the overfill condition has been corrected.

(b) If the system is equipped with a lower garner or surge bin, that garner shall also be equipped with an overfill sensor which will cause the flow control mechanism emptying the load-receiving element to remain open, activate an alarm, and inhibit weighing until the overfill condition has been corrected.
[Nonretroactive as of January 1, 20XX]

And amend Appendix D – Definitions as follows:

no-load reference value. – A positive **or negative** weight value indication with no load in the load-receiving element of a scale. ~~**(Used with automatic bulk-weighing systems and certain single-draft, manually-operated receiving hopper scales installed below grade and used to receive grain.)**~~ [2.20, 2.22]

NIST OWM Detailed Technical Analysis:

The submitter of this item (State of Kansas) requested its withdrawal during S&T open hearings at the fall 2021 CWMA meeting. Based on the submitters recommended withdrawal, OWM offers no comments and recommendation on this item.

Summary of Discussions and Actions:

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, **doug.musick@ks.gov**

There are many devices currently in use that, when not returned to zero, produce an inaccurate weighment. For example, a hopper scale used to weigh aluminum cans. The hoppers of these scales tend to become very sticky from residue and cans may stick to the side. When the indicator does not return to zero the operator will typically re-zero the scale to begin the next weighment. If the operator does not notice the device didn't return to zero, they may pay for the same cans more than once. If the device is re-zeroed with the can still stuck and it is knocked loose later, the customer may be paid for less material than they brought to the facility if the operator does not notice the indicator is below zero. If properly operated, a system utilizing a load-receiving element separate from a weighing element can be used to determine an accurate net weight.

In some cases, the load receiving element of a scale will retain materials (in the case of a hopper scale often referred to as the "heel"). This is typically a positive value but if the operator manually re-zero's the indicator and the material is subsequently cleared this can result in a negative value and should be accounted for when determining a net weight.

At the NCWM 2020 Interim Meeting, the submitter (Mr. Musick) stated the intent of this item was directed towards weighing systems utilizing hoppers and tanks and that his understanding of the NIST OWM analysis is that the intent of the proposal may not have been clear and will work towards clarifying the purpose of the item. Mr. Musick requested the committee assign a Developing Status. A representative of the NIST OWM indicated he had discussed the item with the submitter and is willing to work with him to assist in the development of the item.

A representative of the SMA commented that their group is opposed to the item because the intent is not understood.

During the Committee's work session, the Committee assigned this item a Developing status.

At the NCWM 2020 Annual Meeting, due to the 2020 COVID-19 pandemic, this meeting was adjourned to January 2021, at which time it was held as a virtual meeting. Due to constraint of time, only those items designated as 2020 Voting Items were addressed. All other items were addressed in the subsequent 2021 NCWM Interim Meeting.

At the 2021 NCWM Interim Meeting, the Committee heard testimony in the open hearing session from Mr. Loren Minnich (Kansas, submitter) stating that this proposal would replace another proposal from this submitter (ABW-16.1) which the submitter is recommending Withdraw. Mr. Minnich recommended an Information or Developing status for this item. Mr. Russ Vires (SMA) stated that the SMA takes no position on this item. Mr. Kevin Schnepp (California Division of Measurement Standards) supports a Developing status for the item.

During the 2021 Interim Meeting work session, the Committee recommended the submitter continue to work with NIST OWM to further develop this item and agreed the item should remain as a Developing status.

At the 2022 NCWM Interim Meeting, the Committee heard from Mr. Loren Minnich (Kansas, submitter) that he requested the item be withdrawn. Mr. Russ Vires (SMA) stated they oppose the item and feel it is an application issue. The Committee agreed to withdraw this item.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearing the following comments were heard: Mr. Russell Vires (SMA): carryover item. SMA opposes item in current form. The potential problem is an application issue and not specification issue. Their position is recorded on the NCWM website.

The WWMA S&T Committee recommends the status remain developmental so that the submitter can continue to work on this as they have previously stated.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing Mr. Russ Vires, SMA, stated that he opposes this item because he believes it's an application issue, not a specifications issue, citing that the submitter has requested it remain developmental.

This S&T Committee recommends this item remain a Developing status.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearings, no comments were heard, and the submitter was not available.

The S&T Committee recommends that this item remain in Developing Status.

During the 2022 Annual Meeting open hearings no comments were received because this item was withdrawn at the 2022 Interim Meeting.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing, the Committee heard comments from the floor. Mr. Loren Minnich (Kansas) (submitter) suggested withdraw. Mr. Lou Straub (SMA) does not support item, feels it's an application issue not a specifications item.

CWMA S&T Committee supports the submitter request to withdraw.

During the CWMA 2022 Annual Meeting Open Hearing no comments were received because this item was withdrawn at the 2022 Interim Meeting.

SMA

During the SMA 2021 fall meeting, the SMA opposed this item in its current form. The SMA believed that the potential problem the item is attempting to address is an application issue, not a specification issue.

SCL-22.2 A UR.1. Selection Requirements, UR.1.X. Cannabis

Source: NCWM Cannabis Task Group

Purpose and Justification:
Establish uniform scale suitability requirements among the states for sales of cannabis.

OWM Executive Summary for SCL-22.2 – UR.1. Selection Requirements, UR.1.X. Cannabis

OWM Recommendation: For these reasons, OWM recommends this item be withdrawn. A much-preferred approach would be to develop a guidance document, taking into account all scale suitability factors thereby continuing to provide officials the discretion they currently possess to making final scale suitability determinations based on the results of their inspection.

- Suitability requirements should be applied independent of the product being weighed. It raises the question, "Why only cannabis and not other products?"

- There are many significant factors that need to be considered when determining whether or not a particular scale is suitable for its intended application. For example, the smallest, largest, and average loads to be weighed on the scale; the scale's minimum division value; the various unit prices of commodities weighed and whether or not the scale has tare deduction and/or computing capability; the environment in which the scale will be used; and other factors (not mentioned) should all be a part of that decision making process.

  - Because maximum scale division is only one such factor, establishing maximum scale division values in HB 44 may have the unintentional effect of restricting an official's ability to take enforcement action on a scale.

- Unit prices of commodities change over time and new products are continually being brought to market, some of which may have a much higher or lower unit price than products currently offered. For this reason, it is not possible to specify an acceptable maximum scale division value that will render the application of a scale suitable over time.

- NIST HB 44 already provides the necessary resources (in the way of General Code paragraph G-UR.1. Suitability of Equipment and Scales Code paragraph UR.1. Selection Requirements) for officials to be able to enforce scale suitability based on the many factors that need to be considered at time of inspection.

- Although the "Old" NIST HB 44 Scales code (i.e., pre-1986) provided maximum scale division values based on scale type or design per Table 7b, Applicable to Devices Not Marked with a Class Designation, the concept of specifying maximum scale division values for different commodities to be weighed on a scale was abolished with the adoption of a new Scales Code in 1986, which bases scale selection on a scale's accuracy class designation.

Table 3. Summary of Recommendations							
SCL -22.2 – UR.1. Selection Requirements, UR.1.X. Cannabis							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**
Submitter							
OWM							
WWMA		✓					
SWMA	✓						
NEWMA				✓			
CWMA				✓			
NCWM							

	Letters of Support	**Letters of Opposition**	**Notes**
Industry			
Manufacturers		✓	• A&D Engineering (01-04-22)
Retailers and Consumers			
Regulators	✓		• FL Dept Agriculture letter of support. (12-07-21)

***Notes Key:**
1 – Submitted modified language
2 – Item not discussed
3 – No meeting held
4 – Not submitted on agenda
5 – No recommendation or not considered

Item under Consideration:

Amend NIST Handbook 44, Scales Code as follows:

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.[3]

UR.1.X. Cannabis. – The scale division for scales weighing Cannabis shall not exceed:

(a) 0.01g for net weighments up to capacity,

(b) 0.1g for net weighments greater than 10g, up to capacity, and

(c) 1g for net weighments greater than 100g, up to capacity.

(Added 20XX)

NIST OWM Detailed Technical Analysis:

The following was copied from OWM's 2022 NCWM Interim Meeting analysis and remains little changed for the 2022 NCWM Annual Meeting:

We believe this proposal is intended to limit the maximum division value (for three specified net load ranges) so that it is sufficiently small that a scale's round-off error and allowable tolerance is insignificant relative to the load being weighed. Although we can understand why some might be in favor of supporting such a proposal given its simplicity, we don't believe it is possible to designate a tiered set of maximum division values that will remain relevant over time. A potential problem that we see, and several others have already pointed this out in comments made during recent S&T open hearings held during regional weights and measures association meetings, is that there's no way to predict how the use of a scale might change over time with respect to the kinds of products weighed or their prices. Consequently, by adopting such a proposal one runs the risk of having to be boxed in (i.e., having to accept use of a scale) should over time, different products having a much higher unit price be weighed on the scale, or unit prices of products weighed on the scale at time of initial scale certification increase significantly to an amount that causes one to view the scale's application unsuitable.

The value of a scale's minimum increment is but one factor used to determine the suitability of a scale for a particular application, albeit an important one. Other important factors to consider include, but are not limited to:

- the smallest and largest load to be weighed
- the average load to weighed (ideally, the majority of weighing should take place between one-quarter and three-quarters of scale capacity)
- unit prices of commodities weighed and whether or not the scale has computing capability
- dimensions of the load-receiving element
- special application (e.g., prepack versus direct sale, etc.)
- scale accuracy class and the HB 44 tolerance to be applied, etc.
- sufficient tare capability

Each of these factors (and others not mentioned) need to be consider when determining whether or not a scale is suitable for a particular scale application.

HB 44 already provides the necessary tools (in the way of General Code and Scales Code requirements) for officials to be able to enforce suitability. It also provides officials the necessary discretion to decide (at time of inspection), based on the many important factors noted above, whether or not a scale is or is not suitable for its given application. Rather than proposing changes to HB 44, might the Task Group assigned consider developing a scale suitability guide that includes the maximum division value for loads weighed as well as other important factors that need to be considered when selecting a scale and distribute it to all states?

The following are some additional areas of concern that were discussed by members of OWM's Legal Metrology Devices Program in drafting its analysis of this proposal:

- The term "scale division" is specified in the proposed new user requirement paragraph. It is not clear if this term was intended to mean scale division (d) or verification scale division (e). Given that the value of the scale division (d) is typically ten times smaller than the verification scale division (e) on Class I and II scales equipped with different values of (d) and (e), this is a very important consideration.

- We question the rationale used to establish the breakpoints of the three tiers proposed. That is, how does one justify requiring a division value not to exceed 0.01g for loads up to and including 10 g, and yet allow a scale division value ten times greater (i.e., 0.1g) once the load is increased beyond a 10g? The same question can be asked for the loads comprised of the next higher breakpoints (i.e., 0.1g versus 1g).

- Suitability requirements should be applied independent of the product being weighed. The argument to specify maximum permissible scale division values, which correspond to different load ranges of cannabis products to be weighed, can be made for other (non-cannabis) commodities.

- It raises the question, "Why cannabis (and not other products)?" We think adoption of the proposal could set a bad precedent in NIST Handbook 44 and possibly lead to additional proposals to establish maximum scale division values for other products (e.g., gems, precious metals, meat products, etc.), which we view as completely unnecessary.

Summary of Discussions and Actions:

During the 2022 NCWM Interim meeting, the Committee received somewhat a wide range of comments during open hearings. Most who commented supported further development of the item, although there were also several questions raised concerning the need for the proposed changes.

Mr. Doug Musick (Kansas) acknowledged that he agreed with the concept of the proposal while noting too that the NCWM had failed to adopt strong standards in that NISI Handbook 44 Scales Code Table 8 specifies "recommended" minimum loads, making them difficult to enforce. He also noted that HB 44 already addresses scale suitability and that any proposal should address more than just a single commodity; but rather, all products of high cost.

Mr. Evan Foisy (A&D Engineering) read the position statement provided by A&D Engineering to the Committee in advance of the 2022 NCWM Interim Meeting as follows:

A&D opposes this item completely and recommends that it be withdrawn. The addition of such specific user requirements for a commodity is unprecedented for HB 44. We fail to see the rationale for including readability requirements for Cannabis when such requirements have never been required for gold or other precious metals with a higher dollar per gram value.

If the Committee decides that such specifications are warranted, A&D proposes that the requirements be changed to 0.01 g for net weighments up to 100 g capacity. The technology exists and is already in use to not limit the readability to 0.1 g for capacities from 10 g up to 100 g. Having different accuracy requirements for Cannabis consumers who purchase less than 10 g vs. those who purchase more than 10 g is not promoting fairness and equity in the market. The maximum that any state allows for a single user

purchase is 2.5 oz (approximately 71 g). By offering 100 g x 0.01 g, the entire range of consumer purchases will be covered equally and consistently.

Example: Deli scales allow the same increment size whether you're getting 1 slice or 10. Cannabis should be no different.

The SMA supported continue development of the item with the recommendation that NIST Handbook 44 Scales Code Table 8 titled "Recommended Minimum Load" be considered in its further development.

NIST OWM provided the Committee a high-level summary of its analysis of the item, many of the points of which questioned not only the need for the proposed change, but also the effect the change (if adopted) would have for setting a precedent for producers of other commodities to use in support of making similar changes to HB 44 intended to address products they produce. OWM, in its comments to the Committee, emphasized that HB 44 already provides the necessary tools (in the way of General Code and Scales Code requirements) for officials to be able to enforce scale suitability. It also provides officials the needed discretion to decide (at time of inspection), based on the many important factors needing to be considered, whether or not a scale is or is not suitable for its given application. OWM recommended, as an alternative to the proposal, the development of a scale suitability guide, which should include all important factors (and not just scale division value) that need to be considered when determining scale suitability.

Several who commented before the Committee also questioned use of the term "scale division" in the proposal and whether any maximum increments proposed should, instead, be based on "scale verification division."

In considering the comments received during open hearings, the Committee agreed to maintain the "assigned" status of the item.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearings the following comments were heard:

Mr. Josh Nelson (Ex-Officio NCWM S&T Committee): put forward to address some issues for cannabis, recommend developing - still needs work and continue to work forward.

Mr. Matt Douglas (California - DMS): California supports further development, add non retroactive date - subsection A states up to capacity… lists suitability requirements based on California, however, this info is not a standard.

Mr. Eric Golden (Cardinal Scales): section A B and C, be better to say 0.1 g for net weighments up to 10 grams, then B 10 to 100 grams, then C say over 100, etc.

Mr. Kurt Floren (Los Angeles County, California): Mr. Golden stated perfectly what is lacking. There has to be ranges put in as to where the graduations are appropriate.

Ms. Erin Sullivan (CO Department of Agriculture): does this pertain to cannabis in any form or concentration?

Mr. Josh Nelson (Ex-Officio NCWM S&T Committee): this is what is going into HB44 - each jurisdiction has to define their own. For Oregon, medical is much different than retail. Retail has to abide by this. Med. does not. Verbiage in A B and C does need additions.

Ms. Erin Sullivan (CO Department of Agriculture): grows vs. dispensaries? Different products in processing facilities are weighed with many containers on the scales. Do states determine the regulation?

Mr. Josh Nelson (Ex-Officio NCWM S&T Committee): up to the states to determine how to apply tares and increments in which product is weighed.

Mr. Kurt Floren (Los Angeles County, California): cannabis products: later we'll see proposed def. of cannabis and cannabis products, are we anticipating the adoption of the proposed language?

Mr. Josh Nelson (Ex-Officio NCWM S&T Committee): it is not limited to flowers or bud. Mentions dabs. Is there a packaging requirement for the label? Oregon does. There must be a legal for trade scale that can prove they are meeting net contents. They must ensure that their process is being executed correctly. He thinks this is not limited to flower/bud.

Mr. Kurt Floren (Los Angeles County, California): this raises the point that further consideration needs to be put into terms. Brownies, cannabis infused pizza… and other items sold by weight. Are we setting the terms for pure cannabis product or are the scales being used for any cannabis containing product?

Mr. Josh Nelson (Ex-Officio NCWM S&T Committee): welcomes written input for this topic from anyone. Mr. Don Onwiler was a big proponent in this, Mr. Nelson will continue to develop this.

Mr. Eric Golden (Cardinal Scales): clarification on Mr. Nelson: geared towards net sales, packaging for the customer. Is this part of the track and trace program for growers or just for retail?

Mr. Josh Nelson (Ex-Officio NCWM S&T Committee): needs to be expanded upon, in Oregon: even the growers have to do track and trace. Any scale weight that is used for the cannabis tracking system needs to be Weights and Measures compliant. Maybe has to address even a class III scale. They will look more into it.

Mr. Joe Moreo (Ag. Com. Sealer): over time we are going to need one level for concentrates, one for food, one for flower, one size fits all will not work.

Mr. Josh Nelson (Ex-Officio NCWM S&T Committee): Agrees that one size does not fit all. This will start to give limitations as to what a particular weight will be. Not trying to pigeonhole any device into one category, just trying to figure out what works, that's the intent.

The WWMA S&T Committee recommends the item be assigned a developmental status so that the submitter can continue to work on this as they commented during open hearings.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing, Mr. Russ Vires, SMA, stated that they have no position on this item at this time.

Mr. Matt Curran, State of Florida, stated that he supports this as a Voting item. He also provided comments in support of this item from Mr. Eric Golden, Cardinal Scale. Cardinal offered some changes as well. The suggested changes are as follows:

UR.1.X. Cannabis. – The scale division for scales weighing Cannabis shall not exceed:

(a) 0.01 g for net weighments ~~up to capacity~~ up to 10g,

(b) 0.1 g for net weighments greater than 10g, up to 100g~~, capacity, and~~

(c) 1 g for net weighments greater than 100g, up to capacity.
(Added 20XX)

Mr. Charlie Rutherford (Cannabis Committee) stated that he supports this item moving forward as a voting item with the changes suggested by Cardinal Scale and Dr. Curran.

This Committee recommends that this item be moved forward as a Voting item if the changes suggested above are made.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.

Mr. Eric Golden (Cardinal Scale) made suggestions to change the language in this item to the following:

UR.1.X *Cannabis*……

(a) 0.01g for net weighments up to 10 g

(b) 0.1g for net weighments greater that 10g , up to 100 g, and

(c) 1 g for net weighments greater than 100g , up to capacity

Mr. Lou Sakin (Hopkinton/Northbridge, Massachusetts) commented that he agrees with changes above.

Discussions were heard regarding the agreement with table 8 in scale code as this requirement is more restrictive than table 8 parameters.

Mr. Eric Golden (Cardinal Scale) commented that national uniformity would be good and many states have informational publications that outline requirements in their state for Cannabis scale requirements.

Mr. Jimmy Cassidy (Massachusetts) recommends voting status with the changes above.

Mr. Matt Curran (Florida) commented that harmonization with table 8 would be a good idea if possible.

Mr. Lou Sakin (Hopkinton/Northbridge, Massachusetts) questioned if Cannabis should be in *italics.* The Committee suggests making the change to italics for *Cannabis*.

The NEWMA Specifications and Tolerances Committee recommends that this item be given Voting Status with suggested edits.

During the 2022 Annual Meeting Open Hearings the following comments were heard:

Mr. James Cassidy (Massachusetts) commented as the Co-Chair of the NCWM Cannabis Task Group. He supported the assigned status so the task group can continue to develop the item from comments received at the 2022 Interim. Mr. Russ Vires (SMA) supported continued development and indicated that a user requirement typically does not pertain to a specific commodity. Mr. Vires suggested the words "retail cannabis" should be added to the "Class II" section of Table 7a and the words "bulk cannabis processing and sales" should be added to the "Class III" section of Table 7a. Mrs. Tina Butcher (NIST OWM) read the following statement: "As a non-regulatory metrology institute, NIST defers to federal agencies with regulatory authority under the Controlled Substances Act (CSA) for the scheduling of drugs or other substances. NIST does not have a policy role related to the production, sale, distribution, or use of cannabis (including hemp and marijuana). While the 2018 Farm Bill removed hemp from the list of controlled substances under Schedule 1 of the CSA, marijuana remains on that list. NIST must respect that distinction even as it exercises its statutory authority to develop and disseminate national weights and measures standards for the production, distribution, and sale of products in the commercial marketplace. NIST remains committed to providing technical assistance to the weights and measures community. OWM has provided key technical points for the community to consider in its deliberations of cannabis-related proposals, and OWM would be happy to provide any necessary clarification. OWM comments are intended to encourage technically sound application of legal metrology laws, regulations, and practices to the measurement and sale of these products."

After hearing comments from the floor, the Committee recognized the need for further development of the item and recommended that the item retain an Assigned status. The Committee recommends the NCWM Cannabis Task Group work with the SMA and other stakeholders to further develop this item.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing, the Committee heard comments from the floor. Mr. Loren Minnich (Kansas) stated he's not sure of the intent and that it needs more developing. Mr. Eric Golden (Cardinal Scales) agreed with Mr. Golden, is it "e" or "d", will send notes to Committee. Mr. Ivan Hankins (Iowa) would support item with Mr. Golden's language. Mr. Golden continued by recommending the following change to which will add clarity to the listed weight ranges in SCL22.2 (in red)

SCL-22.2 UR.1. Selection Requirements, UR.1.X. Cannabis

UR.1.X. Cannabis. – The ~~scale division~~ verification scale interval, e, for scales weighing Cannabis shall not exceed:

(d) 0.01g for net weighments ~~up to capacity~~ up to 10g,

(e) 0.1g for net weighments greater than 10g, up to 100g, ~~capacity, and~~

(f) 1g for net weighments greater than 100g, up to capacity.

(Added 20XX)

CWMA S&T Committee recommends as voting item with the proposed changes from Cardinal Scales.

During the 2022 Annual Meeting Open Hearings the following comments were heard:

Mr. Doug Musick (Kansas) welcomed the attempt to define suitability; recommended the following:

SCL-22.2 UR.1. Selection Requirements, UR.1.X. Cannabis

UR.1.X. Cannabis. – A retail Cannabis scale shall not be used to weigh net loads smaller than 100 displayed scale divisions "d",

(a) 0.01g for net weighments 10g or less,

(b) 0.1g for net weighments greater than 10g and up to 100g, and

(c) 1g for net weighments greater than 100g.

(Added 20XX)

Mr. Russ Vires (SMA): The addition of a User Requirement is not the best approach in this situation; User Requirements do not typically apply to a specific commodity. Supported continuing as developing and the following proposed changes should be considered instead:

- The words "retail cannabis" should be added to the "Class II" section of Table 7a.
- The words "bulk cannabis processing and sales" should be added to the "Class III"

  section of Table 7a.

Mr. Charlie Stutesman (Kansas) questioned why only metric units are referenced and not also include inch-pound units.

The CWMA S&T Committee recommends this item remain with the NCWM Cannabis Task Group and that the suggested changes are considered.

SMA

During the 2021 Fall Meeting, the SMA supported the continued development of this item.

During the 2022 Spring Meeting, the SMA supported the continued development of this item.

Rationale: The addition of a User Requirement is not the best approach in this situation; User Requirements do not typically apply to a specific commodity. The following proposed changes should be considered instead:

- The words "retail cannabis" should be added to the "Class II" section of Table 7a.
- The words "bulk cannabis processing and sales" should be added to the "Class III" section of Table 7a.

LMD – LIQUID MEASURING DEVICES

LMD-21.1 V Table S.2.2. Categories of Device and Method of Sealing

Source: Gilbarco, Inc.

Purpose and Justification:
To modify Category 3 requirements under Methods of Sealing to allow electronic copy of event logger for liquid measuring devices. To enhance or have alternate wording to existing Item LMD-20.1 under review for this item.

Current requirement is that category 3 device must have printed copy made available on site for the event logger information. Category 3 devices are fully connected electronic devices here in the modern age and thus we need to move away from the archaic requirement of only allowing a paper copy for this item. The industry fully supports this change. LMD's have many types of regulatory events that accumulate in the event logger: blend ratio changes, calibration changes for the meters, SW downloads are examples. Often our only available print option is through the device receipt printer. With its tiny width of receipt paper, the event log for an older liquid measuring device will be several feet long and have text that wraps and is difficult to read. Allowing an electronic copy will be more convenient, easily read, and easily saved/retained/shareable.

Wayne Fueling Systems, LLC had a current proposal, Item LMD-20.1 for this item and in discussion with him he has been very supportive of me providing alternate wording above for consideration, or possibly to use in place of his proposal. Hopefully we can hear from Wayne Fueling Systems on this in the upcoming meetings. Also, I am aware of the Electric vehicle charger industry is working on this item to propose allow electronic copy as well.

The submitter requested voting status for this item in 2021.

OWM Executive Summary for LMD-21.1 – Table S.2.2. Categories of Device and Method of Sealing

OWM Recommendation: OWM concurs with the direction toward permitting an electronic form of the event log, provided the following key issues that have been raised in discussions are addressed.

- ***Event Log Information Accessible During the Inspection.*** Inspectors need this information in order to assess the disposition of a device during the inspection process, not at a later point in time.

- ***IT Security Concerns with Connection Method.*** Options suggesting use of a memory stick or wired interface with a mobile device may pose a deterrent since many jurisdictions' IT security policies would not permit this method of accessing information on a jurisdiction-owned mobile device.

- ***Availability of Mobile Devices.*** Not all inspectors are equipped with mobile devices for downloading and viewing information.

- ***(Larger) Electronic Display on Site***. Might another alternative be to provide an on-site, inspector-accessible display which meets minimum dimensions? This option might be considered a compromise in which the inspector could easily access and view the information, though it does create a potential problem and disadvantage in not facilitating the recording and retaining of the results as part of the inspection record.

- ***Security of Event Logger Data.*** A point raised in discussions of this issue was how an inspector can determine if information downloaded electronically is connected with the specific device under inspection. Revisions to the current requirements need to consider including information with any remotely-downloaded log that would enable the inspector to link the log to the specific device.

OWM Executive Summary for LMD-21.1 – Table S.2.2. Categories of Device and Method of Sealing

- It is not clear that the current proposal has addressed all of these items. Should the proposal move forward as written, it will be important at minimum that these items be considered during type evaluation and followed up during field inspection to ensure that the above items are addressed.

- While the ultimate goal is to move in the direction of the electronic form, not all jurisdictions may have the capability of viewing an electronic version of the event log at the time of inspection. Most people seem to be supportive of the concept of electronic versions of the information and want to move in that direction; however, it is essential that inspectors be able to gain the information needed for an inspection in a form accessible at the time of the inspection. An inspector needs to have access to this information on site, for example if the information is transmitted, how will the inspector view the information on site if they do not have electronic capability to do so? The use of General Code requirement G-UR.2.3 Accessibility for Inspection, Testing, and Sealing Purposes and G-UR.4.4. Assistance in Testing Operations may be used but may not be apparent to all inspectors.

- Similar language was adopted into the Electric Vehicle Fueling Systems tentative code.

- As language is adopted in NIST HB 44 to accept an electronic copy of the sealing information, consideration should be given to making appropriate changes to the sealing requirements for other devices in NIST HB 44.

Table 3. Summary of Recommendations

LMD-21.1 Table S.2.2. Categories of Device and Method of Sealing

	V	D	W	A	I	Notes*	Comments
Submitter							
OWM							
WWMA	✓						
SWMA	✓						
NEWMA	✓						
CWMA	✓						
NCWM							

	Letters of Support	Letters of Opposition	Notes
Industry			
Manufacturers			
Retailers and Consumers			

Table 3. Summary of Recommendations							
LMD-21.1 Table S.2.2. Categories of Device and Method of Sealing							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**

***Notes Key:**
1 – Submitted modified language
2 – Item not discussed
3 – No meeting held
4 – Not submitted on agenda
5 – No recommendation or not considered

Item under Consideration:

Amend Handbook 44, Liquid Measuring Devices Code as follows**:**

Table S.2.2. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.*	*[The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.]** *[*Nonretroactive as of January 1, 1996]*

Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *[Nonretroactive as of January 1, 1995]* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.* *[Nonretroactive as of January 1, 2001]*	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 on demand through the device or through another on-site device. The information may also be available electronically.**~~ **The event logger information shall be available at the time of inspection either as a printed copy or in electronic format. The information may be printed by the device, printed by another on site device, or transmitted 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.)

[Nonretroactive as of January 1, 1995]
(Table Added 1993) (Amended 1995, 1998, 1999, 2006, and 2015)

NIST OWM Detailed Technical Analysis:

NIST OWM previously provided comments to this item which was a Block item that included LMD 20.1 and LMD 21.1. Both items addressed the allowance of an electronic log in lieu of a printed copy of an audit trail for category three method of sealing in the liquid measuring devices code.

Initially, the submitter of LMD-20.1, Randy Moses, Wayne Fueling Systems, LLC requested this item be withdrawn based on concerns raised during discussions at the 2019 NTEP Measuring Sector Meeting. In January 2020, however, Mr. Moses retracted that request.

During the 2021 NCWM Interim Meeting work session, the Committee agreed to withdraw LMD-20.1 and agreed that the submitter of LMD-20.1, Wayne Fueling Systems, LLC, will work with the Submitter of LMD-21.1, Gilbarco, to develop one proposal to allow electronic logs for Category 3 sealing requirements. The Committee agreed on a Developing status for LMD-21.1.

OWM met with Gilbarco in 2021 to discuss the proposed changes and concurs with the direction toward permitting an electronic form of the event log, provided the following key issues that have been raised in discussions are addressed.

OWM recognizes the desire to move forward with electronic forms of required information and believes this is an appropriate direction in which to head. A key question the Committee must consider is what alternatives may need to be offered as we move in this direction to ensure that officials have adequate information to make enforcement decisions at the time of an inspection.

- OWM offers no opposition to the proposal but suggests the community revisit past discussions to ensure that the issues raise during those discussions are no longer of concern.

- In assessing this item, although G-S.5.6. refers to printed receipts and tickets, the Committee will want to consider some of the rationale and discussion surrounding the changes made to G-S.5.6. Recorded Representations in 2014 (also referenced by the submitter) to determine whether or not the points raised in the past with regard to providing required information to the official in only an electronic form will meet the needs of the regulators.

- During discussions of G-S.5.6. concerns raised within the regulatory community included the inspector's lack of access to the internet (e.g., when no internet service available in a given area or the inspector has no means to access the internet or is not permitted to insert digital media from an external source into his or her computer. Some comments heard by the Committee during these discussions indicated that inspectors sometimes don't have email or have access to it on site and the information from an event logger is typically needed at the time of inspection in order to make an enforcement decision.

- While the ultimate goal is to move in the direction of the electronic form, not all jurisdictions may have the capability of viewing an electronic version of the event log at the time of inspection. Most people seem to be supportive of the concept of electronic versions of the information and want to move in that direction; however, it is essential that inspectors be able to gain the information needed for an inspection in a form accessible at the time of the inspection. An inspector needs to have access to this information on site.

- At the 2020 Interim Meeting, Mr. Brent Price (Gilbarco) recommended a Voting or Developing status for this item and offered to work with the submitter. Mr. Price noted that the Category 3 devices coming into the market are able to print an event log, but the font is quite small.

- Given the requirement for ensuring event logger information is readable and readily understandable, OWM noted suggestions to use a narrow receipt (such as is provided with "Card Readers in Dispensers") as the means for printing an event log may not meet requirements for clarity and legibility if printed in an extremely small font.

- Some members of industry (LC, FMC) and the regulatory community (Alaska, Oregon, California, New York) support the concept of an electronic version of the required event log on a Category 3 device, but noted the proposal requires additional work.

- Mr. Jim Pettinato (Technip FMC) noted the Software Sector also supports an electronic log and suggested a user requirement may also be warranted.

- OWM concurs with the direction toward permitting an electronic form of the event log, provided the following key issues that have been raised in discussions are addressed:

    - ***Event Log Information Accessible During the Inspection.*** Inspectors need this information in order to assess the disposition of a device during the inspection process, not at a later point in time.

    - ***IT Security Concerns with Connection Method.*** Options suggesting use of a memory stick or wired interface with a mobile device may pose a deterrent since many jurisdictions' IT security policies would not permit this method of accessing information on a jurisdiction-owned mobile device.

- ***Availability of Mobile Devices.*** Not all inspectors are equipped with mobile devices for downloading and viewing information.

- ***(Larger) Electronic Display on Site***. Might another alternative be to provide an on-site, inspector-accessible display which meets minimum dimensions? This option might be considered a compromise in which the inspector could easily access and view the information, though it does create a potential problem and disadvantage in not facilitating the recording and retaining of the results as part of the inspection record.

- ***Security of Event Logger Data.*** A point raised in discussions of this issue was how an inspector can determine if information downloaded electronically is connected with the specific device under inspection. Revisions to the current requirements need to consider including information with any remotely-downloaded log that would enable the inspector to link the log to the specific device.

- OWM also concurs with the Committee's suggestion for the submitter to focus on the format of an electronic display of the event log and any barriers to its access (as noted above).

- OWM further asks jurisdictions to consider whether they are actively inspecting and viewing event counter and event logger information. Experience reviewing event counter and logger information will help regulators make a better-informed decision on any alternatives proposed.

- OWM notes that device types that are activated and/or operated using mobile applications may already be providing some flexibility in this regard (see 5.60 TNMS Code S.2.3. Change Tracking, p.5-104).

- Similar language was adopted into the EVF tentative code.

- As language is adopted in NIST HB 44 to accept an electronic copy of the sealing information, consideration should be given to making appropriate changes to the sealing requirements for other devices in NIST HB 44.

Summary of Discussions and Actions:

The Committee agreed at the 2021 Interim Meeting to withdraw LMD-20.1. The Committee agreed on a Developing status for LMD-21.1 and at this meeting the item was assigned to the following persons for further development. For more information or to provide comment, please contact:

Mr. Brent Price
Gilbarco Inc.
(336) 547-5009
brent.price@gilbarco.com

Mr. Randy Moses
Wayne Fueling Systems, LLC
(215) 257-2759

At the NCWM 2022 Interim Meeting open hearings the submitter of this item noted that this proposal will allow an electronic copy of category 3 event loggers and also noted that this was adopted into the EVF tentative code. The submitter requested a voting status for this item. Several States were in support of a Voting status for this item. An industry representative was also in support of a Voting status for this item. The Committee agreed to a Voting Status for this item.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearings the following comments were heard:

Mr. Brent Price (Gilbarco), submitter: to modify event logger for cat. 3 devices - will allow electronic copy to be available to W/M and not just hard copy. Worked with Wayne to develop this, conferenced with NIST and they are supportive. EV systems allows for this. We ask to allow LMD allow this (like EV). Has support of industry. Wants to consider this for Voting status.

The WWMA S&T Committee recommends this item be assigned a Voting status.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing, Mr. Brent Price (Gilbarco) who is the submitter of this item, stated that the EVF code was recently changed to allow electronic copies of the event logger, and that he supports moving this forward as a Voting Item.

Mr. Tim Chesser (Arkansas) supported moving this forward as a Voting Item.

This Committee recommends moving this item forward as a Voting Item.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.

Mr. Jim Willis (New York) and Mr. John McGuire (New Jersey) commented to recommend Voting status. The NEWMA Specifications and Tolerances Committee recommends that this item be given Voting status.

During the 2022 Annual Meeting Open Hearing Mr. Brent Price (Gilbarco) and Mr. Jim Willis (New York) commented that they support an electronic format of event loggers.

After hearing comments from the floor, the Committee considered the item to be fully developed and recommended that the item retains Voting status.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing, the Committee heard comments from the floor. Ms. Diane Lee (NIST OWM) said this item is ready to move forward as a Voting or remain Developing item. Mr. Charles Stutesman (Kansas) said the item is read for vote.

CWMA S&T Committee recommends that the item move forward as Voting.

During the 2022 Annual Meeting, Open Hearing Mr. Brent Price (Gilbarco): on behalf of Gilbarco and industry, appreciate the support to allow electronic format for event logger. Printed copy on site is difficult when the system doesn't contain printers. Taxi meters and EVSE allow digital versions of event logger.

The CWMA S&T Committee recommends this item to remain a Voting item.

LMD-22.1 V Table T.2. Accuracy Classes and Tolerances for Liquid Measuring Devices Covered in NIST Handbook 44, Section 3.30

(**Note:** This item was submitted to the NCWM by the November 1, 2021 deadline for item submission for items submitted directly by NCWM committees and other work groups. However, the item was not submitted in time for it to be considered at the fall 2021 regional weights and measures association meetings.)

Source: NTEP Measuring Sector

Purpose and Justification:
To correct an inconsistency between the application of tolerances to smaller capacity Diesel Exhaust Fluid (DEF) measuring systems and retail motor-fuel dispensers.

OWM Executive Summary for LMD-22.1 – Table T.2. Accuracy Classes and Tolerances for Liquid Measuring Devices Covered in NIST Handbook 44, Section 3.30

OWM Recommendation: OWM believes this item is ready for a vote as proposed.

- During a review of NTEP requirements related to DEF dispensing systems, the NTEP Measuring Sector observed an inconsistency between the application of NIST Handbook 44.tolerances for retail motor-fuel dispensers (RMFDs) and for small capacity DEF measuring systems.
- Smaller capacity DEF measuring systems use measuring equipment nearly identical to that used for RMFDs.
  - Though DEF is not a motor fuel, NCWM and NTEP have agreed in past discussions to treat these systems the same.
  - Most inspectors have treated them essentially the same for some years.
  - Given the properties of the product being measured and the capabilities of the dispensing equipment, OWM concurs with this approach.
- As presently written, Table T.2. specifies a different tolerance for special tests of DEF dispensers than would be used for RFMDs.
  - Without specific clarification in Table T.2, there is a potential for inconsistently applying tolerances to DEF dispensers.
- OWM concurs the proposed change to Footnote 1 will:
  - correct the oversight made when DEF dispensers were added to requirements;
  - will align the special test tolerances for DEF dispensers with that of RMFDs; and
  - will eliminate the potential which currently exists for inconsistent application of tolerances.

OWM Executive Summary for LMD-22.1 – Table T.2. Accuracy Classes and Tolerances for Liquid Measuring Devices Covered in NIST Handbook 44, Section 3.30

- Although this item was submitted too late for the regional associations to review in fall 2021, OWM concurs with the Measuring Sector's recommendation to designate this as a Voting item for 2022. This is based on:
  - the approach used by NTEP for many years to treat DEF and RMFDs consistently;
  - consistency among current requirements in NIST HB 44 for the two applications; and
  - feedback OWM has had over the years regarding how some weights and measures jurisdictions approach DEF systems relative to RMFDs.
- This is further supported by the support of the CWMA and NEWMA at their Spring 2022 annual meetings.

Table 3. Summary of Recommendations

LMD-22.1 Table T.2. Accuracy Classes and Tolerances for Liquid Measuring Devices Covered in NIST Handbook 44, Section 3.30

	V	D	W	A	I	Notes*	Comments
Submitter							
OWM	✓						
WWMA						4	
SWMA						4	
NEWMA	✓					4	
CWMA	✓					4	
NCWM							

	Letters of Support	Letters of Opposition	Notes
Industry			
Manufacturers			
Retailers and Consumers			

***Notes Key:**
1 – Submitted modified language
2 – Item not discussed
3 – No meeting held
4 – Not submitted on agenda
5 – No recommendation or not considered

Item under Consideration:

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

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

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

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

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

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

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

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

(Added 2002) (Amended 2006 and 2013)

NIST OWM Detailed Technical Analysis:

- During a review of NTEP requirements related to DEF dispensing systems, the NTEP Measuring Sector observed an inconsistency between the application of NIST Handbook 44tolerances for retail motor-fuel dispensers (RMFDs) and for small capacity DEF measuring systems.
    - As presently written, Table T.2. specifies a different tolerance for special tests of DEF dispensers than would be used for RFMDs.
- Based on discussions with some weights and measures jurisdictions and discussions at Measuring Sector meetings, OWM is not certain if the tolerances presently specified in Table T.2. for special tests are being consistently applied.
- Smaller capacity DEF measuring systems use measuring equipment nearly identical to that used for RMFDs.
    - Though DEF is not a motor fuel, NCWM and NTEP have agreed in past discussions to treat these systems the same, both in NIST HB 44 requirements and in type evaluation.
    - Given the properties of the product being measured and the capabilities of the dispensing equipment, OWM concurs with this approach.
- OWM concurs the proposed change to Footnote 1 will correct the oversight made when DEF dispensers were added to requirements and align the special test tolerances for DEF dispensers with that of RMFDs.
- Although this item was submitted too late for the regional associations to review in fall 2021, OWM concurs with the Measuring Sector's recommendation to designate this as a Voting item for 2022. This is based on:
    - the approach used by NTEP for many years to treat DEF and RMFDs consistently;
    - consistency among current requirements in NIST HB 44 for the two applications; and
    - feedback OWM has had over the years regarding how some weights and measures jurisdictions approach DEF systems relative to RMFDs.

Summary of Discussions and Actions:

During the review of NTEP requirements related to DEF dispensing systems, the NTEP Measuring Sector observed an inconsistency between the application of tolerances for retail motor-fuel dispensers (RMFDs) and for small capacity DEF measuring systems.

Smaller capacity DEF measuring systems use measuring equipment nearly identical to that used for RMFD applications and the NCWM and NTEP have agreed in past discussions that these two applications should be addressed consistently. Changes were made to NIST Handbook 44 in 2019 to more closely align requirements for RMFDs and smaller capacity DEF measuring systems; for example, paragraph N.4.2.2. Retail Motor-Fuel Devices and DEF, which specifies identical special test procedures for both systems. However, Table T.2. Accuracy Classes and Tolerances for Liquid-Measuring Devices Covered in NIST Handbook 44, includes an inconsistency in the application of tolerances for the "special test" for these two applications

It was judged during the Measuring Sector's review that, based upon the application flow rates, without the note a DEF dispenser would be given a different tolerance for special tests than would RMFDs.

The proposed change to Footnote 1 will correct the oversight made when DEF dispensers were added to requirements in alignment with retail motor-fuel devices.

The submitter requested that this be a Voting item in 2022.

At the 2022 NCWM Interim Meeting, the Committee recommended the item under consideration be given a Voting status with the addition of the word "retail" in front of DEF to add clarity to the code.

Regional Association Reporting:

Western Weights and Measures Association

At the WWMA 2021 Annual Meeting, this item was not submitted to the Fall 2021 regional weights and measures associations.

Southern Weights and Measures Association

At the SWMA 2021 Annual Meeting, this item was not submitted to the Fall 2021 regional weights and measures associations.

Northeastern Weights and Measures Association

At the NEWMA 2021 Interim Meeting, this item was not submitted to the Fall 2021 regional weights and measures associations.

During the 2022 NEWMA Annual Meeting, NEWMA heard comments from Mr. Brent Price (Gilbarco) stating he supported the item as it adds clarity for tolerances for DEF. Mrs. Tina Butcher (NIST OWM) commented that this item originated in the Measuring Sector and identified this as a house keeping item as DEF dispensers are often designed and treated as RMFDs. Therefore, the tolerance table for RMFD on special test tolerances will be updated to include DEF.

After hearing comments from the floor, the NEWMA S&T Committee considered the item to be fully developed and recommended that the item retains a Voting status.

Central Weights and Measures Association

At the CWMA 2021 Interim Meeting, this item was not submitted to the Fall 2021 regional weights and measures associations.

During the CWMA 2022 Annual Meeting, the CWMA heard comments from Mr. Michael Keilty (Endress+Hauser, Chair of NTEP Measuring Sector) who noted the possibility of confusion that would allow retail DEF dispensers to have a different tolerance and recommended moving this forward as voting item. Mr. Brent Price (Gilbarco) supported the item. When DEF dispensers were built, they built them along the same guidelines as RMFD. This provides clarity.

The CWMA S&T Committee recommends this item to remain a Voting item.

VTM – VEHICLE TANK METERS

VTM-18.1 V S.3.1 Diversion of Measured Liquid and S.3.1.1. Means for Clearing the Discharge Hose and UR.2.6. Clearing the Discharge <u>on a multiple-product, single discharge hose.</u>

(**NOTE:** At the 2020 Interim Meeting the Committee agreed to combine both VTM-18.1 and VTM-20.1. Both items are now one item under VTM-18.1.)

Source:
New York and NIST OWM (Carryover from 2018, VTM 1-B) and Murray Equipment, Inc., Total Control Systems

Purpose and Justification:
Provide specifications and user requirements for manifold flush systems on a multiple-product, single-discharge hose. 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 and clarify the paragraph to protect vehicle motor fuel quality, retain safe operating procedures when handling vehicle motor fuels, and to prevent fraud during delivery of vehicle motor fuels from vehicle tank meters.

OWM Executive Summary for VTM-18.1 – S.3.1 Diversion of Measured Liquid and S.3.1.1. Means for Clearing the Discharge Hose and UR.2.6. Clearing the Discharge on a multiple-product, single discharge hose.
OWM Recommendation: OWM believes the proposed changes represent a reasonable solution that will help minimize the potential for fraud with the use of manifold flush systems while allowing companies access to the safety-related benefits from the use of such systems in distributing products on VTMs. With the most recent version of the Item under Consideration, OWM believes this item is ready for vote.

OWM Executive Summary for VTM-18.1 – S.3.1 Diversion of Measured Liquid and S.3.1.1. Means for Clearing the Discharge Hose and UR.2.6. Clearing the Discharge on a multiple-product, single discharge hose.

- A manifold flush system allows liquid to be diverted from the discharge line on single hose multi-product VTMs so that liquid of one product is not mixed with liquid of another in the discharge line.
- NIST Handbook 44 already includes provisions allowing the use of manifold flush systems.
  - However, without appropriate safeguards, these systems represent a significant potential for fraud.
  - OWM believes the current Item under Consideration offers additional safeguards that are not present in the current NIST HB 44 language.
  - These changes will reduce the potential for facilitation of fraud with the design and use of these devices.
- When presented for a vote in 2019, this item (though revised multiple times in response to comments) failed to obtain sufficient votes to "pass" or "fail" and was returned to Committee.
  - Several additional variations to address comments and concerns were subsequently considered.
- In January 2020, this item was combined with a related Item VTM-20.1 (which proposed limits on the use of these systems with specific product types) with the goal of having the submitters of both items work together to reach a reasonable compromise between the two proposals.
- Since January 2020, the submitters of both items have worked to find a compromise that best meets the needs of the community.
- In developing the current proposal, the submitters considered concerns raised regarding the use of these systems, including:
  - the potential for facilitation of fraud with the use of these systems;
  - the potential for cross contamination of products in different tank compartments; and
  - the suitability of using a single meter for multiple product types.
- These concerns were balanced against comments indicating:
  - these same product handling practices have occurred for many years without the use of such systems; and
  - manifold flush systems can offer distinct safety advantages for drivers when flushing product.
- OWM continues to have concerns regarding the safety of delivering products such as gasoline and home heating oil through the same meter (and questions whether a single meter is suitable for such purposes)

OWM Executive Summary for VTM-18.1 – S.3.1 Diversion of Measured Liquid and S.3.1.1. Means for Clearing the Discharge Hose and UR.2.6. Clearing the Discharge on a multiple-product, single discharge hose.

- However, OWM recognizes this is already a widespread practice in the industry and placing a blanket limitation in NIST Handbook 44 may not best serve the community.

- OWM acknowledges the safety advantages of such a systems to the drivers since the drivers do not have to climb on top of the VTM truck to flush product from the line before delivering another product.

- OWM notes that such changes do not preclude a jurisdiction from implementing policies regarding the use of a single meter to dispense multiple different product types.

Table 3. Summary of Recommendations

VTM-18.1 - S.3.1 Diversion of Measured Liquid and S.3.1.1. Means for Clearing the Discharge Hose and UR.2.6. Clearing the Discharge <u>on a multiple-product, single discharge hose.</u>

	V	D	W	A	I	Notes*	Comments
Submitter	✓						
OWM	✓						Email comments NIST OWM (01-04-21)
WWMA		✓					
SWMA		✓					
NEWMA	✓						
CWMA	✓						
NCWM	✓						

	Letters of Support	Letters of Opposition	Comments
Industry			
Manufacturers			
Retailers and Consumers			

***Notes Key:**
1 – Submitted modified language
2 – Item not discussed
3 – No meeting held
4 – Not submitted on agenda
5 – No recommendation or not considered

Item under Consideration:

Amend Handbook 44, Vehicle-Tank Meters Code as follows**:**

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

(a) liquid can flow from only one such outlet at one time; and

(b) the direction of flow for which the mechanism may be set at any time is definitely and conspicuously indicated.

This paragraph does not apply to the following:

(1) Equipment used exclusively for fueling aircraft.

(2) Multiple-product, single-discharge hose metering systems that are equipped with systems designed to flush the discharge hose, provided the flushing system complies with the provisions of paragraph S.3.1.1. Means for Clearing the Discharge Hose**, Multiple-Product, Single-Discharge Hose Metering Systems.**

(Amended 2018 **and 20XX**)

S.3.1.1. Means for Clearing the Discharge Hose, Multiple-Product, Single-Discharge Hose Metering Systems. - Multiple-product, single-discharge hose ~~M~~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")****;*
[Nonretroactive as of January 1, 2024]

(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
[Nonretroactive as of January 1, 2024]

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

(Added 2018) **(Amended 20XX)**

UR.2.6. Clearing the Discharge Hose.

UR.2.6.1. Clearing the Discharge Hose, General. – A manifold flush or similar system designed to accommodate the flushing of product on single-hose, multiple-product systems is not to be used during a commercial transaction. The following restrictions apply:

(a) The inlet valves for the system are not to be connected to any hose or piping (dust covers are permitted) when not in use.

(b) 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.

(c) 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. Minimizing Cross Contamination. – When dissimilar products are dispensed through a single meter, the user shall take steps to ensure the system is properly flushed to minimize the potential for cross contamination of product in receiving tanks on subsequent deliveries. Dispensing products having radically different characteristics (e.g., gasoline and diesel fuel) through a single meter delivery system is not recommended.

(Added 20XX)

UR.2.6.3. 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)

NIST OWM Detailed Technical Analysis:

Mrs. Tina Butcher (NIST OWM), Mr. Jim Willis (New York), and Mr. Jim Hathaway (Murray Equipment) met on December 2, 2021 to discuss the proposed changes to VTM-18.1. There were specific concerns raised with VTM-20.1, which was previously included with this proposal that still needed to be addressed which included concerns with contamination, safety, and fraud. It was agreed that in order to further develop a joint proposal, there was a need to resolve the concerns addressed in VTM-20.1 to the extent possible. Mrs. Tina Butcher (NIST OWM), Ms. Diane Lee (NIST OWM), Mr. Jim Willis (New York), and Mr. John Hathaway (Murray Equipment) met again on January 3, 2021. As a result of this meeting all parties agreed with the existing item under consideration. In addition, the meeting participants agreed with adding a new User Requirement under UR.2.6. Clearing the Discharge Hose to the item under consideration to address the concerns with the use of manifold flush systems with dissimilar fluids a follows:

UR.2.6.2. Minimizing Cross Contamination. – When dissimilar products are dispensed through a single meter, the user shall take steps to ensure the system is properly flushed to minimize the potential for cross contamination of product in receiving tanks on subsequent deliveries. Dispensing products having radically different characteristics (e.g., gasoline and diesel fuel) through a single meter delivery system is not recommended.

UR.2.6.3. 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)

Discuss points during the December 2, 2021 and January 4, 2022 meetings are outlined below:

- **Contamination and Safety.**

    - There is no disagreement over concerns about contamination and safety that can come about from inadvertent mixing of products in a storage tank.

    - These concerns, however, are not unique to the use of manifold flush systems.

        - Whether product is flushed using a manifold flush system or by flushing into a compartment from the top opening, the risk of contamination is present and is of concern.

    - If flushing is to be prohibited and/or the use of single meter/multiple product applications, it should be universally applied and presented as a separate proposed change to NIST Handbook 44, not just to systems equipped with manifold flush systems.

    - Establishing minimum flush requirements might also assist with minimizing contamination.

    - See recommendations below under "Dissimilar Fluids" and "Minimum Measured Quantity" that might help address these two concerns.

    - It might also be acknowledged that the use of manifold flush systems is intended to address a different aspect of safety and that is safety of the driver when conducting a flush operation; the manifold flush system provides a safer way of accomplishing the task than climbing onto the top of a vehicle tank.

Dissimilar Fluids:

- The original proposal in 20.1 (from Murray Equipment) expresses concerns about the use of a single meter to deliver multiple products and suggests language that would limit the use of manifold flush systems only to those systems which have individual meters dedicated to individual products.

- Such concerns would appear to apply to all systems, not just those equipped with manifold flush systems.

- If a prohibition is to be added to NIST Handbook 44 regarding the use of individual meters for multiple products, this should be done as a separate requirement not included as part of paragraph S.3.1.

Minimum Measured Quantity (MMQ):

- The concept of establishing a minimum delivery size would seem to help minimize concerns over possible contamination however it may be problematic to craft a requirement to adequately cover all applications.

Fraud.

- The concerns about potential fraud are quite valid and have been expressed in OWM's comments from the inception of these requirements.

- The provisions for manifold flush were modified to include various provisions to limit that potential.

- Proposed changes to the existing language in the original Item 18.1 and as shown in the current "Item under Consideration" include additional recommendations to minimize the potential for fraud when installing and using manifold flush systems. If the additional provisions are adopted, this would help reduce that potential.

Additional Points – Mechanical Metering Systems:

- Some manufacturers raised questions regarding whether communication between the manifold flush system and mechanical metering systems is feasible, raising concerns about the newly proposed changes to S.3.1.1. Means for Clearing the Discharge Hose paragraphs (f) and (g).

- Those manufacturers expressed intent to explore this point more carefully.

NIST OWM provided previous comments to this item. Some oppose modifications that will restrict the use of manifold flush systems with only certain products. Some oppose use of manifold flush systems unless there is a restriction placed on the products with which the system can be used. The submitters (including NIST OWM) will need to work together to find a solution amenable to both views.

- As noted by Mr. Jim Willis (New York) during the NEWMA meeting, New York, Murray Control Systems, and NIST OWM will work together to finalize a recommendation for this item.

- NIST OWM looks forward to working with the other submitters (New York and Murray Equipment) to find a solution that is more widely supported.

- For reference, OWM has retained the technical comments offered in its original analysis below.

Background to Consider:

- Based on comments at the 2019 NCWM Annual Meeting from the submitters of Item VTM-18.1 (New York & NIST OWM) and with support from the Meter Manufacturers Association, the Committee agreed to modify items (f) and (g) in the proposal and to designate part (g) as nonretroactive as of January 2022 to become retroactive January 2025.

- At the July 2019 meeting, comments from Murray Equipment noted significant problems with fraud in Europe where they are permitted, suggesting the item be withdrawn.

- Comments from FL at the July 2019 meeting suggested limiting the application to only certain products. This issue is addressed in the new Item 20.1 from Murray Equipment, which was subsequently withdrawn and is now included in this item (VTM-18.1).

  - When presented for a vote, the revised item failed to obtain sufficient votes to "pass" or "fail" and was returned to Committee.

  - In reviewing the proposals, one needs to recall that a manifold flush system allows liquid to be diverted from the discharge line on single hose multi-product VTMs so that liquid of one product is not mixed with liquid of another in the discharge line.

  - OWM acknowledges the safety advantages of such a system since the operator does not have to climb on top of the VTM truck to flush product from the line before delivering another product.

  - However, without appropriate safeguards, these systems represent a significant potential for fraud. Concerns have been voiced over this potential at multiple national and regional meetings.

- ***OWM offered the following comments on Item 18.1:***

  - At its Fall 2019 meeting, NEWMA recommended changes to extend the *nonretroactive* date. OWM recognizes this extension may help move the item forward and, thus, help reduce the potential for fraud when using these systems. OWM would also like to hear from the Meter Manufacturers Association regarding the difficulty designing communications between the metering system and the flushing system and the feasibility of an earlier nonretroactive date.

  - At its Fall 2019 meeting, NEWMA also recommended eliminating the *retroactive* date. Given the potential to facilitate fraud and a number of comments received to that effect over the past several years, OWM is concerned with the proposed elimination of the retroactive date. However, if this will allow the item to progress it may represent a viable solution. OWM heard from NY regarding the extensive number of systems already in the field, particularly mechanical ones which may not lend themselves to modification. OWM is also interested in how others view the proposal to eliminate the retroactive date.

  - The remaining regional associations recommended the item be given Developing status to permit the submitters to address concerns raised during the Annual Meeting.

  - Comments from the SWMA voice serious concern about the potential for cross contamination of products. The proposal in Item 20.1 may help to address this by including limitations on the type of products with which these systems can be used.

  - OWM believes the term "operational" should be deleted from proposed paragraph UR.2.6.1. since the key point is that the system should not be *used* when a commercial transaction is in progress.

- ***OWM offered the following comments to consider in addressing the recommendations originally presented in VTM-20.1 and now included as part of this item (VTM-18.1):***

- OWM notes that one jurisdiction (NY) in NEWMA specifically opposes the limitation of product types. The S&T Committee will have to consider how to address this.

- After discussing the proposed limitation of using manifold flush systems to only products other than engine fuels with NY W&M, OWM recognizes there may be instances where a VTM is used to transport only engine fuels of different types and grades. OWM recognizes that a blanket limitation may unintentionally impact applications that may not have been considered under Item 20.1.

- While OWM continues to have concerns regarding the safety of delivering products such as gasoline and home heating oil through the same meter (and questions whether a single meter is suitable for such purposes), OWM recognizes this is already a widespread practice in the industry and placing a blanket limitation may not best serve the community. OWM suggests working with the submitter of 20.1 to see if there are ways to resolve specific concerns without impacting other applications.

- In its review of these issues, OWM also noted the need to clarify when paragraph S.3.1.1. applies and suggests the addition of the terms "multiple-product, single discharge hose" to both the title and preamble.

Summary of Discussions and Actions:

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 submitter has voiced concerns involving the safety of this practice noting that the operator could be subject to falls from the tanker. 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. The submitter of VTM-1 has also seen these systems installed on trucks that are for sale where the seller notes the system as a selling point. He can foresee 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 fabricated onsite. These systems are often difficult to distinguish and installed in an inconspicuous manner. While the submitter of VTM-1 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 weights and measures jurisdiction in the other state. This lack of uniformity is problematic for both officials and private industry.

This item was originally submitted by New York Department of Agriculture as a Developing item. The item was intended to encourage uniformity in how manifold flush systems were being designed, installed, and regulated with the goal of minimizing the facilitation of fraud through the use of these systems while realizing the safety benefits provided by such systems.

This item was one of two separate parts of VTM-1 (previously VTM-1A and VTM-1B) considered by the Committee at the 2018 NCWM Annual Meeting. The item voted on at the 2018 Annual Meeting, VTM-1A was adopted and VTM-1B was assigned an Informational status and carried-over to the next cycle.

In the period between 2018 and 2021, the Item under Consideration underwent multiple changes based on feedback received at regional and national meetings and, more recently based on collaborations amongst the submitter of this and other related items, which resulted in the current Item under Consideration. In developing the current proposal, the submitters considered concerns raised regarding the use of these systems, including the potential for facilitation of fraud with the use of these systems; the potential for cross contamination of products in different tank compartments; and the suitability of using a single meter for multiple product types. These concerns were balanced against comments indicating that product handling practices have occurred for many years without the use of such systems and there are distinct safety advantage for drivers when these manifold flush systems are used.

At the 2022 NCWM Interim Meeting, the Committee heard from Mr. Jim Willis (New York, submitter) and provided an update that contained amended language with modifications to UR.2.6.2 and creating UR.2.6.3. The amendments were agreed upon by the other joint submitters, NIST OWM, and Murray Equipment. Mr. Willis stated that the new proposed language would hold device owners responsible for ensuring there is no cross-contamination of fuels and also allows jurisdictions to prohibit using manifold flush systems or dispensing dissimilar products through a single meter. The Meter Manufacturers Association, Mr. John Hathaway (Murray Equipment), Ms. Cheryl Ayer (New Hampshire), and Mr. John McGuire (New Jersey) also voiced support for the amended language and urged the item be given a voting status. Mr. Hal Prince (Florida) opposed the entire item, indicating the use of a single meter to dispense different products is not legal in his state and has concerns of cross-contamination of fuel. During the Committee work session, the Committee assigned this item a Voting status with the amended language seen above as the Item under Consideration. The item as presented to the 2022 NCWM Interim Meeting can be seen below the Item under Consideration.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearing the following comments were heard:

Mr. Matt Douglas (California - DMS): California supports further development. Has there been any further development since the annual meeting?

The WWMA S&T Committee recommends the status remain Developmental. The Committee recommends that the submitters (NIST, New York, and Murray Equipment) continue their work together to further develop the item.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing no comments were received on this item. NIST requests this item remain Developmental.

This Committee recommends the status remain Developing at the request of the submitter.

Northeastern Weights and Measures Association

During the 2021 NEWMA Interim Meeting open hearings, comments were heard from Mr. Jim Willis (New York) as submitter of this item. He stated that communication was in process with Murray Controls in regard to changes to this proposal. The flushing "systems" have been around for decades and not just as OEM systems. The driver would climb on top the truck to flush a line. Now they can flush the hose without the danger of falling off the truck. Some suggestions have been made to limit the products carried on the truck to similar products. NYS does not support such language as the flush system actually allows for the safe clearing of the hose and minimizes contamination. A flush manifold enables a truck to carry different products at the same time.

Mr. Jim Willis (New York) recommended further development.

Mr. Lou Sakin (Hopkinton/Northbridge, Massachusetts) asked when development may be finished. Mr. Willis responded that hopefully by the NCWM Interim Meeting.

Mr. John McGuire (New Jersey) supported developing status.

The NEWMA Specifications and Tolerances Committee recommends that this item remain in Developing Status and encouraged New York, NIST, and Murray Controls to continue working towards full development.

During the 2022 NEWMA Annual Meeting, NEWMA heard comments from Mr. Jim Willis (New York), Mr. John McGuire (New Jersey), Mr. Ethan Bogren (Westchester County, New York) and Mrs. Tina Butcher (NIST OWM) who rose in support of the item as Voting.

After hearing comments from the floor, the Committee considered the item to be fully developed and recommended the item retain a Voting status.

Central Weights and Measures Association

During the CWMA 2021 Interim Meeting, the CWMA heard comments from the floor. Ms. Diane Lee (NIST OWM) commented about this item in the NCWM Annual report. Mr. Charles Stutesman (Kansas) asked if the intent of this item was for vehicle motor fuel or for all items such as home heating oil.

CWMA S&T Committee recommends item as a Developing item.

During the 2022 CWMA Annual Meeting, the CWMA heard no comments from the floor and recommended this item remain a Voting item.

VTM-20.2 A Table T.2. Tolerances for Vehicle Mounted Milk Meters.

(**NOTE:** This item was revised based on changes that were made by the Committee at the 2021 Interim Meeting.)

(**NOTE:** The Item under Consideration was removed from the voting consent calendar at the 2021 Annual Meeting and the S&T Committee made this a Developing item.)

Source: POUL TARP A/S

Purpose and Justification:
Change tolerances to accommodate more efficient milk-metering systems.

OWM Executive Summary for VTM-20.2 – Table T.2. Tolerances for Vehicle Mounted Milk Meters.
OWM Recommendation OWM supports the Assigned status for this item and encourages the task group to continue its review of the proposed OIML tolerances for Vehicle Tank Milk Meters. • One of the questions raised concerning the current proposal that includes the OIML tolerances is that the proposal includes tolerances for the system and a separate tolerance for the meter. • NIST OWM observed that a separate tolerance for the meter would apply during OIML type evaluation. However, NIST HB 44 only includes requirements for the entire measurement system and not separate main elements nor does it have separate tolerances for main elements known to be metrologically significant. • NIST OWM will look forward to more discussion of this item during task group meetings.

Table 3. Summary of Recommendations

VTM-20.2 Table T.2. Tolerances for Vehicle Mounted Milk Meters.

	V	D	W	A	I	Notes*	Comments
Submitter/Task Group							**Task Group Documents**: • Milk Meter Tolerance Spreadsheet (01-14-2021) • Milk Meter Tolerance Report (Task Group, 07-19-21) • Proposed Tolerance Tables (01-10-2022) • Milk Meter NTEP CC Data (01-10-2022)
OWM				✓			
WWMA		✓					
SWMA		✓					
NEWMA				✓			
CWMA				✓			
NCWM				✓			

Table 3. Summary of Recommendations							
VTM-20.2 Table T.2. Tolerances for Vehicle Mounted Milk Meters.							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**
	Letters of Support		**Letters of Opposition**			**Notes**	
Industry			Agri-Mark (01-13-20) Dean Foods (01-14-20) Dairy Farmers of America (01-14-20) Danone North America (01-15-20)				
Manufacturers							
Retailers and Consumers							

***Notes Key:**
1 – Submitted modified language
2 – Item not discussed
3 – No meeting held
4 – Not submitted on agenda
5 – No recommendation or not considered

Item under Consideration:

Amend Handbook 44, Vehicle-Tank Meters Code as follows**:**

T.2. Tolerance Values. – Tolerances shall be as shown in Table 1. Accuracy Classes and Tolerances for Vehicle-Tank Meters Other Than Vehicle-Mounted Milk Meters and Table 2. Tolerances for Vehicle-Mounted Milk Meters.

(Amended 1995**, 20XX**)

Table 2. **Tolerances for Vehicle-Mounted Milk Meters**		
~~**Indication (gallons)**~~	~~**Maintenance Tolerance (gallons)**~~	~~**Acceptance Tolerance (gallons)**~~
~~**100**~~	~~**0.5**~~	~~**0.3**~~
~~**200**~~	~~**0.7**~~	~~**0.4**~~
~~**300**~~	~~**0.9**~~	~~**0.5**~~
~~**400**~~	~~**1.1**~~	~~**0.6**~~
~~**500**~~	~~**1.3**~~	~~**0.7**~~
~~**Over 500**~~	~~**Add 0.002 gallon per indicated gallon over 500**~~	~~**Add 0.001 gallon per indicated gallon over 500**~~

~~**(Added 1989)**~~

Table 2. Tolerances for Vehicle-Mounted Milk Meters		
	Acceptance Tolerance	**Maintenance Tolerance**
Complete Measuring System	0.5 %	0.5 %
Meter Only	0.3 %	0.3 %

(Amended 20XX)

NIST OWM Detailed Technical Analysis:

A Milk Meter Task Group Meeting last met on January 3, 2022 to further discussed the proposed tolerances for Milk Meters. This is a proposal to increase the tolerances for vehicle mounted pump metering systems that measure milk and the proposed tolerance are those used in OIML for milk measuring systems.

	Proposed Tolerance		**Current NIST Tolerance**		**Proposed Tolerance**		**Current NIST Tolerance**	
Collected volume	**Maintenance**		**Maintenance**		**Acceptance**		**Acceptance**	
	Gallon	Percent %	Gallon	Percent %	Gallon	Percent %	Gallon	Percent %
50 Gallon	0.25	0.5 %			0.25	0.5 %		
100 Gallon	0.5	0.5 %	0.5	0.50 %	0.5	0.5 %	0.3	0.30 %
200 Gallon	1	0.5 %	0.7	0.35 %	1	0.5 %	0.4	0.20 %
300 Gallon	1.5	0.5 %	0.9	0.30 %	1.5	0.5 %	0.5	0.17 %
400 Gallon	2	0.5 %	1.1	0.275 %	2	0.5 %	0.6	0.15 %
500 Gallon	2.5	0.5 %	1.3	0.26 %	2.5	0.5 %	0.7	0.14 %

The submitter (Poul Tarp) explained that use of vehicle mounted pump metering systems to measure milk reduces the amount of time needed to collect and process the milk which reduces the cost and loss of product that would occur with a slower measurement process. But, with the use of vehicle mounted pump measuring systems, entrained air is produced that cannot be removed and this air is measured as product. As such, with the use of a pump metering system there is an inherit loss to the buyer. Although the system has means for air elimination, not all entrained air can be removed and this is the submitter's reason for requesting that the tolerances currently in the HB be increased.

Poul Tarp also noted that it is recognized by the European Standardization Agencies: Measuring Instrument Directive (MID) and Organization of Legal Metrology (OIML) Recommendation (R) 117 *Dynamic measuring systems for liquids other than water* and the dairy industry in general that it is not possible to remove all the air from milk before measuring it. Poul Tarp notes that the MID and OIML (R) 117 standards

specify that measurements of a vehicle mounted milk metering system must not result in inaccuracy of more than 0.5 % at any given amount being collected from a minimum of 50 gallons and up to +500 gallons. NIST HB 44 Section 3.31.has a designated tolerance table in volume for vehicle-mounted milk meters that was added to the code in 1989 with an acceptance tolerance of 0.3 and maintenance tolerance of 0.5 gallons for the first 100 gals and these tolerances decrease in percent tolerance as the indicated volume increases, as was reported in a presentation from Poul Tarp:

NIST OWM's initial points to consider as the Committee began to deliberate on the proposal were:

- Are there other methods that can be employed to remove entrained air from the milk?

- Can the amount of error introduced from entrained air be determined?

- Should NIST HB 44 tolerances be aligned with OIML R 117 less stringent tolerances, as recommended by the submitter.

- Should there be a separate tolerance table to address vehicle mounted pump metering systems?

During the 2019 Interim Meeting another company stated that they met the current tolerances in HB 44 and were issued an NTEP certificate and believe that the current tolerances are appropriate. Other State regulators commented that the current certificate was limited to testing up to 300 gallons. At that time the S&T Committee assigned a task group to this item and NIST OWM expressed interest in working with the task group.

Mr. Charlie Stutesman, Kansas, and Chair of the Task Group sent an email to the Milk Meter Tolerance Task Group (TG) providing a list of the TG members and the TG's mission. Mr. Stutesman also informed the Task Group that most communication will be conducted via e-mail and that face-to-face meetings will be planned at Interim and Annual Meetings.

The following list contains the names of members on the Milk Meter Tolerance TG:

Chair – Mr. Charlie Stutesman (Kansas)
NEWMA Representative – Mr. Jim Willis (New York)
SWMA Representative – TBD
WWMA Representative – Mr. Jeff Cambies (California)
NTEP Technical Advisor – Mr. Mike Manheim
NIST Technical Advisor – Ms. Diane Lee
Measurement Canada Technical Advisor – Mr. Luciano Burtini
Industry Representative – Mr. Carey McMahon (Poul Tarp)
Industry Representative – Ms. Leigh Hamilton (Piper Systems)
Industry Representative – Mr. Brandon Meiwes (Dairy Farmers of America)
Industry Representative – Mr. Bob Fradette (Agri-Mark)
Mr. Mitch Marsalis (Los Angeles County, California) has agreed to be the SWMA representative. I am just waiting on formal assignment by the NCWM Chair for Mitch.

Milk Meter TG Mission:
The mission of the Task Group is to review and possibly recommend changes to the tolerances that apply to milk meters, which may include milk measuring systems, in Sections 3.31. Vehicle Tank Meters, Section 3.35. Milk Meters, Section 3.37. Mass Flow Meters, and Section 4.42. Farm Milk Tanks. This TG will

consider the tolerances proposed in S & T item VTM-20.2 and the tolerances in OIML R 117-2 "Dynamic measuring systems for liquids other than water" in their discussion."

Mr. Stutesman provided the Task Group with milk meter tolerances and requirements from OIML-R117-2: 2007, NIST HB 44 Tolerances for Milk Meters that are located in the VTM Code Section 3.31, the Mass Flow Meter Code Section 3.37, and the Farm Milk Code Section 4.42 and Measurement Canada's tolerances for milk meters and requested feedback from the task group on appropriate tolerances to apply. A Task Group member from Poul Tarp, the original submitter of the item, recommended that the proposal be changed to align NIST HB 44 with the tolerances for milk meters in OIML R-117-2. Mr. Stutesman circulated a proposal for consideration by the task group that would aligns the tolerances in NIST HB 44 Section 3.31 Table 2 with OIML to tolerances. OIML Tolerances seem to apply two different tolerances. 0.5 % tolerance for milk meters in a system and 0.3 % tolerance for a meter outside of a system that is used to measure milk. The proposed tolerances and changes to NIST HB 44 are provided below:

Table 2. Tolerances for Vehicle-Mounted Milk Meters		
~~**Indication (gallons)**~~	~~**Maintenance Tolerance (gallons)**~~	~~**Acceptance Tolerance (gallons)**~~
~~**100**~~	~~**0.5**~~	~~**0.3**~~
~~**200**~~	~~**0.7**~~	~~**0.4**~~
~~**300**~~	~~**0.9**~~	~~**0.5**~~
~~**400**~~	~~**1.1**~~	~~**0.6**~~
~~**500**~~	~~**1.3**~~	~~**0.7**~~
~~**Over 500**~~	~~**Add 0.002 gallon per indicated gallon over 500**~~	~~**Add 0.001 gallon per indicated gallon over 500**~~

Table 2. Tolerances for Vehicle-Mounted Milk Meters		
Indication (gallons)	**Acceptance Tolerance**	**Maintenance Tolerance**
Complete Measuring System	0.5 %	0.5 %
Meter Only	0.3 %	0.3 %

Proposed change to Handbook 44- Simple rewrite of table 2 and paragraph T.4. in 3.31 VTM Code and Table 1 in 3.35 Milk Meter Code.

3.31 Vehicle Tank Meters

T.2. Tolerance Values. – Tolerances shall be as shown in Table 1. Accuracy Classes and Tolerances for Vehicle-Tank Meters Other Than Vehicle-Mounted Milk Meters and Table 2. Tolerances for Vehicle-Mounted Milk Meters.
(Amended 1995, 20XX)

If changes to the product depletion test tolerances in Handbook 44 are made to match OIML R117-1 paragraph 2.10.1:

> **T.4. Product Depletion Test.** – The difference between the test result for any normal test and the product depletion test shall not exceed 0.5 % of the volume delivered in one minute at the maximum flow rate marked on the meter for meters rated higher than 380 Lpm (100 gpm) or 0.6 % of the volume delivered in one minute at the maximum flow rate marked on the meter for meters rated 380 Lpm (100 gpm) or lower. Test drafts shall be of the same size and run at approximately the same flow rate. **For vehicle tank meter measuring systems used to measure milk, the effect due to the influence of the air or gases on the measuring result shall not exceed 1.0 % of the quantity measured.**

Mr. Charlie Stutesman also asked the Task Group if consideration should be given to updating all of the codes pertaining to milk metering devices in NIST HB 44 and if all milk metering requirements should be included in a single code.

The NCWM Milk Meter Tolerance Task Group met virtually on January 7, 2020. During this meeting the Task Group discussed:

- the system of milk collection from farm to processer (seller to buyer),
- the operation of metering systems that measure milk to include discussion of air elimination systems,
- review of the milk measuring tolerances in NIST HB 44 from 1919 to 2020,
- review of the proposal to harmonize the NIST HB 44 VTM code milk metering tolerances with OIML tolerances for single milk meters and milk meter measuring systems, and
- whether or not the task group wanted to consider expanding its scope to include combining all milk metering requirements in NIST HB 44 to a single code.

By consensus the Task Group agreed with harmonizing the VTM milk metering tolerance with OIML R 117 tolerances and that those tolerance be presented during the NCWM 2021 Interim Meeting for discussion. The Task Group also agreed that a request should be made to the S&T Committee to expand the scope of the Task Group to include combining milk meter requirements in NIST HB 44 to a single code.

Mr. Charlie Stutesman, Task Group Chair, proposed the Task Group visit a location to review Milk Measuring systems in use as its next step. The Task Group last met on July 1, 2021.

NIST OWM is looking forward to gaining additional information on the various systems for milk metering and their capabilities and believes the task groups plans to visit a site will be helpful in determining the best approach for acceptable solution for milk metering systems. In the meantime, harmonizing with OIML tolerances may be an acceptable path forward. OWM reiterates its original questions concerning the operation of milk metering systems. OWM encourages the task group to continue its investigation of these systems.

Summary of Discussions and Actions:

A Milk Meter Tolerance Task Group was formed and assigned to this item. Please contact the Task Group chair for more information:

Mr. Charlie Stutesman
Kansas Department of Agriculture
(785) 564-6681, **charles.stutesman@ks.gov**

Existing tolerances are based on the accuracy of the Flow meter itself. The proposed Tolerances are based on Milk Metering Systems where the magnetic flow meter is a part of the Milk Metering system handling milk containing air.

The accuracy of the Flow meter will always be influenced by the way it is used. The only way you can obtain the accuracy described by the manufacture is when the flow meter is operating as a "stand alone" unit and, equally important, only if the product passing through the flow meter is complete air-free.

The submitter provided the following:

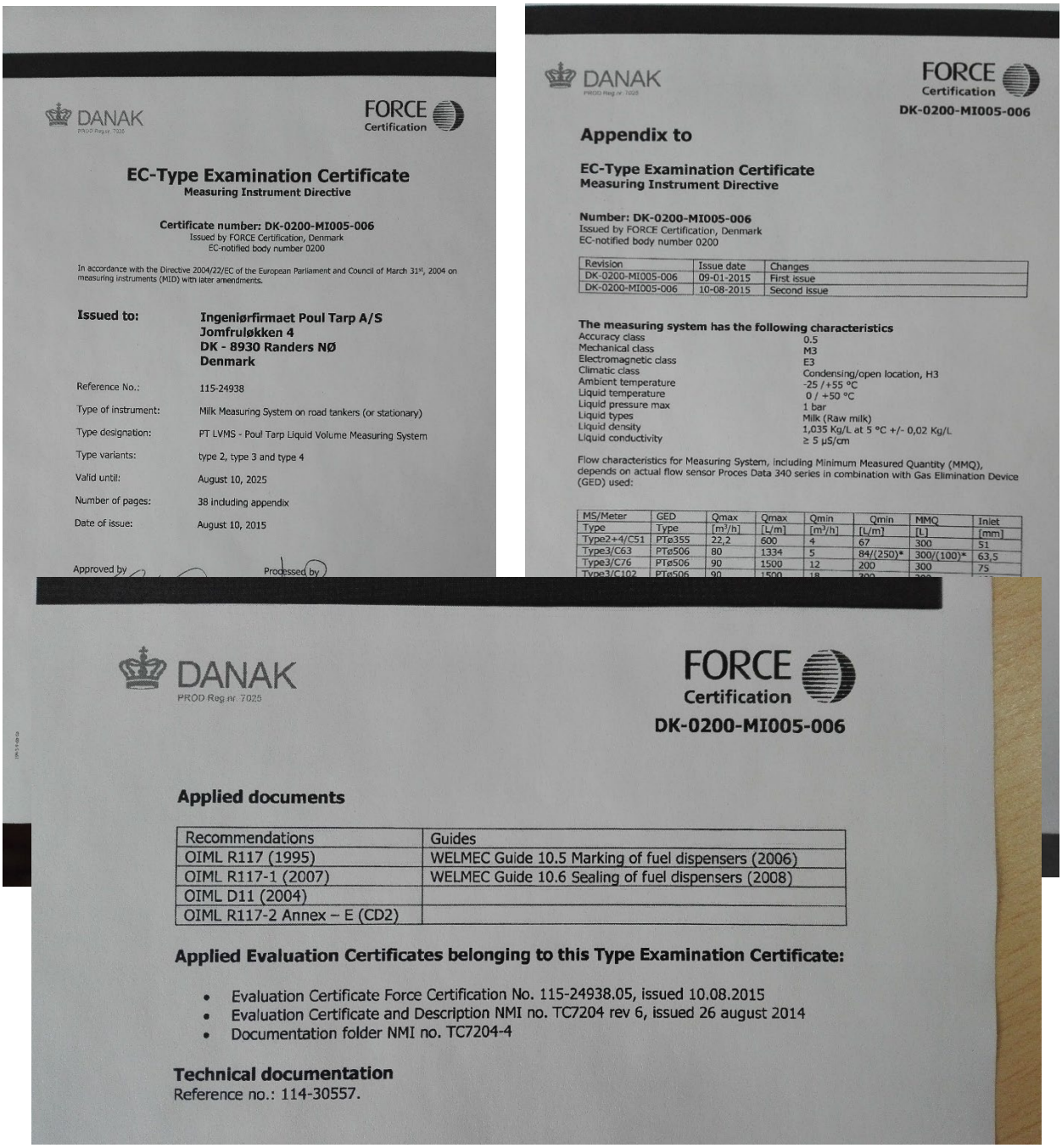
> During the past 20 years, the need for improved efficiency in the collection of milk has resulted in the use of milk pumping equipment being installed on milk tankers.
>
> One of the most obvious places for a modern Dairy to optimize is the amount of time that the milk tanker uses to make a collection. If you can reduce the collection time at each farmer, the Dairy will be able to get a significant reduction in collection and transport cost for the benefit of the Farmer, Consumer and the Dairy itself. At the same time, you will get an environmental benefit as a result of reduced CO2 in the milk collection process.
>
> The consequence of introducing pump systems on milk tankers is that it causes air to be mixed with the milk which again will influence the accuracy of the magnetic flow-meter mounted in the system. Milk entrains air unlike petroleum liquids which do not. As you know, the flow meter will count anything that passes through the meter – liquid as well as air – and it is therefore essential that as much air as possible is removed from the milk before it reaches the flow-meter. However, it is widely recognized that it is not possible to remove all the air from the milk, which will result in an inaccuracy.
>
> It is therefore essential that the tolerances for vehicle mounted milk pump systems using magnetic flow-meters for determining milk volume reflects todays way of collecting milk. This means that existing Tolerance for milk meters cannot be used when the milk meter is a part of a system where different system parts will influence the accuracy of the count. Such milk metering systems will need to be classified with their own tolerances.
>
> Based on our 25 years of experience as a manufacturer of these systems and more than 3000 installations on milk trucks operating in more than 15 countries, we would like to propose that the Tolerance for Vehicle Mounted Milk Metering Systems is changed from 0.3 % to 0.5 % and that the tolerances will be listed and classified separately and not be associated with products from the oil industry. Our proposal is consistent with Weights & Measures tolerances accepted around the world.
>
> We hope that the NCWM will consider our proposal and we will be more than happy to meet with you and answer any questions you may have. We believe that a change of Tolerance is necessary in order for the Handbook 44 to reflect today´s milk collection and the technical progress within milk collection.

Yours sincerely

Poul Tarp
President POUL TARP A/S

The POUL TARP milk pump system holds an MID approval which is recognized and in accordance with guidelines and standards described in the **OIML - INTERNATIONAL ORGANIZATION OF LEGAL METROLOGY**

FLOW COMPUTERS REGULATION IN THE US:



DANAK
PROD Reg.nr. 7025

FORCE Certification

EC-Type Examination Certificate
Measuring Instrument Directive

Certificate number: DK-0200-MI005-006
Issued by FORCE Certification, Denmark
EC-notified body number 0200

In accordance with the Directive 2004/22/EC of the European Parliament and Council of March 31st, 2004 on measuring instruments (MID) with later amendments.

Issued to:	**Ingeniørfirmaet Poul Tarp A/S** **Jomfruløkken 4** **DK - 8930 Randers NØ** **Denmark**
Reference No.:	115-24938
Type of instrument:	Milk Measuring System on road tankers (or stationary)
Type designation:	PT LVMS - Poul Tarp Liquid Volume Measuring System
Type variants:	type 2, type 3 and type 4
Valid until:	August 10, 2025
Number of pages:	38 including appendix
Date of issue:	August 10, 2015

Approved by

Processed by

DANAK
PROD Reg.nr. 7025

FORCE Certification
DK-0200-MI005-006

Appendix to

EC-Type Examination Certificate
Measuring Instrument Directive

Number: DK-0200-MI005-006
Issued by FORCE Certification, Denmark
EC-notified body number 0200

Revision	Issue date	Changes
DK-0200-MI005-006	09-01-2015	First issue
DK-0200-MI005-006	10-08-2015	Second issue

The measuring system has the following characteristics

Accuracy class	0.5
Mechanical class	M3
Electromagnetic class	E3
Climatic class	Condensing/open location, H3
Ambient temperature	-25 /+55 °C
Liquid temperature	0 / +50 °C
Liquid pressure max	1 bar
Liquid types	Milk (Raw milk)
Liquid density	1,035 Kg/L at 5 °C +/- 0,02 Kg/L
Liquid conductivity	≥ 5 µS/cm

Flow characteristics for Measuring System, including Minimum Measured Quantity (MMQ), depends on actual flow sensor Proces Data 340 series in combination with Gas Elimination Device (GED) used:

MS/Meter Type	GED Type	Qmax [m³/h]	Qmax [L/m]	Qmin [m³/h]	Qmin [L/m]	MMQ [L]	Inlet [mm]
Type2+4/C51	PTø355	22,2	600	4	67	300	51
Type3/C63	PTø506	80	1334	5	84/(250)*	300/(100)*	63,5
Type3/C76	PTø506	90	1500	12	200	300	75
Type3/C102	PTø506	90	1500	18	300	300	100

DANAK
PROD Reg.nr. 7025

FORCE Certification
DK-0200-MI005-006

Applied documents

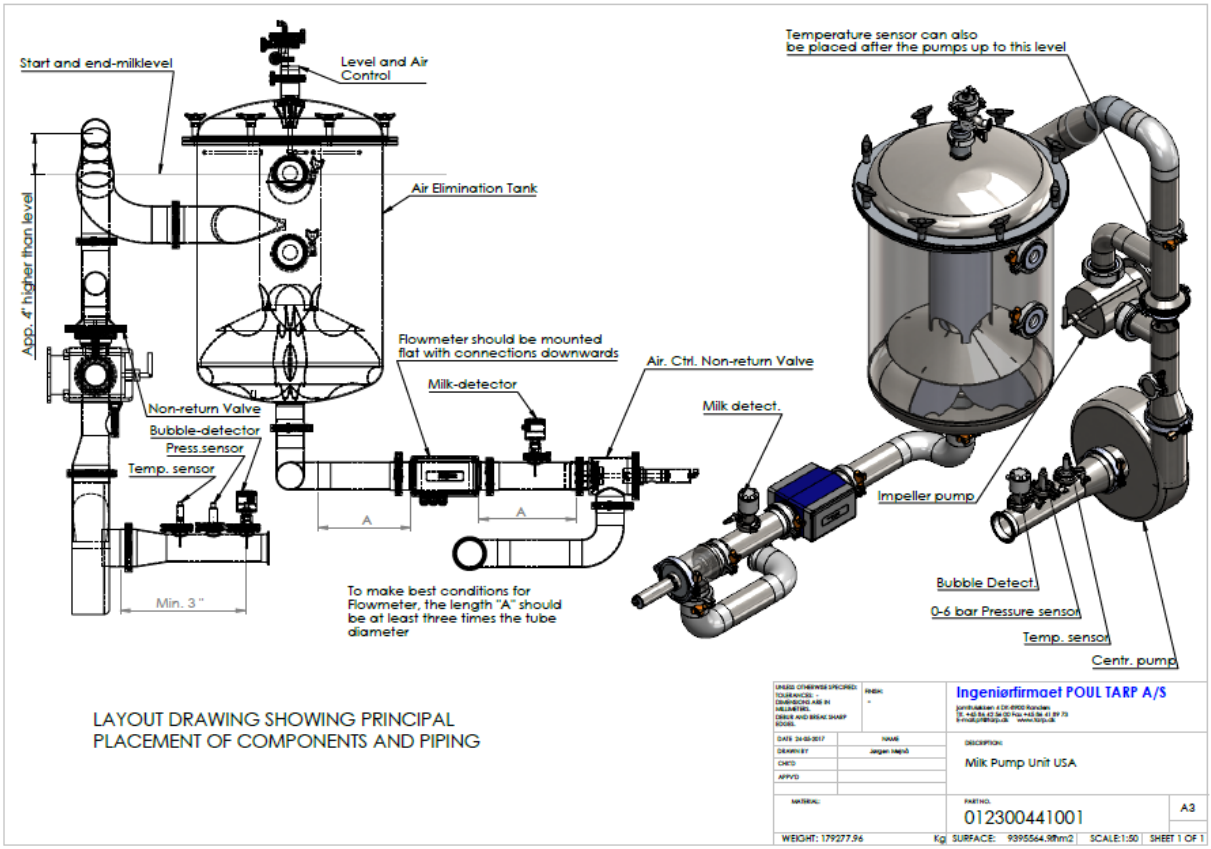
Recommendations	Guides
OIML R117 (1995)	WELMEC Guide 10.5 Marking of fuel dispensers (2006)
OIML R117-1 (2007)	WELMEC Guide 10.6 Sealing of fuel dispensers (2008)
OIML D11 (2004)	
OIML R117-2 Annex – E (CD2)	

Applied Evaluation Certificates belonging to this Type Examination Certificate:

- Evaluation Certificate Force Certification No. 115-24938.05, issued 10.08.2015
- Evaluation Certificate and Description NMI no. TC7204 rev 6, issued 26 august 2014
- Documentation folder NMI no. TC7204-4

Technical documentation
Reference no.: 114-30557.

The standards related to metrological aspects come from OIML R117-1 for liquids (Dynamic measuring systems for liquids other than water, part 1: Metrological and technical requirements) and documents D11 (General requirements for electronic measuring instruments) and D31 (General requirements for software-controlled measuring instruments) from OIML.



At the NCWM 2020 Interim Meeting Mr. Carey McMahon (Poul Tarp) provided a presentation on his company's VTM milk metering system advocating for expanding tolerances for these systems.

Ms. Leigh Hamilton (Piper) provided a presentation concerning the piper system and stated in her presentation that piper currently has an approved NTEP certificate for their device that is in service in the U.S. Ms. Leigh opposes this item to increase the tolerances for milk meters and noted in her presentation that there may not be a need to increase the tolerances in order to move forward in allowing innovation in milk measurements.

Mr. Charles Stutesman (Kansas) provided a presentation on research that KDA has done on the history of 3 HB 44 Codes (3.31. VTMs, 3.35. Milk Meters, and 4.42. Farm Milk Tanks) and the issue of Piper's NTEP Certificate. Mr. Stutesman discussed complications involved in measurement of product using various methods and potential shortcomings of Piper's NTEP Certificate.

Mr. Doug Musick (Kansas) stated that he does not believe there is enough information presented to change existing tolerances and noted that the Piper system was only evaluated for accuracy up to a measurement of 300 gallons. He also noted that he believes that Piper's certificate should be amended to qualify the system for draft sizes up to 300 gallons. Mr. Mike Keilty (Endress + Hauser) commented that he had

concerns with Piper's certificate. Ms. Hamilton noted that Piper followed and followed guidelines as provided during the NTEP evaluation. Ms. Diane Lee (NIST OWM) stated that the Committee may want to consider a developing status for this item and that more information is needed concerning air elimination methods for milk metering systems.

A representative from the Dairy Farmers of America, stated that they oppose the increase in tolerance but supports the use of VTM metering systems. Mr. Carey McMahon (Poul Tarp) pointed out that the Poul Tarp system can be accurate for any size measurement, but the beginning and end of the measurement would not be accurate measures (within tolerance) due to entrained air in the product when the flow is not uniform. Mr. Dmitri Karimov (MMA) stated that the proposal should be further developed and pointed out that due to the tolerance structure becoming more stringent as the volume of the measurement increases, the acceptance tolerance at 500 gallons is unreasonable. Mr. Hal Prince (Florida) stated that he does not agree with expanding the tolerances. Mr. Prince believes that air elimination should be the focus and that the proposal should be assigned to a task group. Mrs. Tina Butcher (NIST OWM) noted that testing should be performed using multiple quantities and flowrates. Mr. Charles Stutesman (Kansas) pointed out that confusion is generated by multiple HB 44 codes addressing the measurement of milk and that the proposal should be assigned to a TG to sort this out. Mr. Stutesman also pointed out there is no requirements in HB 44 for air elimination pertaining to milk metering in these codes. Mrs. Butcher noted that the current HB 44 requirements may not be flexible enough for this new technology and that the existing codes may need to be reviewed and updated.

Ms. Leigh Hamilton (Piper) stated that this is not simply a consideration of only a change in tolerances. There are other requirements (currently in the OIML standard) that should also be considered in making any changes to the existing HB 44 requirements. Mr. Mike Keilty (Endress+Hauser) stated that air elimination is a difficult problem to mitigate and noted that he is not sure if it is necessary to expand the existing tolerances or make other amendments. Mr. Carey McMahon (Poul Tarp) stated that using the existing HB 44 tolerances in the VTM Code, at a draft of 5000 gallons, the tolerance value is highly unreasonable Charles Stutesman (Kansas) noted that the type evaluation performed on the Piper system was limited to a draft of 300 gallons. If evaluation had included other draft sizes, the Piper system mat have failed the testing.

Mr. Ken Ramsburg (Maryland) stated that the proposal should be given a developing status. Mr. Ramsburg agreed that there is no existing requirement for this type of system addressing air elimination and stated that the flow meter, air eliminator, plumbing, and pumps all need to be considered during evaluation and the evaluation should be conducted on the system.

Mr. Tim Chesser (Arkansas) questioned whether the flow meter used in the system is appropriate and noted that there are many unanswered questions surrounding this issue. Mr. Jim Willis (New York) recommended a developing status for this item. Mr. Kevin Schnepp (California) stated that although he is opposed to relaxing existing tolerances, he supports the development of this proposal by an assigned task group.

During the Committee's work session, the Committee agreed that this item has merit and should be given an Assigned status. The charge to the assigned task group will be to address three HB 44 codes (VTM, Farm Milk Tanks and Milk meters) to review the requirements and tolerances found in these codes and assess the need for changes.

The NCWM 2020 Annual Meeting, due to the 2020 COVID-19 pandemic, this meeting was adjourned to January 2021, at which time it was held as a virtual meeting. Due to constraint of time, only those items designated as 2020 Voting Items were addressed. All other items were addressed in the subsequent 2021 NCWM Interim Meeting.

At the NCWM 2021 Interim Meeting, the Committee heard from Mr. Charles Stutesman (Kansas, Chair of the Milk Meter Task Group) who gave an update on the task group activities. Mr. Stutesman reported that the Milk Meter Task Group worked via e-mail communication and reviewed and discussed the proposed Milk Meter Tolerances in Agenda item VTM-20.2. The Milk Meter Task Group also discussed the tolerances that are included in NIST HB 44 for Milk meters in various parts of HB 44 which include the VTM, Section 3.31, Farm Milk Tanks, Section 4.42., Mass Flow Meters, Section 3.37, and Milk Meters, Section 3.35. Mr. Stutesman also reported that the Task Group reviewed OIML tolerances for milk meters. Mr. Stutesman stated that after a review of the various tolerances, the Task Group agreed that the OIML tolerances provide tolerances that encompassed the system of measuring milk and not just a tolerance for the performance of the meter. The Milk Meter Task group agreed with proposing the use of the OIML milk meter tolerance as the milk meter tolerances in the VTM code. Mr. Stutesman provided a copy of the proposed changes to VTM-20.2. The proposed tolerances will align the tolerances in the VTM Code for Milk Meters with OIML Milk Meter Tolerances. Mr. Stutesman requested that this item move forward as a Voting item. The Committee also heard from Mr. Clark Cooney who noted that he supported the items as Developing because one company mentioned meeting the existing tolerances. It was mentioned that the company's testing was only performed over a limited range of volumes.

During the Committee's work session, the Committee agreed with the proposal from the Milk Meter Task Group to adopt OIML tolerances for milk meters in the VTM code, that this item be given a Voting status, and that the Item under Consideration be replaced with the work group's proposal to adopt OIML tolerances. The Committee also agreed with expanding the Task Group to address other milk meter codes in HB 44. The Item under Consideration above are the tolerances agreed to by the Milk Meter Task Group and that align with OIML tolerances.

At the NCWM 2021 Annual Meeting Mr. Stutesman provided an update on the Milk Meter Task Group activities. Mr. Stutesman noted that there was a field trip to observe milk metering systems. He noted that the proposed tolerances will align the milk tolerances with the OIML tolerances for milk meters and Mr. Stutesman noted that the OIML tolerances provides one tolerance for the meter and another tolerance for a milk metering system. He also noted that it may be impractical to perform an air eliminator test on these devices due to comingling of product.

During the Committee's work session, the Committee agreed to a Voting Status for this item and added it to its voting consent calendar.

During the voting session, Mr. Stutesman asked that consideration be given to adding a non-retroactive date to the proposed tolerances. It was questioned during the discussion that if a non-retroactive date was added to the tolerances, then, what tolerances would apply to existing meters that had been manufactured and tested prior to the non-retroactive date. One of the concerns expressed with having a new tolerance table without a nonretroactive date was whether or not existing devices would be required to be reevaluated in the NTEP. The conference voted against adding the nonretroactive requirement to the proposed tolerance table and the Item under Consideration to change the tolerances failed to receive the 27 votes from the House of State Representatives, so the item failed and went back to the S&T Committee. The S&T Committee agreed to a Developing status for this item.

Note: For reference, the Item under Consideration that was included in the 2021 NCWM Interim Meeting Agenda is provided below:

Table 2. Tolerances for Vehicle-Mounted Milk Meters		
Indication (gallons)	Maintenance Tolerance (gallons)	Acceptance Tolerance (gallons)
100	~~0.5~~ **0.6**	~~0.3~~ **0.5**
200	~~0.7~~ **1.2**	~~0.4~~ **1.0**
300	~~0.9~~ **1.8**	~~0.5~~ **1.5**
400	~~1.1~~ **2.4**	~~0.6~~ **2.0**
500	~~1.3~~ **3.0**	~~0.7~~ **2.5**

At the NCWM 2022 Interim Meeting Mr. Charlie Stutesman (Kansas) spoke as Chair of the Milk Meter Task Group. He requested that this item be assigned back to the Task Group for further development. Mr. Stutesman provided an update on the Task Group meeting in January 2022 in which they discussed tolerances in both 3.31 Vehicle Tank Meters and 3.35 Milk Meters and the need to have the tolerance be applied to both vehicle mounted and station meters as the manufacturers are developing meters that will be capable of being installed in either application. The tolerance tables can be found in the supporting documents. Mr. Stutesman also renewed the Task Group's request to expand its scope to include possibly creating a new code that contains requirements of both vehicle mounted and stationary milk meters and metering systems due to the unique properties of milk as a liquid. Speaking on behalf of himself, Mr. Stutesman (Kansas) stated that he has provided a document in the supporting documents that outlines the four active and five inactive NTEP certified meters and metering systems in terms of test draft size and applicable tolerances. He noted that the active four have a range of 0.12 %-0.6 %. He also noted that milk meters are the only liquid measuring device where the volume tolerance decreases as the draft size increases and suggests percentages more in line with OIML tolerance would be more appropriate. Mr. Ken Ramsburg (Maryland) suggested combining the two tolerances to be used for field evaluations. Ms. Diane Lee (NIST OWM) commented that the Task Group should work toward making all test methods uniform. Ms. Lee also suggested that the Task Group and Committee look at the comments from various companies concerning different tolerance along the distribution line for milk. Mr. Doug Musick (Kansas) and Mr. Matt Douglas (California) supported assigning this item to the Task Group for further development. During Committee work sessions, the Committee agreed to assign this item back to the Milk Meter Task Group so they may continue to ascertain data. In addition, the Committee agreed to request that NCWM Chairman Ivan Hankins expand the scope of the Task Group to include all reference to milk meters, meter systems and related test methods, specifications and tolerance in an effort to harmonize the codes.

The Committee agreed to an Assigned status for the item.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearings the following comments were heard:

Ms. Diane Lee (NIST OWM) put forth by Task Group working on milk meters. They're still in process of reviewing. It was put forth to vote but last-minute change to make it non retroactive. This put it back to Developing. What would happen to devices that are currently in the field? During the Annual Meeting this was returned back to Developing and NIST supports Developing.

The WWMA S&T Committee recommends the status remain Developmental. During the 2021 S&T Work Session Ms. Diane Lee (NIST OWM) was asked for further clarification on her testimony. She provided the following clarification: "During the Annual Meeting a proposal was made to add a non-retroactive date. Because questions were raised as to how this would affect existing devices the item was moved from Voting to Developing." The Committee looks forward to hearing from the working group.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing no comments were received on this item.

This Committee would like to see more evidence and reasoning on why these devices should not have to meet the existing tolerances, and why the tolerances listed are appropriate.

This Committee recommends the item remain Developing so that the submitters can gather more evidence about the accuracy of these devices.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.

Mr. Jim Willis (New York) commented as a member of the Task Group about the field trip that was taken in Rochester New York just prior to the NCWM meeting in July to witness the truck mounted Milk Meters in action. The Task Group is asking for recommendations in regards to a tolerance value that people would be comfortable with. Mr. Willis commented that the tolerance of 0.5 % is considered too large by some, but we have 0.4 % in the handbook now in-regards to checking a milk tank with a meter.

Mr. Jimmy Cassidy (Massachusetts) asked if any systems currently meet the requirements in the handbook and Mr. Willis replied that currently there is one milk meter system on tank trucks that meets the requirements currently in the handbook.

The NEWMA Specifications and Tolerances Committee recommends that this item remain in Developing Status.

During the 2022 Annual Meeting Open Hearing Mr. Jim Willis (New York) commented as a member of the Milk Meter Task Group. He indicated that the Task Group has made strides and hopes for ability to perform additional work on the item.

After hearing comments from the floor, the Committee recognized the need for further development of the item and recommended that the item retain an Assigned status. The Committee recommends the NCWM Milk Meter Task Group continue to work with stakeholders to further develop this item.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing, the Committee heard comments from the floor. Mr. Charles Stutesman (Kansas) would like to see item be returned to Task Group.

CWMA S&T Committee recommends that the item be assigned to Milk Meter Tolerance Task Group and be an Assigned item.

During the 2022 Annual Meeting Open Hearing Mr. Charles Stutesman (Kansas, Chair of Milk Meter Tolerance Task Group (MMTTG)) – following 2022 NCWM Interim Meeting, this item was sent back to the MMTTG. Moving forward with staying with original tolerances that were proposed. Request to expand scope has been submitted. There will be a MMTTG meeting prior to the July annual meeting. Hoping to move forward and elevate to Voting status for next cycle.

The CWMA S&T Committee recommends this item to remain an Assigned item.

LIQUIFIED PETROLEUM GAS AND ANHYDROUS LIQUID-MEASURING DEVICES

LPG-15.1 D N.3. Test Drafts.

Previously LPG-4

(**Note:** In 2019 this item was combined with Block 1 "Terminology For Testing Standards" and other items that addressed terminology for standards and the use of "master meters." Based on comments heard during the 2021 Annual Meeting, the S&T Committee recommended that all items that were combined with Block 1 "Terminology For Testing Standards" that originally appeared as a separate item or a separate block of items on the S&T agenda prior to 2019, be removed from Block 1 "Terminology For Testing Standards" and appear as originally presented.

Item LPG-15.1 was removed from Block 1 "Terminology For Testing Standards" and now appears as a separate item on the 2022 Interim Meeting agenda.)

Source: Endress + Hauser Flowtec AG USA

Purpose and Justification:
Amend Handbook 44 to allow field ~~reference~~ standards meters to be used to test and place into service dispensers and delivery system flow meters.

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
(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.

OWM Executive Summary for LPG-15.1 – N.3. Test Drafts.

OWM Recommendation OWM believes that the purpose for this item, as specified by the submitter, is better addressed from a technical standpoint in Item Block 8.

- State and industry have a need to use various types of field test standards to evaluate commercial devices installed in the marketplace. NIST OWM recognizes the need to use various standards to test commercial devices and support the use of these standards when test data supports its use.
- NIST OWM is also supporting the use of various types of field test standards through the purchase of several meters and the collection of data throughout the U.S.
- The purpose statement for Items LPG-15.1 (LPG & Anhydrous Ammonia Liquid-Measuring Devices Code) indicates the goal of this items is:

  "to amend Handbook 44 to allow field reference standard meters to be used to test and place into service dispensers and delivery system flow meters."

OWM Executive Summary for LPG-15.1 – N.3. Test Drafts.

- The proposed changes in Items LPG-15.1 suggest changes to the *test draft criteria* for devices covered under this code, which is not necessary to allow field reference standard meters to be used to test and place into service dispensers and delivery system flow meters.

- Amongst the concerns raised to the S&T Committee over the proposed changes for LPG-15.1 is that it conflicts with existing test draft criteria and confusion over the application of the proposed requirement.

- As such, given the long debate over multiple iterations of the proposals, OWM proposes that since the purpose of the proposal is to allow field reference standard meters to be used to test and place into service dispensers and delivery system, and the responsibility for allowance of these field test standards are already addressed in the NIST Handbook 44 Fundamental Considerations and Item Block 8 clarifies these responsibilities, that Consideration be given to the proposal in Item Block 8 which clearly states the responsibility for allowance of field standards along with a new proposal to add a general code requirement.

- Note that Block 8 items clarify what has long been recognized in NIST HB 44 concerning the responsibility for acceptance of a standard making changes to specific codes such as those references in LPG-15.1 unnecessary and confusing.

- Additionally, the Committee is aware that a new Form 15 has been submitted by Seraphin for the 2023 cycle proposing a new General Code paragraph which clearly references the Director's authority as outlined in the Fundamental Considerations.

    - This not only avoids the need to specifically reference individual test methods in each specific code, it avoids the potential of implying that test methods not specifically referenced in a code would not be appropriate.

    - **G-N.3. Test Methods. – Permissible test methods for verifying compliance of weighing and measuring systems with the provisions of the General Code and Specific Codes include, but are not limited to, test methods and apparatus that have been approved by the State Director of weights and measures as outlined in Appendix A - Fundamental Considerations, Section 3. Testing Apparatus.**

Table 3. Summary of Recommendations

LPG-15.1 N.3. Test Drafts

	V	D	W	A	I	Notes*	Comments
Submitter							
OWM							
WWMA		✓					
SWMA	✓						
NEWMA			✓				
CWMA	✓						

Table 3. Summary of Recommendations							
LPG-15.1 N.3. Test Drafts							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**
NCWM		✓					
	Letters of Support		**Letters of Opposition**		**Notes**		
Industry							
Manufacturers							
Retailers and Consumers							

***Notes Key:**
1 - Submitted modified language
2 - Item not discussed
3 - No meeting held
4 - Not submitted on agenda
5 - No recommendation or not considered

Item under Consideration:

Amend 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)

NIST OWM Detailed Technical Analysis:

- Although this item has been on the agenda for a number of years, this item was group in a block of other similar items then removed from the block and placed back on the NCWM agenda as it originally appeared on the agenda.

- NIST OWM is working with States using Coriolis meters to collect data on the use of these meters as standards to test liquid measuring devices. This data will be shared with all regulatory officials to assist them with their approval of meters as standards.

- This purpose indicates its intent is to permit the use of field reference standard meters in field testing of commercial measuring systems.

- It is not necessary to reference “field reference standards” in a specific NIST HB 44 code in order to permit their use.

- Criteria for assessing the use of a given type of test standard are outlined in NIST HB 44 Appendix A Fundamental Considerations and clarified by Item Block 8 and OWM believes that the purpose for this item, as specified by the submitter, is better addressed from a technical standpoint in Item Block 8.
- The decision on whether or not to accept a particular test method for use in testing commercial weighing and measuring equipment ultimately rests with the regulatory authority.
- NIST OWM and Seraphin developed Block 8 items (GEN-19.1 and OTH-22.1) on the 2022 Annual Meeting Report to help clarify and provide additional information on field standard traceability and specifications, and the regulatory authority's responsibility for approval of field standards.
- With regard to the proposed addition of a paragraph N.3.2. Field ~~Reference~~ Standard Meter Test., no information or data has been provided to justify that:
    - a different test draft size than that specified in N.3.1. Test Draft is necessary in order to use a "Field ~~Reference~~ Standard Meter."
    - the specific criteria of a minimum quantity of "equal to or greater than the amount delivered in one minute at the flow rate being tested" is appropriate.

NIST OWM believes this item is not supported with data, in that it lacks data to show that one minute of flow would be appropriate. We believe that this data can be collected as data is collected across the country to assess field standard meters or the submitter can provide additional data. Also, since the authority to accept or reject a meter as a field standard is the responsibility of the regulatory authority, this item is inappropriate for its purpose.

- A new Form 15 has been submitted by Seraphin for the 2023 cycle proposing a new General Code paragraph which clearly references the Director's authority as outlined in the Fundamental Considerations.
    - This not only avoids the need to specifically reference individual test methods in each specific code, it avoids the potential of implying that test methods not specifically referenced in a code would not be appropriate.

G-N.3. Test Methods. – Permissible test methods for verifying compliance of weighing and measuring systems with the provisions of the General Code and Specific Codes include, but are not limited to, test methods and apparatus that have been approved by the State Director of weights and measures as outlined in Appendix A - Fundamental Considerations, Section 3. Testing Apparatus.

Summary of Discussions and Actions:

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.

The Committee received written comments 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 and stating that it is important to be consistent in our use of terms across multiple sections of NIST Handbook 44. The Committee agreed to carryover this group of items on its 2019 agenda to allow for further discussion and development of these proposals.

At the 2019 NCWM Interim Meeting the Committee decided to combine the items on the agenda dealing with the issue of transfer standard (including items already combined into blocks) into one block. Block 1 (New) of the Interim Meeting report now includes Gen-3, Block 1 (original items from the 2019 interim agenda that appeared under Block 1), Block 2, LPG-3 and MFM-5, which were all separate items and blocks of items on the S&T Committee's 2019 Interim Meeting agenda (NCWM Publication 15). Agenda items Gen-3, Block 1, Block 2, LPG-3, and MFM-5 are listed separately on the Interim agenda with a note added beneath each individual item referring the reader to the New B1 items. All items under this New B1 have retained the same numbering system for ease in referring to the appendix for discussion on each item.

At the 2019 NCWM Annual Meeting: Mr. Brett Gurney (NCWM Chairman) commented regarding the formation of a Task Group assigned to further develop this block proposal. The TG is charged with providing definitions for various types of standards (transfer, field, reference, etc.) as well as the criteria to be met by these types of standards. The completion date given to the TG is July 2021. The Committee agreed to the Assigned status for this block of items and looks forward to hearing updates from the TG. the Chair of the Task Group was:

Mr. Jason Glass
Kentucky Department of Agriculture
(502) 573-0282, **jason.glass@ky.gov**

At the 2020 NCWM Interim Meeting the Field Standard TG Chair Glass reported that the Task Group met prior to the Interim Meeting and has begun discussion of the items under Block 1. Mr. Glass stated that bi-weekly teleconference meetings were scheduled and that the group was optimistic but had significant work to accomplish.

Mr. Russ Vires (SMA) supports the Scale item, SCL 18.1; in this block, Mr. Dimitri Karimov (Meter Manufacturers Association) supports the Task Group activities, Mrs. Tina Butcher (NIST OWM) was encouraged with the progress on terminology and provided an update on the Mass Flow Meter testing reporting that field testing was conducted October 28 to November 1, 2019 and that State and Industry participation included Colorado, Florida, Oregon, Emerson, and Tulsa Gas Technology.

Mr. Kurt Floren (Los Angeles County, California) raised concerns with GEN-19.1. regarding the definition of "Standard, Field" and its reference to "stable" standards and how long a standard is expected to be stable, which is typically 1-year, for which he believes should be longer. Mr. Floren also questioned the statement in the definition "tested over a range of environmental and operational conditions that the measuring devices is used…" Mr. Floren noted that he was unsure if all laboratories will have the capabilities to test over this wide range of conditions. Mr. Floren also expressed concerns with the definition "Standard, Transfer" citing that this standard may not meet the fundamental considerations requirement for standards over a long period of time or wide range of environmental conditions.

Mr. Steve Harrington (Oregon) echoed Mr. Floren's comments. Field Standard TG Chair Glass responded that these are concerns of the TG and these issues will be discussed and considered as the TG develops these items.

During the Committee's work session, the Committee agreed that this item should remain an Assigned item.

At the 2021 NCWM Interim Meeting the NCWM Field Standard TG Chair, Mr. Jason Glass (Kentucky) provided an update on the Task Group activities. Mr. Glass reported that the Field Standard Task Group is following the activities of the NIST Master Meter Project and that the Task Group reviewed API specifications for use of master meters as a standard and a test protocol that will be used to ensure uniformity in collecting data on master meters used as field standards. He also reported that the TG does not have a recommendation for this item. Mr. Glass also reported that he would be stepping down as the TG Chair. Mr. Mike Keilty (Endress+Hauser AG) thanked Chair Glass and the TG for their work and requested that Block 1, LPG-15.1, N.3. and Block 1 MFM-15.1, N.3 be removed from Block 1 items and to allow those items to move forward separate from the other Block 1 Items. Mr. Keilty stated that similar language was added to the Hydrogen code and that the proposed language in LPG-15.1 N.3. and MFM-15.1, N.3 will allow for the recognition of master meters as field standards. Mr. Henry Oppermann (WM-Consulting), stated that data is needed to ensure that master meters can be used over a range of conditions. Mr. Bob Murnane (Seraphin) stated that jurisdictions have the ability to use meters and that Block 1 LPG-15.1, N.3 and Block 1 MM-15.1, N.3 should remain in Block 1 until data is available to support the use of master meters as a standard. Mr. Keilty mentioned that there has been useful dialog regarding master meters in the TG, but that he is concerned that the TG is not close to deciding and he expressed concerns with the TG's focus on the NIST Master Meter Project. Mrs. Tina Butcher (NIST OWM) provided an update on the NIST Master Meter Project and noted that States have the regulatory powers to accept or reject a standard. She also mentioned that NIST is working with States to collect data needed to assess master meters and preliminary testing was conducted and data was collected on CNG at Tulsa Gas Technology's facility in fall 2019. Ms. Diane Lee (NIST OWM) noted that NIST OWM feels that it is premature to add more language to the NIST Handbook 44 on master meters without data to support its use.

During the Committee's work session, the Committee agreed to keeps all items in Block 1 and that this item should remain with an Assigned status.

At the 2021 NCWM Annual Meeting Mr. Glass reported that he would be stepping down as the Field Standard TG Chair. The Committee heard updates from members of the Task Group during open hearings. Mr. Mike Keilty (Endress+Hauser AG) noted that two of the items had been on the agenda since 2015 and requested that they be removed from the block and recommended recognizing the use of master meters. Other comments were to keep the items together until data is analyzed from the NIST Field Reference Standard Work Group to support the use of master meters but that if some items were removed from the block, all items should be removed from the block. Based on comments heard during the 2021 Annual Meeting, the S&T Committee recommended that all items that were included in Block 1 "Terminology For

Testing Standards" that originally appeared as a separate item or a separate block of items on the S&T agenda in and prior to 2019, be removed from Block 1 "Terminology For Testing Standards" and appear as originally presented.

At the 2021 Committee work session, the Committee recognized that the Task Group has accomplished all it is able to at this point and is recommending the Task Group be disbanded and will make said recommendation to the NCWM Chairman. The Committee agreed to break all items in Block 1 into individual items and designate them all as Developing. The Committee thanks the Task Group and its members for their work.

At the 2022 NCWM Interim meeting, the Item under Consideration is provided below:

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)

Mr. Keilty shared a presentation on field standard meters during open hearings relevant to both LPG 15.1 and MFM 15.1. The intent of the presentation was to describe initial and ongoing calibration traceability, compare OIML tolerances vs NIST Handbook 44, describe the benefits and show examples of master meters. An abbreviated copy of the presentation is available on the NCWM website in the interim meeting documents archive. Mr. Keilty commented that he believes LPG 15.1 and MFM 15.1 are fully developed and should receive voting status for the annual meeting. He has updated the proposal to exclude the term "reference" from "field reference standard meter test", as shown above. He requests that the Committee provide specific guidance if a developing status is assigned. A comment from industry (Bob Murnane – Seraphin) stated that N.3.2 in the proposal conflicts with the current code which states normal test drafts must be at least one minute at the maximum discharge flow rate of installation conditions. The current wording allows for a test to be conducted at any flow rate for one minute. There was concern from a regulator (Mr. Charles Stutesman, Kansas) echoing these concerns. Ms. Diane Lee (NIST) requested that more data be made available so that NIST is able to compare worldwide data against test data compiled within the U.S. by NIST. Mr. Mahesh Albuquerque (Colorado) expressed support for this item to receive Voting status. Mr. Marc Butler (Emerson Micro Motion) expressed confusion at the two notes, thinking that perhaps they conflicted with each other; are they both needed or are they independent? Mrs. Tina Butcher (NIST OWM) expressed that she recognizes the use and importance of master meters, but is concerned with the purpose of this item. Mrs. Butcher suggested that the statement for use be reworked as test draft criteria is so critical. Mrs. Butcher recommended and offered NIST OWM assistance on this item.

During the S&T Committee work session, the Committee recognized the submitters desire that a voting status be recommended but determined that there were too many concerns and confusion expressed. The Committee recommends that the submitter develop the item further by aligning language to existing language in Handbook 44, clarifying the purpose to help avoid confusion of the new code on new equipment, and reaching out to NIST OWM or other industry or regulatory officials for feedback.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearings the following comments were heard:

Mr. Michael Keilty (Endress + Hauser): in 2014 - he submitted a Form 15 to edit content and add N.3.2. It was set to Developing. Several W/M officials have supported this. Asks that this be a Voting item in 2022.

Mr. Bob Murnane (Seraphin): this is to allow a field reference standard meter; this definition does not currently exist. Recommends that this be withdrawn so that the definitions can be worked out.

Ms. Diane Lee (NIST OWM): this item was put forth in 2015 - purpose was: to accept a specific master meter in the field. It's not necessary to ref. field ref. standards in specific code. NIST and States are working to collect data to see if master meters can be used. States are to determine which standards are to be used in the states. N.3.2 was an issue. There was no information as to justify a different test draft size than was specified in N.3 or if it is necessary to use a field reference meter.

Mr. Bruce Swice (National Propane Gas Association): he lent support to this discussion (master meters). It would be nice to have something in HB 44 to assist in uniformity.

Mr. Michael Keilty (Endress + Hauser): to address Ms. Lee: he agrees and disagrees. Agree: it was stated that jurisdictions are responsible for their own equipment, however, he was told by States that they need something in HB 44 to tell them what should be used. Again - wants Voting on this item in 2022.

The WWMA S&T Committee recommends the status remain Developmental. The Committee recommends that consideration be made that this item be included in Block 5, as they refer to the same terminology in HB 44. A letter was submitted to the Committee by Mr. Michael Keilty (Endress + Hauser) and will be posted to the NCWM website. NIST OWM also submitted analysis on this item which can be found at the following link on the NCWM website: **https://www.ncwm.com/annual-archive**

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing, Mr. Oppermann (Seraphin) supports the Withdrawal of this item because it is unnecessary, as master meters can already be recognized as field standards.

Mr. Keilty (Endress+Hauser), the submitter of this item, supports striking the words "Reference" and "Meter" from "N.3.2. Field Reference Standard Meter Test." In this proposal, and moving it forward as a Voting Item.

This Committee feels that the item is fully developed and is looking forward to seeing more data on the performance accuracy of master meters by the states that are currently using these devices.

This Committee recommends this item move forward as a Voting item with the editorial changes requested by Mr. Keilty.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing, the following comments were heard.

Mr. Michael Keilty (Endress + Hauser Flowtec), as the submitter of this item, gave a history of the item from 2015 and is recommending voting status with changes striking text seen below. Mr. Keilty also has submitted comments which are available on the NCWM website.

> **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)**

Mr. Henry Opperman (Seraphin) commented that the latest information was not reviewed and changes are immature as data has not been produced to justify this. And he added that NIST OWM is currently undertaking a study to gather data and this data could help provide justification for this item and recommends further development.

Mr. Rick Harshman (NIST OWM) and Bob Murnane (Seraphin) also recommended further development.

At the 2022 NCWM Annual Meeting Open Hearing Mr. Bob Murnane (Seraphin) commented that he does not believe this item is fully developed and recommended that the committee consider withdrawing the item. Mr. Murnane read from submitted comments. Of note, MR. Murnane indicated that under the Fundamental Considerations in HB 44, the State Director has the authority to evaluate standards for use in certifying meters and the fear is that if this proposal goes through, the handbook would have to be changed for each new technology. Mr. Murnane explained that several states have already evaluated meters to use as standards and determined them to be accurate to use. If this proposal is adopted, Mr. Murnane believes that it would take powers away from State Directors to evaluate and use these standards. Mrs. Tina Butcher (NIST OWM) commented that the concept of master and reference meter is to use the meter as a standard in place of provers. The authority to use them rests with the State Director, however, there needs to be a method to ensure accuracy. Mrs. Butcher mentioned several alternatives as outlined in the submitted NIST analysis.

During the open hearings, comments were heard from the floor regarding this item and MFM-15.1 at the same time.

After hearing comments from the floor, the Committee does not believe the item is fully developed, even though the item has been on the agenda for several years. The Committee recommended that the item be withdrawn.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the Committee heard comments from the floor. Mr. Michael Keilty (Endress+Hauser Flow) asked that the item be moved to voting and if not, asks for suggestions from the Committee on how to improve item. Dr. Henry Opperman (Weights and Measures Consultants) does not support the item. Says it does not explain mass flow meter as a standard and where is the data that supports this item. Mrs. Tina Butcher (NIST OWM) agreed with comments from Dr. Henry Opperman. Mr. Charles Stutesman (Kansas) agreed with Mrs. Butcher but understands the submitting of this proposal and should be moved as a Voting item.

CWMA S&T Committee recommends this item moving forward as a Voting item.

During the 2022 Annual Meeting Open Hearing Mr. Micheal Keilty (Endress+Hauser) presented calibration data at the 2022 NCWM Interim Meeting. No recommendations from NCWM have been released. Recommended a minor change that re-includes the word “meters” because it was confusing how

to apply testing requirements. Both items explain the amount of test drafts that differ from other volume standards. Field standard meter provides flexibility for use across many different products and densities. Field Standards are tested against OIML and API standards using gravimetric methods that are NIST traceable. Accuracy and repeatability are long term, it is a maintenance free system with no moving parts. These systems save time and space, contain embedded diagnostics, are easy to use, and easy to maintain. It is easy to train the operator of these systems. NMi has issued a test report on this system. Various setups can be mounted to a rack and easily transported. SWMA and CWMA recommended this item move forward as voting item in the 2021 Interim Meeting. Recommending placing as Voting today and move forward for a vote this week.

Mr. Jan Konijnenburg (NIST OWM): State and industry have a need to use various types of field test standards to evaluate commercial devices installed in the marketplace. NIST OWM recognizes the need to use various standards to test commercial devices and support the use of these standards when test data supports its use.

The NIST OWM is also supporting the use of various types of field test standards through the purchase of several meters and the collection of data throughout the U.S.

The purpose statement for Items LPG-15.1 (LPG & Anhydrous Ammonia Liquid-Measuring Devices Code) indicates the goal of this items is:

"to amend Handbook 44 to allow field reference standard meters to be used to test and place into service dispensers and delivery system flow meters."

The proposed changes in Items LPG-15.1 suggest changes to the test draft criteria for devices covered under this code, which is not necessary to allow field reference standard meters to be used to test and place into service dispensers and delivery system flow meters.

Amongst the concerns raised to the S&T Committee over the proposed changes for LPG-15.1 is that it conflicts with existing test draft criteria and confusion over the application of the proposed requirement.
As such, given the long debate over multiple iterations of the proposals, OWM proposes that since the purpose of the proposal is to allow field reference standard meters to be used to test and place into service dispensers and delivery system, and the responsibility for allowance of these field test standards are already addressed in the NIST Handbook 44 Fundamental Considerations and Item Block 8 clarifies these responsibilities, that Consideration be given to the proposal in Item Block 8 which clearly states the responsibility for allowance of field standards along with a new proposal to add a general code requirement. (See Item Block 8 of the NIST OWM Analysis for the S&T Annual Meeting.)

Mr. Mike Johnson (Nebraska) supports this item and agrees with Mr. Keilty. Nebraska has had great success over the last 18 years using this method. Nebraska has over 300 mass flow meters and gravimetric testing isn't practical.

Bob Murnane (Seraphin): the stated purpose on these proposals to amend Handbook 44 and to allow field standards meters to be used to test and place into service dispensers and delivery system flow meters. The current language adding N.3.2., has nothing to do with the purpose statement nor does have any effect at all on whether meters can be accepted or used as field standards.

Handbook 44 under fundamental considerations already allows for the use of field standards and /or equipment, as approved by the Director. There are already numerous meters in the field being used as standards that have been approved by State Directors under these fundamental considerations.

Note: Seraphin has a proposal, item OTH-22-1 that supports the Directors authority.

What is the reason and justification for N.3.2 when we already have a test draft size in N.3.1? What data and analysis has been provided regarding the uncertainties associated with the field standard meters and the sizes of the drafts proposed in N.3.2.? The proposal MFM-15.1., N.3.2 would impose constraints on the capability of the W&M officials to test mass flow meters.

Under the current paragraph N.3., W&M officials can conduct tests at any flow rate for any quantity that is equal to or greater than minimum measured quantity (MMQ) specified by the manufacture of the meter. Under the proposed N.3.2., the minimum size of the test drafts must be greater than or equal to the quantity delivered in one minute at the flow rate at which the test is being conducted. Depending upon the measurement application and the test equipment available, this could substantially increase the size of the required test drafts for almost all flow rates for mass flow meters.

Example: Recently there was CNG testing performed in Colorado. The test drafts were for 1/3 of the capacity of the test cylinder (as specified in the EPO) and it took less than one minute to complete. In this case the proposed change to the size of the test draft on MFM15.1. would have prevented Weights & Measures officials from conducting the tests.

Weights and Measures officials should be able to test mass flow meters using any test draft size, equal to or greater than the MMQ over the range of flow rates. I did not do an extensive review but I did find six NTEP Certificates of Conformance that would not be able to be tested using the proposed MFM-15.1., N.3.2. What happens to them?

If the proposal were adopted with its current purpose statement it could be interrupted that every meter is acceptable for use as a field standard. How do you know which meters are acceptable for use as a field standard and which ones are not? For example, if a meter is brought into the United States from another country, can it be used as a field standard. This proposal will cause confusion for both Weights and Measure officials and testing companies.

Additional Notes:
NIST and Seraphin requested Mr. Mike Keilty's participation in a meeting on these items and he declined. There has been a total of six changes to the wording on these items since they were introduced. Again, I would like to remind the Committee that States are already using meters as field standards and this is permitted by the existing fundamental considerations. There is no need for these proposals. Seraphin Test Measures opposes items LPG-15.1. and MFM-15.1 and asks the Committee to withdraw this item from consideration. Comment: years on an agenda are not part of criteria for deciding if an item should be made a Voting item.

Mr. Charlie Stutesman (Kansas): Regarding Fundamental Considerations: states already have the ability to decide what's allowed. It already falls within The Director's authority, but we have other existing codes in HB 44 which reference transfer standards and specifically allowing their use for testing particular devices. The NIST EPOs are still in draft status and are a resource tool only. Flow rate will be more important going forward as gravimetric testing becomes more prevalent. Recommends sending to Voting status. Does this only apply to mass flow meters as the standard? NIST stated they are using Coriolis meters. But the decision to use non-mass flow meters as the field standard rests with The Director. This will apply to any meter technology, not just mass flow meters.

Mr. Michael Keilty (Endress+Hauser): Other codes in HB 44 contain advice on specific test drafts when using transfer standards. These proposals give test draft advice to handle slow flow devices. The EPO for CNG testing uses small containers but the EPO can be changed.

Mr. Ivan Hankins (Iowa) – Mr. Hankins has witnessed these tests using these transfer standards at multiple flow rates and drafts. It took much less time. This technology will allow jurisdictions to test at a quicker pace, using less staff. Supports this proposal.

Mr. Bob Murnane (Seraphin) – Mr. Murnane questioned if the draft size is merely a suggestion.

The CWMA S&T Committee recommends this moves forward as a Voting item.

LPG-22.2 W S.2.6. Zero-Set-Back Interlock, for Stationary Customer-Operated Retail Motor-Fuel Devices, Electronic.

Source: U-Haul International, Inc.

Purpose and Justification:
The proposal will address practical issues that propane marketers encounter when trying to comply with the zero setback requirements for propane stationary and truck-mounted meters in Handbook 44.

Motor fuel, within the context of NFPA 58, refers to any container that has the potential to provide propane to fuel an engine. This can include a multitude of DOT cylinders and ASME containers that are not for the propulsion of an automobile. Current mechanical meter technology utilized in a standard propane dispenser for the filling of portable containers, such as those utilized in NFPA 58 for motor fuel applications or those that do power automobiles, are not capable of being equipped with a zero-set-back interlock and the technology will not be potentially available until 2022, per meter manufacturers.

NFPA 58 currently does not allow the public to refuel its automobiles. All automobiles or other containers must be filled by a specially trained employee. A proposed change has been introduced for consideration in the 2023 edition of NFPA 58 that would permit public refueling of automobiles as long as the dispensing system meets very specific safety requirements, including a specialized nozzle, and is furnished with visible instructions. Upon the acceptance of this new public refueling allowance the propane industry agrees that Zero-Setback-interlocks are needed. These public self-service automotive dispensing systems will be listed to Underwriters Laboratories Standard 495 and will be dedicated to the filling of motor vehicles.

Most propane dispensed is for purposes other than motor-fuel. Pursuant to NFPA 58, this is accomplished by a trained and certified employee dispensing propane, typically using mechanical meters, into cylinders and tanks. The employee is trained and required to manually reset the meter to zero after each transaction and verify the meter is reset prior to initiating a subsequent transaction. This has been and remains an accepted practice for dispensing propane. This process is the industry standard for approximately 97 % of all propane used in the United States. *See* U.S. Department of Energy, Alternative Fuels Data Center **afdc.energy.gov/fuels/propane_basics.html**.

Unlike traditional motor-fuel, such as gasoline or diesel, customers cannot currently dispense propane into their vehicles. If NFPA 58 is amended to allow customers to dispense their own propane into their vehicles and the demand for propane as motor-fuel increases, the market will drive retailers to provide electronic customer-operated retail motor-fuel devices to meet the demand and customer expectations for efficient and expedient fueling transactions. At that time, the electronic customer-operated motor-fuel devices will

certainly need to incorporate an automatic zero-set-back interlock. It is simply too early in the process to effectively force mechanical retail motor-fuel devices out of the market for such a small percentage of the retail propane market (approximately 3 %).

It is difficult to counter the argument above. Opponents of this proposed change may argue that automatic zero-set-back interlocks are necessary to prevent customers being overcharged for propane.

The submitter requested that this be a Voting Item in 2022.

OWM Executive Summary for LPG-22.2 – S.2.6. Zero-Set-Back Interlock, for Stationary Customer-Operated Retail Motor-Fuel Devices, Electronic.
OWM Recommendation: No recommendation. This item was withdrawn following the 2022 Interim Meeting.

Table 3. Summary of Recommendations

LPG-22.2 S.2.6. Zero-Set-Back Interlock, for Stationary Customer-Operated Retail Motor-Fuel Devices, Electronic.

	V	D	W	A	I	Notes*	Comments
Submitter							
OWM							
WWMA		✓					
SWMA			✓				
NEWMA							No comments received because this item was withdrawn following the 2022 Interim Meeting.
CWMA							No comments received because this item was withdrawn following the 2022 Interim Meeting.
NCWM							

	Letters of Support	Letters of Opposition	Notes
Industry	• Letter from Endress+Hauser (10-07-2021) • Endress+Hauser Slides (01-11-2022) • Endress+Hauser Letter to CWMA (05-12-2022)	• Comments from Seraphin (09-27-2016) • Comments from Seraphin (06-23-2017) • Comments from Seraphin (07-02-2018) • Comments from Seraphin Test Measure Co. (06-17-2022)	
Manufacturers			
Retailers and Consumers			

Table 3. Summary of Recommendations							
LPG-22.2 S.2.6. Zero-Set-Back Interlock, for Stationary Customer-Operated Retail Motor-Fuel Devices, Electronic.							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**
***Notes Key:** 1 - Submitted modified language 2 - Item not discussed 3 - No meeting held 4 - Not submitted on agenda 5 - No recommendation or not considered							

Item under Consideration:

Amend Handbook 44, Liquefied Petroleum Gas and Anhydrous Ammonia Liquid-Measuring Devices Cod as follows:

S.2.6~~5~~5.2. Zero-Set-Back Interlock for Stationary Customer-Operated 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.

[**~~Retroactive~~ Nonretroactive as of January 1, ~~2017~~ 2023**]

(Added 2016**, Amended ~~2022~~ 20XX**)

NIST OWM Detailed Technical Analysis:

This proposal provides changes to the title of Zero Set-back Interlock for Stationary Retail Motor-Fuel Devices by adding "Consumer Operated" Retail Motor Fuel Dispenser, "Electronic" in the LP-Gas code. In the submitter's justification it is noted that a proposed change was introduced in consideration for proposed changes introduced in the 2023 edition of NFPA to permit public refueling of automobiles with LP-Gas, which is currently not allowed; currently automobiles and containers must be filled by a specially trained employee. These public self-service automotive dispensing systems will be dedicated to fueling motor vehicles. As such the industry agrees that zero set-back interlock is needed for these devices.

The current requirement for Zero-Setback Interlock for Stationary Retail Motor Fuel Devices in the 2022 version of NIST HB 44 Section 3.32 LPG and Anhydrous Ammonia Liquid Measuring Devices Code has

requirements for electronic stationary meters and for analog stationary retail motor fuel dispensers. Both paragraphs apply to either customer or employee operated. Adding "Customer-Operated" and "Electronic" does not appear to be necessary. Both are covered under the existing requirements.

- It appears that the most current edition (2022 edition) of NIST HB 44 was not used when this proposal was created.

- The paragraph that is numbered S.2.6 in the proposal is S.2.5.2 in the 2022 version of NIST HB 44.

- NIST HB 44 does not typically make a distinction as to who operates the device and currently S.2.5.2 applies to both electronic and analog devices and as such the proposed changes in this item are already addressed in S.2.5.2.

- The proposed change to the paragraph S.2.6 to become a retroactive requirement would require that manufacturers retrofit the equipment or get new equipment for all equipment. This paragraph originally was non-retroactive as of January 1, 2017.

- This proposal appears to be redundant. The requirements for zero-set-back interlock already apply to electronic retail motor fuel devices, regardless of whether or not they are customer or owner operated.

- Additional discussion may be needed as to the intent of this proposal.

Summary of Discussions and Actions:

At the 2022 Interim Meeting some were in support of this item and others suggested that this item be combined with LPG 22.3. NIST OWM provided comments and noted that the proposed changes in this item were not based on the current edition of NIST HB 44 and would need to be updated per the current NIST HB 44 code requirements. Following the 2022 Interim meeting this item, LPG-22.2, was withdrawn and the submitter worked with the submitter of item LPG-22.3 in developing that proposal.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearings the following comments were heard:

Mr. Dwight Farr (U-Haul Program Manager): they proposed this amendment. The majority of propane meters are mechanical - this forces them to switch to electronic. He wants this to only pertain to electronic meters. This will affect the infrastructure growth. This will deter alt. fuel options (sites just will not sell LPG as retail fuel instead of switching to electronic). Customer cannot dispense their own LPG - has to be a specially trained associate. Setting back every time a single customer brings in multiple tanks will be detrimental to the customer. This only applies to 3 % of his customers. Wants this to be a Voting item next year.

Mr. Bruce Swiecicki (National Propane Gas Association): supports this proposal as stated. This will go a long way towards fixing the problem.

Ms. Cadence Matijevich (Nevada): Question for submitter: retroactive status?

Mr. Dwight Farr (U-Haul Program Manager): retroactive to 2017 - law was established at that year.

Ms. Cadence Matijevich (Nevada): the way it is written, it will not suffice.

Mr. Dwight Farr (U-Haul Program Manager): if it needs to be changed, so be it.

The WWMA S&T Committee recommends based on testimony heard in open hearings and input from the NIST advisors during the work session that this item be assigned a Developing status. The Committee also recommends that the submitters of LPG-22.2 and LPG-22.3 combine their efforts to develop one of the items with consideration to the 2022 version of NIST HB 44.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing, Mr. Steven Benjamin (North Carolina) stated that he is opposed to this item, because he feels it will allow device manufacturers to cut corners on "full service" devices.

Mr. Tim Chesser (Arkansas) opposes this item. He stated that it was a bad item, seemed incomplete, and recommended it be withdrawn.

This Committee agrees that the item could allow subpar devices to be put into commerce, that the item itself is incomplete, and recommends this item be Withdrawn.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearings, no comments were heard on this item.

The NEWMA Specifications and Tolerances Committee recommends that this item remain in Developing Status.

During the 2022 Annual Meeting Open Hearing no comments were received because this item was withdrawn.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the Committee heard no comments from the floor. The Committee received updated proposal to S.2.5. and S.2.6 from Mr. Bruce Swieciki (National Propane Gas Association) because technology won't be available till 2022 per manufacturers.

CWMA S&T Committee recommends item move forward as a Developing item.

During the 2022 Annual Meeting Open Hearing no comments were received because this item was withdrawn.

LPG-22.3 D S.2.5. Zero-Set-Back Interlock, Stationary ~~and Vehicle Mounted~~ Meters, Electronic., S.2.6. Zero-Set-Back Interlock, Vehicle Mounted Meters, Electronic., and S.2.~~6~~7. Zero-Set-Back Interlock for Stationary Self-Operated Retail Motor-Fuel Devices.

Note: The Item under Consideration has been updated since the 2022 Interim Meeting. The current item is a combined effort of the National Propane Gas Association and U-Haul International, Inc.

Source: National Propane Gas Association

Purpose and Justification:
The proposal will address practical issues that propane marketers encounter when trying to comply with the zero setback requirements for propane stationary and truck-mounted meters in NIST Handbook 44.

National Propane Gas Association:

This proposal was developed by the National Propane Gas Association's Technology, Standards and Safety Committee, a volunteer organization comprised of 2500+ members, including propane retail marketers and others providing products or services to the propane industry.

In S.2.5, the removal of the vehicle mounted meters from this two-minute requirement is necessary as the initiation of a vehicle mounted meter is performed at the truck prior to moving the delivery hose to the customer tank, sometimes as far as 150 feet from the meter, or in installations with multiple containers that may require continued adjustment of containers or delivery hose to complete a delivery. This configuration can lead to periods of up to 5 minutes between initial meter engagement and first container filling or between containers being filled on a single delivery.

In revised S.2.6, we are proposing that vehicle mounted meters be allowed periods between meter engagement and product flow of greater than 2 minutes prior to automated time out initiation. A five-minute period is more practical as the initiation of a vehicle mounted meter is performed at the truck prior to moving the delivery hose to the customer tank, sometimes as far as 150 feet from the meter, or in installations with multiple containers that may require continued adjustment of containers or delivery hose to complete a delivery. The configuration on a typical bobtail can lead to periods of up to 5 minutes between initial meter engagement and first container filling or additionally periods of greater than two minutes can transpire between containers being filled on a single delivery.

Addressing proposed new S.2.7, motor fuel, within the context of NFPA 58, refers to any container that has the potential to provide propane to fuel an engine. This can include a multitude of DOT cylinders and ASME containers that are not for the propulsion of an automobile. Current mechanical meter technology utilized in a standard propane dispenser for the filling of portable containers, such as those utilized in NFPA 58 for motor fuel applications or those that do power automobiles, are not capable of being equipped with a zero-set-back interlock and the technology will not be potentially available until 2022, per meter manufacturers.

NFPA 58 does not currently explicitly allow the public to refuel its automobiles. All automobiles or other containers must be filled by a specially trained employee. A proposed change has been introduced for consideration in the 2023 edition of NFPA 58 that would permit public refueling of automobiles as long as the dispensing system meets very specific safety requirements, including a specialized nozzle, and is furnished with visible instructions. Upon the acceptance of this new public refueling allowance the propane industry agrees that Zero-Setback-interlocks are needed. These public self-service automotive dispensing

systems will be listed to Underwriters Laboratories Standard 495 and will be dedicated to the filling of motor vehicles.

In view of the above information, existing dispenser systems that may only be utilized by qualified trained employees should be permitted to continue operations with the existing meter technology and should not be required to include Zero-Set-Back Interlocks. This should include when the dispenser is removed from one location and installed in another, as long as the original meter remains functional. Existing cabinetry and controls utilized in a standard dispenser cabinet generally include non-digital meters and no electronic controls with the exception of a single switch that operates the pump. These simplistic designs are still effective and should not be prohibited from use in future (new) installations in which the transfer process is attended by trained personnel. Limiting the scope of this section will allow attended dispenser operations which are primarily utilized for filling of portable containers to remain consistent in design and construction. Current use of this technology has not resulted in any known impact to the consumer or over-charge situations. The term "self-operated" is used in other locations in Handbook 44 and would include electronic dispensing devices and meters, which would then be consistent with the prior two sections that are limited to electronic meters.

It is difficult to counter the arguments above. The sheer difficulties that a service person can encounter when a wet hose must be carried over terrain fairly long distances between receiving containers should be sufficient justification to approve this proposal. The counter argument to new S.2.7 would be that the customer may not be able to view the meter to ensure it is set back to zero. The submitter requested that this be a Voting Item in 2022.

U-Haul International, Inc.
Motor fuel, within the context of NFPA 58, refers to any container that has the potential to provide propane to fuel an engine. This can include a multitude of DOT cylinders and ASME containers that are not for the propulsion of an automobile. Current mechanical meter technology utilized in a standard propane dispenser for the filling of portable containers, such as those utilized in NFPA 58 for motor fuel applications or those that do power automobiles, are not capable of being equipped with a zero-set-back interlock and the technology will not be potentially available until 2022, per meter manufacturers.

NFPA 58 currently does not allow the public to refuel its automobiles. All automobiles or other containers must be filled by a specially trained employee. A proposed change has been introduced for consideration in the 2023 edition of NFPA 58 that would permit public refueling of automobiles as long as the dispensing system meets very specific safety requirements, including a specialized nozzle, and is furnished with visible instructions. Upon the acceptance of this new public refueling allowance the propane industry agrees that Zero-Setback-interlocks are needed. These public self-service automotive dispensing systems will be listed to Underwriters Laboratories Standard 495 and will be dedicated to the filling of motor vehicles.

Most propane dispensed is for purposes other than motor-fuel. Pursuant to NFPA 58, this is accomplished by a trained and certified employee dispensing propane, typically using mechanical meters, into cylinders and tanks. The employee is trained and required to manually reset the meter to zero after each transaction and verify the meter is reset prior to initiating a subsequent transaction. This has been and remains an accepted practice for dispensing propane. This process is the industry standard for approximately 97 % of all propane used in the United States. *See* U.S. Department of Energy, Alternative Fuels Data Center **afdc.energy.gov/fuels/propane_basics.html**.

Unlike traditional motor-fuel, such as gasoline or diesel, customers cannot currently dispense propane into their vehicles. If NFPA 58 is amended to allow customers to dispense their own propane into their vehicles and the demand for propane as motor-fuel increases, the market will drive retailers to provide electronic customer-operated retail motor-fuel devices to meet the demand and customer expectations for efficient and expedient fueling transactions. At that time, the electronic customer-operated motor-fuel devices will certainly need to incorporate an automatic zero-set-back interlock. It is simply too early in the process to effectively force mechanical retail motor-fuel devices out of the market for such a small percentage of the retail propane market (approximately 3 %).

OWM Executive Summary for LPG-22.3 – S.2.5. Zero-Set-Back Interlock, Stationary and Vehicle Mounted Meters, Electronic., S.2.6. Zero-Set-Back Interlock, Vehicle Mounted Meters, Electronic., and S.2.67. Zero-Set-Back Interlock for Stationary Self-Operated Retail Motor-Fuel Devices.

OWM Recommendation: NIST OWM is not in support of this proposal to change S.2.5.2 requirements in the LPG Code and feel that this creates different requirements for retail motor fuel devices used for other products. Also, a proposal is needed for consideration of changes to timeout for LPG.

- The submitters explained in their justification that only trained operators can dispense propane into a vehicle and that these propane retail motor fuel dispensers do not meet the requirements for Zero-Set Back Interlock for Stationary Retail Motor-Fuel Devices. As such, the submitters are proposing that since these are not customer operated dispensers, and that the dispensers are operated by trained staff, the requirements in S.2.5.2 Zero-Set-Back Interlock for Stationary Retail Motor Fuel Devices should be revised to only apply to Customer Operated Electronic Retail Motor Fuel Devices. The following are NIST OWM comments to this proposed change.

- If a dispenser is operating as a retail motor fuel device the current requirements for zero-set-back interlock apply whether or not it is operated by the customer or trained staff.

- The purpose of the Zero-Set-back Interlock is to ensure that an automatic interlock prevents subsequent delivery until the indicating element is returned to zero.

- With the changes proposed, any propane retail motor fuel device that is operated by trained staff could possibly not be returned to zero at the start the next transaction.

- Propane retail motor fuel devices, that are not customer operated, would not be required to meet S. 2.5.2. in the LPG Code.

Table 3. Summary of Recommendations

LPG-22.3 S.2.5. Zero-Set-Back Interlock, Stationary and Vehicle Mounted Meters, Electronic., S.2.6. Zero-Set-Back Interlock, Vehicle Mounted Meters, Electronic., and S.2.67. Zero-Set-Back Interlock for Stationary Self-Operated Retail Motor-Fuel Devices.

	V	D	W	A	I	Notes*	Comments
Submitter							
OWM							
WWMA		✓					

Table 3. Summary of Recommendations							
LPG-22.3 S.2.5. Zero-Set-Back Interlock, Stationary and Vehicle Mounted Meters, Electronic., S.2.6. Zero-Set-Back Interlock, Vehicle Mounted Meters, Electronic., and S.2.67. Zero-Set-Back Interlock for Stationary Self-Operated Retail Motor-Fuel Devices.							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**
SWMA	✓						
NEWMA							No recommendation from this region was provided as no comments were heard from the body on this item during the 2022 NEWMA Annual Meeting.
CWMA	✓						
NCWM							

	Letters of Support	**Letters of Opposition**	**Notes**
Industry			
Manufacturers			
Retailers and Consumers			

***Notes Key:**
1 - Submitted modified language
2 - Item not discussed
3 - No meeting held
4 - Not submitted on agenda
5 - No recommendation or not considered

Item under Consideration:

Amend Handbook 44, Liquefied Petroleum Gas and Anhydrous Ammonia Liquid-Measuring Devices Cod as follows:

S.2.5. Zero-Set-Back Interlock.

S.2.5.1. Zero-Set-Back Interlock, Electronic Stationary Meters (Other than Stationary Retail Motor-Fuel Dispensers) and Electronic Vehicle-Mounted Meters. − *A device shall be constructed so that after an individual delivery or multiple deliveries at one location have been completed, an automatic interlock system shall engage to prevent a subsequent delivery until the indicating element and, if equipped, recording element have been returned to their zero positions.*
[Nonretroactive as January 1, 2021]

(Added 2019)

(Amended 2021)

S.2.5.2. Zero-Set-Back Interlock for Stationary <u>Customer-Operated Electronic</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.
[Nonretroactive as of January 1, 2017]

(Added 2016)

NIST OWM Detailed Technical Analysis:

A similar proposal LPG-22.2, submitter U-Haul International, Inc. was withdrawn and both U-Haul International, Inc. and National Propane Gas Association collaborated to further develop LPG-22.3. Initially, the proposed changes, were made to an older version of the handbook. The current Item under Consideration has been edited and changes are being proposed to the current version of NIST HB 44.

Per review of the discussion provided by the submitter, propane dispensed into a vehicle requires a trained operator to dispense the propane. From other proposals on the 2022 Interim Meeting report, it is NIST OWM understanding that some stationary propane dispensers have been retrofitted to dispense propane as fuel for vehicles. As such these dispensers are now retail motor fuel dispensers and must meet the requirements for these device in the LPG code.

The submitters explained in their justification that only trained operators can dispense propane into a vehicle and that these propane retail motor fuel dispensers do not meet the requirements for Zero-Set Back Interlock for Stationary Retail Motor-Fuel Devices. As such, the submitter is proposing that since these are not customer operated dispensers, and that the dispensers are operated by trained staff, the requirements in S.2.5.2. Zero-Set-Back Interlock for Stationary Retail Motor Fuel Devices should be revised to only apply to Customer Operated Electronic Retail Motor Fuel Devices The following are NIST OWM comments to this proposed change.

- If a dispenser is operating as a retail motor fuel device the current requirements for zero-set-back interlock apply whether or not it is operated by the customer or trained staff.

- The purpose of the Zero-Set-back Interlock is to ensure that an automatic interlock prevents subsequent delivery until the indicating element is returned to zero.

- With the proposed changes, any propane retail motor fuel device that is operated by trained staff could possibly not be returned to zero at the start the next transaction.

- Retail motor fuel dispenser such as gasoline dispensers are required to meet these requirements in a self-serve (Customer operated) or full Service (Trained staff operated) locations.

- Propane retail motor fuel devices, that are not customer operated, would not be required to meet S. 2.5.2. in the LPG Code.

- The title of the proposal will need to be updated with the current handbook paragraphs.

- In reference to requirements for a 5-minute timeout, the timeout was discussed by the conference in 2021. During those discussions 2, 3 and 5 minutes were discussed. The conference adopted a 3-minute timeout which was added to NIST HB 44 in 2021. Although timeout was discussed in the submitters justification, the revised Item under Consideration did not include a proposal for a change to the timeout requirements for LPG.

- NIST OWM is not in support of this proposal to change S.2.5.2 requirements in the LPG Code and feel that this creates different requirements for retail motor fuel devices used for other products. Also, a proposal is needed for consideration of changes to timeout for LPG.

Summary of Discussions and Actions:

During the 2022 NCWM Interim Meeting, Mr. Bruce Swiecicki (National Propane Gas Association), working in collaboration with U-Haul International, requested the Committee replace the proposal in its 2022 Interim Meeting agenda for this item with the following revised version:

Amend Handbook 44, Liquefied Petroleum Gas and Anhydrous Ammonia Liquid-Measuring Devices Code as follows:

S.2.6. Automatic Timeout.

S.2.6.1. Electronic Stationary (Other than Stationary Retail Motor-Fuel Dispensers) ~~and Electronic Vehicle-Mounted~~ Meters. *– For individual deliveries, if there is no product flow for three minutes the transaction must be completed before additional product flow is allowed. The three-minute timeout shall be a sealable feature on an indicator.*
[Nonretroactive as of January 1, 2021]
(Added 2021)

S.2.6.2. Zero-Set-Back Interlock, Electronic Vehicle Mounted Meters. - ***A device shall be so constructed that after an individual delivery or multiple deliveries at one location have been completed, an automatic interlock system shall engage to prevent a subsequent delivery until the indicating element and, if equipped, recording element have been returned to their zero position. For individual deliveries, if there is no product flow for a maximum of five minutes the transaction must be completed before additional product flow is allowed. The 5-minute timeout shall be a sealable feature on an indicator.***
[Nonretroactive as of January 1, 2021]

During Committee open hearings, Mr. Swiecicki acknowledge the proposal was based on an earlier version of NIST Handbook 44 and the paragraph numbering had changed. Consequently, the proposal needed modification to correspond to the 2022 version of the handbook. Mr. Swiecicki reported a two-minute time out was difficult to accomplish and suggested this be changed to five minutes.

During the Committee's work session, members of the Committee reviewed the revised proposal, which includes updated language and paragraph numbering, however, members of the Committee concluded the proposal was still not fully developed. The Committee agreed to amend the proposal as requested by the

submitter. The Committee recommended the submitter of this item work with the submitter of LPG-22.2 (U-Haul International) to harmonize the two proposals.

Two officials supported Mr. Swiecicki's comments and were also in favor of a five-minute time out.

Ms. Diane Lee (NIST OWM) commented the proposal needed to be cleaned up to match the 2022 version of NIST Handbook 44. There was also a suggestion for the submitter to work with NIST OWM to further develop the proposal.

No comments were heard in opposition to the continued development of this item.

Following the 2022 Interim Meeting, the submitter of this item and Item LPG-22.2 collaborated on a joint proposal as requested and submitted it to the Committee in time that it could be added to the Committee's agenda for the 2022 NCWM Annual Meeting. See the Item under Consideration for the new joint proposal. Because the submitters combined the two items into one, the Committee was able to withdraw LPG 22.2. from its agenda.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearings the following comments were heard:

Mr. Bruce Swiecicki (National Propane Gas Association): This addresses two subjects: has to do with zero setback, but were breaking out vehicle meters. In some situations with a bobtail where there may be several tanks not close to one another and the operator has to carry the long hose. They have to walk from tank to tank. They want more time (5 minute timer). He supports this but wants to break out the systems that aren't used full time for Retail motor fuel.

Mr. Dwight Farr (U-Haul Program Manager): they are in support of the NPGA proposal.

Mrs. Tina Butcher (NIST OWM): Look at the previous verbiage. The Conference did vote on changes with regard to zero setback and time out in 2021. The paragraph number is different than the 2020 version.

The WWMA S&T Committee recommends based on testimony heard in open hearings and input from the NIST advisors during the work session that this item be assigned a Developing status. The Committee also recommends that the submitters of LPG-22.2 and LPG-22.3 combine their efforts to develop one of the items with consideration to the 2022 version of NIST HB 44.

Southern Weights and Measures Association

At 2021 Annual SWMA Meeting Open Hearing, Mr. Steve Benjamin (North Carolina) supported this item.

This Committee recommends this item move forward as a Voting item.

Northeastern Weights and Measures Association

During the 2021 Interim NEWMA S&T open hearings, no comments were heard on this item.

The NEWMA Specifications and Tolerances Committee recommends that this item remain in Developing Status.

During the 2022 Annual Meeting Open Hearing no comments were received on this item and NEWMA made no recommendation to the NCWM.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing, the Committee heard no comments from the floor. Committee received updated proposal to S.2.5. and S.2.6 from Mr. Bruce Swieciki (National Propane Gas Association) because technology won't be available 2022 per manufacturers.

CWMA S&T Committee recommends item move forward as a Developing item.

During the CWMA's 2022 Annual Meeting, the CWMA's Committee considered the following comments:

Mr. Konrad Pilatowicz (U-Haul International) (comments received via email prior to the meeting): This proposal was developed by the National Propane Gas Association's Technology, Standards and Safety Committee, a volunteer organization comprised of 2500+ members, including propane retail marketers and others providing products or services to the propane industry.

Addressing proposed S.2.5.2, motor fuel, within the context of NFPA 58, refers to any container that has the potential to provide propane to fuel an engine. This can include a multitude of DOT cylinders and ASME containers that are not for the propulsion of an automobile. Current mechanical meter technology utilized in a standard propane dispenser for the filling of portable containers, such as those utilized in NFPA 58 for motor fuel applications or those that do power automobiles, are not capable of being equipped with a zero-set-back interlock and the technology will not be potentially available until 2022, per meter manufacturers.

NFPA 58 does not currently explicitly allow the public to refuel its automobiles. All automobiles or other containers must be filled by a specially trained employee. A proposed change has been introduced for consideration in the 2023 20 edition of NFPA 58 that would permit public refueling of automobiles as long as the dispensing system meets specific safety requirements, including a specialized nozzle, and is furnished with visible instructions. Upon the acceptance of this new public refueling allowance the propane industry agrees that Zero-Setback-interlocks are needed. These public self-service automotive dispensing systems will be listed to Underwriters Laboratories Standard 495 and will be dedicated to the filling of motor vehicles.

In view of the above information, existing dispenser systems with mechanical registers that may only be utilized by qualified trained employees should be permitted to continue operations with the existing meter technology and should not be required to include Zero-Set-Back Interlocks. This should include when the dispenser is removed from one location and installed in another, as long as the original meter remains functional. Existing cabinetry and controls utilized in a standard dispenser cabinet generally include non-digital meters and no electronic controls with the exception of a single switch that operates the pump. These simplistic designs are still effective and should not be prohibited from use in future (new) installations in which the transfer process is attended by trained personnel.

Limiting the scope of this section will allow attended dispenser operations which are primarily utilized for filling of portable containers to remain consistent in design and construction. Current use of this technology

has not resulted in any known impact to the consumer or over- charge situations. The term "customer-operated" is used in several other locations in Handbook 44.

Mr. Michael Keilty (Endress+Hauser, NTEP Measuring Sector) – This is a new item that the NTEP Measuring Sector has not reviewed and would like to discuss at their September 2022 meeting.

Based upon these comments, the CWMA recommended this item as a Voting item on the NCWM agenda.

MFM – MASS FLOW METERS

MFM-15.1 D N.3. Test Drafts.

Previously MFM-2

(**Note:** In 2019 this item was combined with Block 1 "Terminology For Testing Standards" and other items that addressed terminology for standards and the use of "master meters." Based on comments heard during the 2021 Annual Meeting, the S&T Committee recommended that all items that were combined with Block 1 "Terminology For Testing Standards" that originally appeared as a separate item or a separate block of items on the S&T agenda prior to 2019, be removed from Block 1 "Terminology For Testing Standards" and appear as originally presented.

Item MFM-15.1 was removed from Block 1 "Terminology For Testing Standards" and now appears as a separate item on the 2022 Interim Meeting agenda.)

Source: Endress + Hauser Flowtec AG USA

Purpose and Justification:
Amend Handbook 44 to allow field reference standard meters to be used to test and place into service dispensers and delivery system flow meters. 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 HB 44 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.

OWM Executive Summary for MFM-15.1 – N.3. Test Drafts.

OWM Recommendation OWM believes that the purpose for this item, as specified by the submitter, is better addressed from a technical standpoint in Item Block 8.

- State and industry have a need to use various types of field test standards to evaluate commercial devices installed in the marketplace. NIST OWM recognizes the need to use various standards to test commercial devices and support the use of these standards when test data supports its use.
- The NIST OWM is also supporting the use of field test standards through the purchase of several meters and the collection of data throughout the U.S.
- The purpose statement for Item MFM-15.1 (Mass Flow Meters Code) indicates the goal of this item is:
  - "to amend Handbook 44 to allow field reference standard meters to be used to test and place into service dispensers and delivery system flow meters."
- The proposed changes in Items MFM-15.1 suggest changes to the *test draft criteria* for devices covered under this code, which is not necessary to allow field reference standard meters to be used to test and place into service dispensers and delivery system flow meters.
- Amongst the concerns raised to the S&T Committee over the proposed changes for MFM-15.1, is the inability for an inspector or service company to test devices under their conditions of use and as required elsewhere in the MFM code.

OWM Executive Summary for MFM-15.1 – N.3. Test Drafts.

- Specifically, with the proposed addition of a paragraph N.3.2. Field Reference Standard Meter Test., no information or data has been provided to justify that:
  - a different test draft size than that specified in N.3.1. or the current Mass Flow Meter, NIST HB 44 paragraph N.3 Test Draft is necessary in order to use a "Field Reference Standard Meter."
  - the current requirements for test draft "one test draft at the maximum flow rate of the installation and one test draft at the minimum flow rate" is appropriate for use when testing with a meter or volume prover.
- This proposal creates two test draft paragraphs in NIST HB 44. It retains the existing criteria for the test draft and adds a proposal for a second test draft paragraph that states "the test draft shall be equal to or greater than the amount delivered in one minute"
  - It has been observed when testing CNG that some draft will take far less time than one minute. If the proposed test draft paragraph is added the test draft will not be achievable and as stated unable to test under conditions of use.
  - Since this proposal adds another test draft paragraph with the existing paragraph for test draft it also creates confusion as to what paragraph the inspector should apply.

  As such, given the long debate over multiple iterations of the proposals, OWM proposes that since the purpose of the proposal is to allow field reference standard meters to be used to test and place into service dispensers and delivery system, and the responsibility for allowance of these field test standards are already addressed in the NIST Handbook 44 Fundamental Considerations and Item Block 8 clarifies these responsibilities, that Consideration be given to the proposal in Item Block 8 which clearly states the responsibility for allowance of field standards along with a new proposal to add a general code requirement.

- Note that Block 8 items clarify what has long been recognized in NIST HB 44 concerning the responsibility for acceptance of a standard making changes to specific codes such as those references in MFM-15.1 and is better addressed in Block 8.
- Additionally, the Committee is aware that a new Form 15 has been submitted by Seraphin for the 2023 cycle proposing a new General Code paragraph which clearly references the Director's authority as outlined in the Fundamental Considerations.
  - This not only avoids the need to specifically reference individual test methods in each specific code, it avoids the potential of implying that test methods not specifically referenced in a code would not be appropriate.
- **G-N.3. Test Methods. – Permissible test methods for verifying compliance of weighing and measuring systems with the provisions of the General Code and Specific Codes include, but are not limited to, test methods and apparatus that have been approved by the State Director of weights and measures as outlined in Appendix A - Fundamental Considerations, Section 3. Testing Apparatus.**

Table 3. Summary of Recommendations							
MFM-15.1 N.3. Test Drafts							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**
Submitter							
OWM							
WWMA							
SWMA	✓						
NEWMA			✓				
CWMA	✓						
NCWM							

	Letters of Support	**Letters of Opposition**	**Notes**
Industry	• Letter from Endress+Hauser (10-07-2021) • Endress+Hauser Slides (01-11-2022) • Endress+Hauser Letter to CWMA (05-12-2022)	• Comments from Seraphin (09-27-2016) • Comments from Seraphin (06-23-2017) • Comments from Seraphin (07-02-2018) • Comments from Seraphin Test Measure Co. (06-17-2022)	
Manufacturers			
Retailers and Consumers			

***Notes Key:**
1 – Submitted modified language
2 – Item not discussed
3 - No meeting held
4 - Not submitted on agenda
5 - No recommendation or not considered

Item under Consideration:

Amend 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)

NIST OWM Detailed Technical Analysis:

- Although this item has been on the agenda for a number of years, this item was group in a block of other similar items then removed from the block and placed back on the NCWM agenda as it originally appeared on the agenda.
- NIST OWM is working with States using Coriolis meters to collect data on the use of these meters as standards to test liquid measuring devices. This data will be shared with all regulatory officials to assist them with their approval of meters as standards.
- This purpose indicates its intent is to permit the use of field reference standard meters in field testing of commercial measuring systems.
- It is not necessary to reference "field reference standards" in a specific NIST HB 44 code in order to permit their use.
- Criteria for assessing the use of a given type of test standard are outlined in NIST HB 44 Appendix A Fundamental Considerations.
- The decision on whether or not to accept a particular test method for use in testing commercial weighing and measuring equipment ultimately rests with the regulatory authority.
- NIST OWM and Seraphin developed Block 8 items (GEN-19.1 and OTH-22.1) on the 2022 Annual Meeting Report to help clarify and provide additional information on field standard traceability and specifications, and the regulatory authority's responsibility for approval of field standards.
- Specifically, with regard to the proposed addition of a paragraph N.3.2. Field Reference Standard Meter Test, no information or data has been provided to justify that:
    - a different test draft size than that specified in N.3.1. or the current Mass Flow Meter, NIST HB 44 paragraph N.3 Test Draft is necessary in order to use a "Field Reference Standard Meter."
    - The current requirements for test draft "one test draft at the maximum flow rate of the installation and one test draft at the minimum flow rate" is appropriate is for use when testing with a meter or volume prover.
- This proposal creates two test draft paragraphs in NIST HB 44. It retains the existing criteria for the test draft and adds a proposal for a second test draft paragraph that states "the test draft shall be equal to or greater than the amount delivered in one minute".
    - It has been observed when testing CNG that some draft will take far less time than one minute. If the proposed test draft paragraph is added the test draft will not be achievable.
    - Since this proposal adds another test draft paragraph with the existing paragraph for test draft it also creates confusion as to what paragraph the inspector should apply.

As such, given the long debate over multiple iterations of the proposals, OWM proposes that since the purpose of the proposal is to allow field reference standard meters to be used to test and place into service dispensers and delivery system, and the responsibility for allowance of these field test standards are already addressed in the NIST Handbook 44 Fundamental Considerations and Item Block 8 clarifies these responsibilities, that Consideration be given to the proposal in Item Block 8 which clearly states the responsibility for allowance of field standards along with a new proposal to add a general code requirement.

Summary of Discussions and Actions:

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.

The Committee received written comments 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 and stating that it is important to be consistent in our use of terms across multiple sections of Handbook 44. The Committee agreed to carryover this group of items on its 2019 agenda to allow for further discussion and development of these proposals.

At the 2019 NCWM Interim Meeting, the S&T Committee decided to combine the items on the agenda dealing with the issue of transfer standard (including items already combined into blocks) into one block. Block 1 (New) of the Interim Meeting report now includes GEN-3, Block 1 (original items from the 2019 interim agenda that appeared under Block 1), Block 2, LPG-3, and MFM-5, which were all separate items and blocks of items on the S&T Committee's 2019 Interim Meeting agenda (NCWM Publication 15). Agenda items GEN-3, Block 1, Block 2, LPG-3, and MFM-5 are listed separately on the Interim agenda with a note added beneath each individual item referring the reader to the New B1 items. All items under this New B1 have retained the same numbering system for ease in referring to the appendix for discussion on each item.

At the 2019 NCWM Annual Meeting, Mr. Brett Gurney (NCWM Chairman) commented regarding the formation of a Task Group assigned to further develop this block proposal. The TG is charged with providing definitions for various types of standards (transfer, field, reference, etc.) as well as the criteria to be met by these types of standards. The completion date given to the TG is July 2021. The Committee agreed to the Assigned status for this block of items and looks forward to hearing updates from the TG. The Chair of the Task Group was:

Mr. Jason Glass
Kentucky Department of Agriculture
(502) 573-0282, **jason.glass@ky.gov**

At the 2020 NCWM Interim Meeting Field Standard TG Chair Glass reported that the Task Group met prior to the Interim Meeting and has begun discussion of the items under Block 1. Mr. Glass stated that bi-weekly teleconference meetings were scheduled and that the group was optimistic but had significant work to accomplish.

Mr. Russ Vires (SMA) supports the Scale item, SCL 18.1; in this block, Mr. Dimitri Karimov (Meter Manufacturers Association) supports the Task Group activities, Mrs. Tina Butcher was encouraged with the progress on terminology and provided an update on the Mass Flow Meter testing reporting that field testing was conducted October 28 to November 1, 2019 and that State and Industry participation included Colorado, Florida, Oregon, Emerson, and Tulsa Gas Technology.

Mr. Kurt Floren (Los Angeles County, California) raised concerns with GEN-19.1. regarding the definition of "Standard, Field" and its reference to "stable" standards and how long a standard is expected to be stable, which is typically 1-year, for which he believes should be longer. Mr. Floren also questioned the statement in the definition "tested over a range of environmental and operational conditions that the measuring devices is used…". Mr. Floren noted that he was unsure if all laboratories will have the capabilities to test over this wide range of conditions. Mr. Floren also expressed concerns with the definition "Standard, Transfer" citing that this standard may not meet the fundamental considerations requirement for standards over a long period of time or wide range of environmental conditions.

Mr. Steve Harrington (Oregon) echoed Mr. Floren's comments. Field Standard TG Chair Glass responded that these are concerns of the TG and these issues will be discussed and considered as the TG develops these items.

During the Committee's work session, the Committee agreed that this item should remain an Assigned item.

At the 2021 NCWM Interim Meeting, the NCWM Field Standard TG Chair, Mr. Jason Glass (Kentucky) provided an update on the Task Group activities. Mr. Glass reported that the field standard Task Group is following the activities of the NIST Master Meter Project and that the Task Group reviewed API specifications for use of master meters as a standard and a test protocol that will be used to ensure uniformity in collecting data on master meters used as field standards. Mr. Glass also reported that the TG does not have a recommendation for this item. Mr. Glass also reported that he would be stepping down as the TG Chair. Mr. Mike Keilty (Endress+Hauser AG) thanked Chair Glass and the TG for their work and requested that Block 1, LPG-15.1, N.3. and Block 1 MFM-15.1, N.3 be removed from Block 1 items and to allow those items to move forward separate from the other Block 1 Items. Mr. Keilty stated that similar language was added to the Hydrogen code and that the proposed language in LPG-15.1 N.3. and MFM-15.1, N.3 will allow for the recognition of master meters as field standards. Mr. Henry Oppermann (W&M Consulting), stated that data is needed to ensure that master meters can be used over a range of conditions. Mr. Bob Murnane (Seraphin) stated that jurisdictions have the ability to use meters and that Block 1 LPG-15.1, N.3 and Block 1 MM-15.1, N.3 should remain in Block 1 until data is available to support the use of master meters as a standard. Mr. Keilty mentioned that there has been useful dialog regarding master meters in the TG, but that he is concerned that the TG is not close to deciding and he expressed concerns with the TG's focus on the NIST Master Meter Project. Mrs. Tina Butcher (NIST OWM) provided an update on the NIST Master Meter Project and noted that States have the regulatory powers to accept or reject a standard. She also mentioned that NIST is working with States to collect data needed to assess master meters and preliminary testing was conducted and data was collected on CNG at Tulsa Gas Technology's facility in fall 2019. Ms. Diane Lee (NIST OWM) noted that NIST OWM feels that it is premature to add more language to the NIST Handbook 44 on master meters without data to support its use.

During the Committee's work session, the Committee agreed to keeps all items in Block 1 and that this item should remain with an Assigned status.

At the 2021 NCWM Annual Meeting, Mr. Glass reported that he would be stepping down as the Field Standard TG Chair. The Committee heard updates from members of the Task Group during open hearings. Mr. Michael Keilty noted that two of the items had been on the agenda since 2015 and requested that they be removed from the block and recommended recognizing the use of master meters. Other comments were to keep the items together until data is analyzed from the NIST Field Reference Standard Work Group to support the use of master meters but that if some items were removed from the block, all items should be removed from the block. Based on comments heard during the 2021 Annual Meeting, the S&T Committee recommended that all items that were included in Block 1 "Terminology For Testing Standards" that originally appeared as a separate item or a separate block of items on the S&T agenda in and prior to 2019, be removed from Block 1 "Terminology For Testing Standards" and appear as originally presented.

During the 2021 Committee work session the Committee recognized that the Task Group has accomplished all it is able to at this point and is recommending the Task Group be disbanded and will make said recommendation to the NCWM Chairman. The Committee agreed to break all items in Block 1 into individual items and designate them all as Developing. The Committee thanks the Task Group and its members for their work.

At the 2022 NCWM Interim Meeting the Item under Consideration presented at this meeting is provided below.

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)

Mr. Keilty shared a presentation on field standard meters during open hearings relevant to both MFM 15.1 and LPG 15.1. The intent of the presentation was to describe initial and ongoing calibration traceability, compare OIML tolerances vs NIST Handbook 44, describe the benefits and show example. An abbreviated copy of the presentation is available on the NCWM website in the interim meeting documents archive. Mr. Keilty commented that he believes MFM 15.1 and LPG 15.1 are fully developed and should receive voting status for the annual meeting. He has updated the proposal to exclude the term "reference" from "field reference standard meter test", as shown above. He requests that the Committee provide specific guidance if a Developing status is assigned. A comment from industry (Mr. Bob Murnane (Seraphin)) stated that N.3.2 in the proposal conflicts with the current code which states normal test drafts must be at least one minute at the maximum discharge flow rate of installation conditions. The current wording allows for a test to be conducted at any flow rate for one minute. There was concern from a regulator (Charles Stutesman, Kansas) echoing these concerns. Ms. Diane Lee (NIST OWM) requested that more data be made available so that NIST is able to compare worldwide data against test data compiled within the U.S. by NIST. Mr. Mahesh Albuquerque (Colorado) expressed support for this item to receive Voting status. Mr. Marc Butler (Emerson Micro Motion) expressed confusion at the two notes, thinking that perhaps they

conflicted with each other; are they both needed or are they independent? Mrs. Tina Butcher (NIST OWM) expressed that she recognizes the use and importance of master meters, but is concerned with the purpose of this item. Mrs. Butcher suggested that the statement for use be reworked as test draft criteria is so critical. Mrs. Butcher recommended and offered NIST OWM assistance on this item.

During the S&T Committee work session, the Committee recognized the submitters desire that a Voting status be recommended but determined that there were too many concerns and confusion expressed. The Committee recommends that the submitter develop the item further by aligning language to existing language in Handbook 44, clarifying the purpose to help avoid confusion of the new code on new equipment, and reaching out to NIST OWM or other industry or regulatory officials for feedback.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearings the following comments were heard:

Mr. Michael Keilty (Endress + Hauser): companion item to LPG-15.1. This is enabling language. Wants this to be a Voting item in 2022.

Mr. Bob Murnane (Seraphin): does not recognize the verbiage, needs a definition - see previous comments (referencing LPG-15.1, field reference standard meter).

Ms. Diane Lee (NIST OWM): agreed with Mr. Keilty about companion item. Clarification to both items: MFM-15.1 - in HB the purpose statement is not there. In Amendment A there is already criteria there. Needed justification for language in N.3.2 - standard meter test - the min. quant. for any test draft shall be equal to or greater than am. delivered in 1 min. of the amount being tested. In CNG there is a 1/3 test being conducted. It wouldn't even take a minute to deliver. The question was: how do you come up with 1 min. and this would not be appropriate for all master meters.

Mr. Keilty addressing Ms. Lee in 2016 there was supposed to be a vote. NIST tech. adviser brought this up. There was a revision to the time to be extended. CNG is completely separate, EPO does say 1/3 but that was when CNG tanks were small (delivered at lower flow rate and shorter time). Mr. Wagner can verify. He made it 1 min. because N.3.1 says one test draft at the max. flow rate and one at the min. flow rate of installation.

The WWMA S&T Committee recommends the status remain Developmental. The Committee recommends that consideration be made that this item be included in Block 5, as they refer to the same terminology in HB 44. A letter was submitted to the Committee by Mr. Keilty and will be posted to the NCWM website. NIST OWM also submitted analysis on this item which can be found at the following link on the NCWM website: **https://www.ncwm.com/annual-archive**.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing, Mr. Henry Oppermann (Seraphin) stated that this creates a conflict with the Mass Flow Meter code regarding the minimum test. He also stated that he believes this item is unnecessary, because Field Standard Tests are already specified.

Mr. Keilty (Endress+Hauser), the submitter, suggested an editorial revision to striking the words "Reference" and "Meter" from "N.3.2. Field Reference Standard Meter Test." in this proposal and moving it forward as a Voting Item.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.

Mr. Michael Keilty (Endress + Hauser Flowtec) commented and recommended Voting status with the changes below.

> **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)**

Mr. Rick Harshman (NIST OWM) commented and discussions were had regarding states meeting the requirement of flow time that may be less than the one minute flow in N.3.2.

Mr. Keilty responded that new equipment is in place and will meet the requirement in N.3.2.

Mr. Henry Opperman (Weights and Measures Consulting) commented that some NTEP certs may have been issued that would not meet the N.3.2 in this proposal.

The Committee would like to have clarification on questions regarding the current NTEP certs and test draft sizes that are currently being used.

The NEWMA Specifications and Tolerances Committee recommends that this item remain in Developing Status.

During the 2022 Annual Meeting open hearing**s** Mr. Bob Murnane (Seraphin) commented that he does not believe this item is fully developed and recommended that the Committee consider withdrawing the item. Mr. Murnane read from submitted comments. Of note, Mr. Murnane indicated that under the Fundamental Considerations in HB 44, the State Director has the authority to evaluate standards for use in certifying meters and the fear is that if this proposal goes through, the handbook would have to be changed for each new technology. Mr. Murnane explained that several states have already evaluated meters to use as standards and determined them to be accurate to use. If this proposal is adopted, Mr. Murnane believes that it would take powers away from State Directors to evaluate and use these standards. Mrs. Tina Butcher (NIST OWM) commented that the concept of master and reference meter is to use the meter as a standard in place of provers. The authority to use them rests with the State Director, however, there needs to be a method to ensure accuracy. Mrs. Butcher mentioned several alternatives as outlined in the submitted NIST analysis.

During open hearings, comments were heard from the floor regarding this item and LPG-15.1 at the same time.

After hearing comments from the floor, the Committee does not believe the item is fully developed, even though the item has been on the agenda for several years. The Committee recommended that the item be withdrawn.

Central Weights and Measures Association

During the 2021 Interim Meeting open hearings the Committee heard comments from the floor. Mr. Michael Keilty (Endress+Hauser Flow) asked that the item be moved to Voting and if not, asks for suggestions from the Committee on how to improve item. Mr. Henry Opperman (Weights and Measures Consultants) does not support the item. Says it does not explain mass flow meter as a standard and where is the data that supports this item. Mrs. Tina Butcher (NIST OWM) agreed with comments from Mr. Opperman. Mr. Charles Stutesman (Kansas) agreed with Mrs. Butcher but understands the submitting of this proposal and should be moved as a Voting item.

CWMA S&T Committee recommends this item moving forward as a Voting item.

At the 2022 Annual Meeting Open Hearing**s,** Mr. Keilty presented calibration data at the 2022 NCWM Interim Meeting. No recommendations from NCWM have been released. Recommended a minor change that re-includes the word "meters" because it was confusing how to apply testing requirements. Both items explain the amount of test drafts that differ from other volume standards. Field standard meter provides flexibility for use across many different products and densities. Field Standards are tested against OIML and API standards using gravimetric methods that are NIST traceable. Accuracy and repeatability are long term, it is a maintenance free system with no moving parts. These systems save time and space, contain embedded diagnostics, are easy to use, and easy to maintain. It is easy to train the operator of these systems. NMi has issued a test report on this system. Various setups can be mounted to a rack and easily transported. SWMA and CWMA recommended this item move forward as voting item in the 2021 Interim meeting. Recommending placing as voting today and move forward for a vote this week.

Mr. Jan Konijnenburg (NIST OWM) - State and industry have a need to use various types of field test standards to evaluate commercial devices installed in the marketplace. NIST OWM recognizes the need to use various standards to test commercial devices and support the use of these standards when test data supports its use.

The NIST OWM is also supporting the use of field test standards through the purchase of several meters and the collection of data throughout the U.S.

The purpose statement for Item MFM-15.1 (Mass Flow Meters Code) indicates the goal of this item is:
"to amend Handbook 44 to allow field reference standard meters to be used to test and place into service dispensers and delivery system flow meters."

The proposed changes in Items MFM-15.1 suggest changes to the test draft criteria for devices covered under this code, which is not necessary to allow field reference standard meters to be used to test and place into service dispensers and delivery system flow meters.

Amongst the concerns raised to the S&T Committee over the proposed changes for MFM-15.1, is the inability for an inspector or service company to test devices under their conditions of use and as required elsewhere in the MFM code.

As such, given the long debate over multiple iterations of the proposals, OWM proposes that since the purpose of the proposal is to allow field reference standard meters to be used to test and place into service dispensers and delivery system, and the responsibility for allowance of these field test standards are already addressed in the NIST Handbook 44 Fundamental Considerations and Item Block 8 clarifies these responsibilities, that Consideration be given to the proposal in Item Block 8 which clearly states the

responsibility for allowance of field standards along with a new proposal to add a general code requirement. (See Item Block 8 of the NIST OWM Analysis for the S&T Annual Meeting.)

OWM Recommendation: OWM recommends that this item be withdrawn, and that consideration be given to Item Block 8.

Mr. Mike Johnson (Nebraska) supports this item and agrees with Mr. Keilty. Nebraska has had great success over the last 18 years using this method. Nebraska has over 300 mass flow meters and gravimetric testing isn't practical.

Mr. Bob Murnane (Seraphin) stated purpose on these proposals to amend Handbook 44 and to allow field standards meters to be used to test and place into service dispensers and delivery system flow meters. The current language adding N.3.2., has nothing to do with the purpose statement nor does have any effect at all on whether meters can be accepted or used as field standards.

Handbook 44 under fundamental considerations already allows for the use of field standards and /or equipment, as approved by the Director. There are already numerous meters in the field being used as standards that have been approved by State Directors under these fundamental considerations.

Note: Seraphin has a proposal, item OTH-22-1 that supports the Directors authority.

What is the reason and justification for N.3.2 when we already have a test draft size in N.3.1?

What data and analysis has been provided regarding the uncertainties associated with the field standard meters and the sizes of the drafts proposed in N.3.2.?

The proposal MFM-15.1., N.3.2 would impose constraints on the capability of the W&M officials to test mass flow meters.

Under the current paragraph N.3., W&M officials can conduct tests at any flow rate for any quantity that is equal to or greater than minimum measured quantity (MMQ) specified by the manufacture of the meter. Under the proposed N.3.2., the minimum size of the test drafts must be greater than or equal to the quantity delivered in one minute at the flow rate at which the test is being conducted. Depending upon the measurement application and the test equipment available, this could substantially increase the size of the required test drafts for almost all flow rates for mass flow meters.

Example: Recently there was CNG testing performed in Colorado. The test drafts were for 1/3 of the capacity of the test cylinder (as specified in the EPO) and it took less than one minute to complete. In this case the proposed change to the size of the test draft on MFM15.1. would have prevented Weights & Measures officials from conducting the tests.

Weights and Measures officials should be able to test mass flow meters using any test draft size, equal to or greater than the MMQ over the range of flow rates. I did not do an extensive review, but I did find six NTEP Certificates of Conformance that would not be able to be tested using the proposed MFM-15.1., N.3.2. What happens to them?

If the proposal were adopted with its current purpose statement it could be interpreted that every meter is acceptable for use as a field standard. How do you know which meters are acceptable for use as a field standard and which ones are not? For example, if a meter is brought into the United States from another

country, can it be used as a field standard. This proposal will cause confusion for both Weights and Measure officials and testing companies.

Additional Notes:
NIST and Seraphin requested Mr. Keilty's participation in a meeting on these items and he declined. There has been a total of six changes to the wording on these items since they were introduced. Again, I would like to remind the Committee that States are already using meters as field standards and this is permitted by the existing fundamental considerations. There is no need for these proposals. Seraphin Test Measures opposes items LPG-15.1. and MFM-15.1 and asks the Committee to withdraw this item from consideration. Comment: Years on an agenda are not part of criteria for deciding if an item should be made a Voting item.

Mr. Charlie Stutesman (Kansas) - Regarding Fundamental Considerations: States already have the ability to decide what's allowed. It already falls within The Director's authority, but we have other existing codes in HB 44 which reference transfer standards and specifically allowing their use for testing particular devices. The NIST EPOs are still in draft status and are a resource tool only. Flow rate will be more important going forward as gravimetric testing becomes more prevalent. Recommends sending to Voting status. Does this only apply to mass flow meters as the standard? NIST stated they are using Coriolis meters. But the decision to use non-mass flow meters as the field standard rests with The Director. This will apply to any meter technology, not just mass flow meters.

Mr. Michael Keilty (Endress+Hauser) - Other codes in HB 44 contain advice on specific test drafts when using transfer standards. These proposals give test draft advice to handle slow flow devices. The EPO for CNG testing uses small containers but the EPO can be changed.

Mr. Ivan Hankins (Iowa) has witnessed these tests using these transfer standards at multiple flow rates and drafts. It took much less time. This technology will allow jurisdictions to test at a quicker pace, using less staff. Supports this proposal.

Mr. Bob Murnane (Seraphin) questioned if the draft size is merely a suggestion.

The CWMA S&T Committee recommends this moves forward as a Voting item.

MFM-22.1 V Table T.2. Accuracy Classes and Tolerances for Mass Flow Meters.

Source: NIST Office of Weights and Measures

Purpose and Justification:
Currently Handbook 44, Section 3.37 Mass Flow Meters Code paragraph A.2. Vapor (Gases) recognizes measurements of hydrocarbon gases, but the code is silent to this product application in Table T.2 Accuracy Classes and Tolerances for Mass Flow Meters. This proposed modification to Table T.2 clarifies the tolerances the code developers intended to apply to hydrocarbon gas measurements. The amendment of Table T.2. will assist officials and industry by providing the exact tolerances applicable to hydrocarbon gas measurements and eliminate any need to borrow tolerances established and deemed appropriate for similar gas applications in this code (i.e., compressed natural gas) or from other code sections.

OWM Executive Summary for MFM-22.1 Table T.2. Accuracy Classes and Tolerances for Mass Flow Meters.

OWM Recommendation: OWM believes this item is fully developed and ready for a vote.

- This is a housekeeping item that clarifies the original tolerances (i.e., 2.0 percent and 1.0 percent) intended to apply in the dynamic measurement of hydrocarbon (HC) vapor products.
- Hydrocarbon vapor products application which has been recognized and remains unchanged in Application Section paragraph A.2. Vapor (Gases) of the MFM Code since the code was first adopted in 1991.
- The proposal places the family of HC vapor products under an accuracy class designation (i.e., 2.0) which is required marking information specified in paragraph S.5.(e) Markings since January 1, 1995.

Table 3. Summary of Recommendations

MFM-22.1 Table T.2. Accuracy Classes and Tolerances for Mass Flow Meters

	V	D	W	A	I	Notes*	Comments
Submitter	✓						
OWM	✓						
WWMA	✓						
SWMA	✓						
NEWMA	✓						
CWMA	✓						
NCWM	✓						

	Letters of Support	Letters of Opposition	Notes
Industry			
Manufacturers			
Retailers and Consumers			

***Notes Key:**
1 - Submitted modified language
2 - Item not discussed
3 - No meeting held
4 - Not submitted on agenda
5 - No recommendation or not considered

Item under Consideration:

Table T.2. Accuracy Classes and Tolerances for Mass Flow Meters				
Accuracy Class	**Application or Commodity Being Measured**	**Acceptance Tolerance**	**Maintenance Tolerance**	**Special Tolerance**
. . .	. . .	. . .	. . .	. . .
2.0	- Compressed natural gas as a motor-fuel **- All other hydrocarbon gases and any other hydrocarbon gas/air mix applications not shown in the table**	1.5 %	2.0 %	2.0 %
. . .	. . .	. . .	. . .	. . .

NIST OWM Detailed Technical Analysis:

Prior to the NCWM amending the MFM Code in 1994 to introduce a new table format for tolerances, the code recognized maintenance and acceptance tolerances of 0.5 percent and 0.3 percent of the measured quantity for liquid-measuring devices and 2.0 percent and 1.0 percent for vapor-measuring devices, respectively.

The newly formatted table of tolerances did not include the hydrocarbon vapor products application which has been recognized and remains unchanged in Application Section paragraph A.2. Vapor (Gases) of the MFM Code since the code was first adopted in 1991.

This proposal is a housekeeping item that clarifies the original tolerances (i.e., 2.0 percent and 1.0 percent) intended to apply in the dynamic measurement of hydrocarbon (HC) vapor products which should have carried over from the original performance requirements in paragraph format into the table format introduced in 1994. Consistent with the practice for other metered products throughout the MFM Code, the proposal places the family of HC vapor products under an accuracy class designation (i.e., 2.0) which is required marking information specified in paragraph S.5.(e) Markings since January 1, 1995.

During the 2022 CWMA Annual Meeting industry questioned whether the proposed tolerances would apply to hydrogen mixed with compressed natural gas (CNG). The proposal is intended to address all other hydrocarbon gases and any other hydrocarbon gas/air mix applications envisioned by the developers of this code. The specific blend ratios and the application for the blended product was not stated. Compressed natural gas (CNG)/hydrogen (H2) blended products for vehicle fueling do exist although the applicable tolerances for CNG are 1.5 % and 2.0 %, and those for hydrogen gas (See HB 44 Section 3.39 Hydrogen Gas-Measuring Devices Code) are 5.0 % and 7.0 %, respectively for type evaluation/new equipment and equipment in use. At this time CNG and hydrogen fall into two different product categories. The hydrogen code is intended to apply to hydrogen gas with a hydrogen fuel index above 99.97 % so it appears the MFM Code would be the code that applies to CNG/hydrogen blends. This might be a case where at certain

CNG/hydrogen blend ratios (by mass) further examination of data on the meter's performance might be warranted.

Summary of Discussions and Actions:

NCWM 2022 Interim Meeting. Based on comments in support of this item heard during the open hearings, the Committee recommends this item move forward with voting status.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearings the following comments were heard:

Mr. Matt Douglas (California - DMS) : The language is clarifying. CA DMS supports this item.

Mr. Michael Keilty (Endress + Hauser) : states other gasses (hydrocarbon gasses). Solves issue with blended gasses. He supports this item.

The WWMA S&T Committee recommends that this item be assigned a Voting status. The Committee agrees that this item has merit and is fully developed.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing Mr. Keilty, Endress+Hauser, commented that this item is a simple language cleanup from NIST, and that he supports moving it forward as a Voting item. This committee recommends moving this item forward as a Voting item.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.

Ms. Juana Williams (NIST OWM) commented that this is a housekeeping item that adds clarification. Michael Keilty (Endress+Hauser Flowtec), Lou Sakin, (Hopkinton/Northbridge, MA) and Jim Willis (New York) agreed with and recommended Voting Status for this item.

The NEWMA Specifications and Tolerances Committee recommends that this item be moved forward with a Voting Status.

During the 2022 Annual Meeting Open Hearing comments were heard during the open hearing.

Ms. Tina Butcher (NIST OWM) commented that this is a housekeeping item. The intent of this item is to add reference to all hydrocarbon gasses and mixtures to the tolerance table as they were inadvertently omitted during previous updates to this section of the handbook.

After hearing comments from the floor, the committee considered the item to be fully developed and recommended that the item retains voting status.

NEWMA recommends this proposal as a Voting Item on the NCWM agenda.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the committee heard comments from the floor. Michael Keilty-Endress+Hauser Flow asked that item be moved to voting item.

CWMA S&T Committee recommends item move forward as a voting item.

During the 2022 Annual Meeting Open Hearing the following comments were heard during the open hearing session. Mr. Michael Keilty (Endress+Hauser) The proposed table T.2. mentions hydrogen. Hydrogen is a separate section. Would this apply to hydrogen mixed with CNG? Asked for explanation from NIST.

Ms. Lisa Warfield (NIST OWM) will provide clarification regarding the question about hydrogen mixing with CNG.

The CWMA S&T Committee recommends this moves forward as a voting item.

EVF – ELECTRIC VEHICLE FUELING SYSTEMS

EVF-21.1 D A.1. General

Source: ABB, BTCPower, Electrify America, Edison Electric Institute, EVConnect, EVgo, Greenlots, Rivian, Siemens, Tesla, Tritium

Purpose and Justification:
To provide clarity on how Handbook 44, Sec. 3.4 tentative code will apply to existing EVSE that are in the ground before it becomes effective by identifying which elements are non-retroactive.

OWM Executive Summary for EVF-21.1 – A.1. General

OWM Recommendation: OWM believes this item requires further development. Rather than proposing an exemption for all requirements in Section 3.40, OWM recommends the submitters propose modifications to specific requirements to provide for alternative means of compliance. OWM acknowledges the submitters have been diligently working with the NIST USNWG EVFE Subgroup to identify possible alternatives for the submitters to present to the community for review.

- The proposal, if adopted as written, would mean an entire generation of devices will be permitted to operate for a 10-year period without having to comply with any HB 44 Section 3.40 requirements for indications, receipts, accuracy, security for metrological features, specific code markings, etc. for what may well be the lifetime of the device.

- To allow such a blanket exemption does a disservice to the electric vehicle refueling industry and would be viewed as competitively unfair to traditional and other alternative vehicle fueling applications which are required to comply with similar requirements or EVSE manufacturers who are spending money to comply with current requirements.

- The submitter needs to consider that, even if an effective date is added to an entire device-specific code, Section 1.10 General Code requirements will still apply.

OWM Executive Summary for EVF-21.1 – A.1. General

- The submitters made alternate proposals available to the EVFE Subgroup in January 2022 and April 2022. These alternate proposals do not include any modifications to paragraph A.1. General as shown in the Item under Consideration.

- The EVFE Subgroup's discussions have been ongoing in their review of the submitters latest proposals which are intended to replace S&T Agenda Items EVF-21.1 and EVF-21.5. The EVFE has not reached a consensus on the submitters' latest proposals which were revised to address specific features such as the indicating element, identification/marking information, as well as general and type evaluation tolerances).

Table 3. Summary of Recommendations

EVF-21.1 A.1. General

	V	D	W	A	I	Notes*	Comments
Submitter		✓					See 9/28/20 industry presentation of the original proposal at WWMA. See also letters of 7/12/21 and 10/6/21 regarding proposed modifications to the original proposal.
OWM		✓					See also OWM's letter of 9/28/20 summarizing key points to consider.
WWMA			✓				
SWMA			✓				
NEWMA		✓					
CWMA		✓					
NCWM		✓					

	Letters of Support	Letters of Opposition	Notes
Industry	1		In addition to submitters' letters noted above.
Manufacturers			
Retailers and Consumers			

***Notes Key:**

1 – Submitted modified language
2 – Item not discussed
3 – No meeting held
4 – Not submitted on agenda
5 – No recommendation or not considered

Item under Consideration:

A.1. General – This code applies to devices, accessories, and systems used for the measurement of electricity dispensed in vehicle fuel applications wherein a quantity determination or statement of measure is used wholly or partially as a basis for sale or upon which a charge for service is based.

A.1.1. Effective Dates for DC EVSE – All DC EVSE used for commercial purposes and put into service on or before January 1, 2023 are exempt from this standard for a period of 10 years from the date put into service. comply

A.1.2. Effective Dates for AC EVSE – All AC EVSE used for commercial purposes and put into service on or before January 1, 2022 are exempt from this standard for a period of 10 years from the date put into service.

NIST OWM Detailed Technical Analysis:

As the weights and measures community continues to consider proposed new paragraphs A.1.1 and A.1.2 which would exempt EVSEs from all NIST HB 44 Section 3.40 requirements based on the dates these systems were placed into commercial use, NIST OWM would like to note the following concerns:

As worded the proposal is: (1) unclear on the exact type of use that entitles an EVSE to an exemption from all code requirements and also (2) in conflict with General Code paragraph G-A.6. Nonretroactive Requirements.

The proposal, if adopted, would mean an entire generation of devices will be permitted to operate for a 10-year period without having to comply with any HB 44 Section 3.40 requirements for indications, receipts, accuracy, security for metrological features, specific code markings, etc. for what may well be the lifetime of the device.

To allow such a blanket exemption does a disservice to the electric vehicle refueling industry and would be viewed as competitively unfair to traditional and other alternative vehicle fueling applications which are required to comply with similar requirements or EVSE manufacturers who are spending money to comply with current requirements.

The submitter needs to consider that, even if an effective date is added to an entire device-specific code, Section 1.10 General Code requirements will still apply.

For jurisdictions that don't automatically adopt the current version on NIST Handbook 44, this window of time during which noncompliant devices can continue to be installed will be even longer.

The USNWG EVF&S that developed the EVFSs Code and modified the Timing Device Code (to recognize EVSEs) has been widely advertised and all stakeholders (including EVFS OEMs) encouraged to join. Many companies have been an integral part of the development of these requirements and have expended considerable funds to bring their equipment into compliance at a competitive disadvantage if a large group of competing devices were to be exempted from the requirements.

The proposal describes the marketplace as having "existing stations that often do not include an integrated meter" which might be an indication that available EVSEs placed into commercial use before the enforcement date will have limited or no legal metrology components. In this case a notice is necessary for

consumers that purchasing electricity from one site does not provide the same assurance of accuracy that is provided at another site.

If there are concerns about specific provisions in the code, these need to be addressed by making specific sections "nonretroactive" with sunset dates, not by exempting the device from the requirements of the specific code in entirety. Factored into any enforcement dates should be the fact that the EVFS codes have been available for over six years (and was under development by regulators and industry for three years prior to that).

The submitters provided updates to the community in July 2021 about their work to revise the proposals in NCWM S&T Committee Agenda Items EVF-21.1 A.1. General and EVF-21.5 T.2. Load Test Tolerances. Their work was completed in early November 2021.

Throughout 2021 up through June 2022 NIST OWM has recommended the submitters revise their 2021 proposals to address concerns previously expressed by the USNWG EVF&S's EVFE Subgroup and weights and measures community prior to submission of any alternate proposals for a review of the EVFE Subgroup.

On November 20, 2021 NIST OWM provided input on the submitter's alternate proposal. This revised proposal modifies five NIST Handbook 44 Section 3.40 EVFS requirements (that address indicating elements, sealing, identification/marking, and tolerances). The submitters and NIST OWM met on December 7, 2021 to discuss NIST OWM's preliminary review and adjustments suggested for the alternate proposal. Subsequent revisions by the submitters of their alternate proposals were also made available to the EVFE Subgroup in January 2022 and April 2022. These alternate proposals do not include any modifications to paragraph A.1. General. The EVFE Subgroup's discussions have been ongoing in their review of the submitters latest proposals which are intended to replace S&T Agenda Items EVF-21.1 and EVF-21.5. The EVFE has not reached a consensus on the submitters' latest proposals.

Summary of Discussions and Actions:

NCWM 2022 Interim Meeting. The Committee maintained the developing status for this item. The Committee suggests the submitters take into consideration the comments provided during open hearings and prepare a revised draft proposal to NIST OWM, the EVFE Subgroup, etc. to provide a comprehensive proposal to the membership.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearing the following comments were heard:

Justin Wilson (ChargePoint): in the notes for 2021(Interim) there is an error: the notations are incorrect. They recommend withdrawal of this proposal. They think the flexibility should be provided to state officials.

Kevin Schnepp (California - DMS) : extended exemptions are not appropriate - this is still tentative. This should be withdrawn.

The WWMA S&T Committee recommends this item be withdrawn. The Committee makes this recommendation based on testimony heard during the open hearings and previous reports including recommendations from other Regions.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing, the Committee received no comments on this item. This Committee recommends this item be Withdrawn due to the item allowing a 10-year exemption.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open hearings the following comments were heard.

Francesca Wahl (Tesla) speaking on behalf of the submitters group of EVSE companies asked for further development as the submitters work with the national work group to develop language that will satisfy regulators in-regards to time frames of implementation dates. Mr. Alex Beaton from EVgo supported Francesca's comments and supports a development status.

Ms. Juana Williams (NIST OWM) commented in-regards to blanket exemptions that release devices from compliance for such an extended period-of-time seemed too long. (see NIST comments on NCWM website) The NEWMA Specifications and Tolerances Committee recommends that this item remain in Developing Status.

During the 2022 Annual Meeting Open Hearing Ms. Tina Butcher (NIST OWM) commented that this item was originally submitted by a group of manufacturers. The item went to EV-USNWG, received feedback and the submitters have been working to address comments from national and regional levels. Mr. Beaton commented as one of the submitters. He indicated that the submitters heard feedback from regulators regarding the originally proposed 10-year exemption for EV meters and has modified the proposal. For DC meters, the submitters are looking to propose that all meters manufactured prior to 2024 will be subject to 5 % accuracy tolerance and those manufactured after 2024 will be subject to a 1 % accuracy tolerance. Both percentages for accuracy have been supported by data. For AC meters, Mr. Beaton indicated that prior changes to the proposal have been removed as the submitters believe with calibration, all meters can meet current code. Mr. Beaton believes the updated proposal will be available prior to the 2022 Annual Meeting.

After hearing comments from the floor, the Committee recognized the need to further develop this item and recommended the item retain developing status. The Committee suggested that the submitters continue to work with regulatory stakeholders and share data in order to further the development of the item and urges the timely submission of proposals for the Committee to review prior to annual and interim meetings. NEWMA recommends this proposal as a Developing Item on the NCWM agenda.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the Committee heard comments from the floor. Tina Butcher-NIST has not seen a revised proposal from the submitters. Submitters recommend item stay developing.

CWMA S&T Committee recommends the item stay developing.

During the 2022 Annual Meeting Open Hearings, Ms. Francesca Wahl (Tesl) working with NIST EVFE Subgroup to revamp the proposal and focusing on DC. Wants to remain development status. Supports current HB44 3.40 tentative code acceptance in the very near future.

The CWMA S&T Committee recommends this item remain as a developing item per the request of the submitter.

CWMA recommends this proposal as a Developing Item on the NCWM agenda.

EVF-20.1 V S.1.3.2. EVSE Value of the Smallest Unit.

Source: NIST Office of Weights and Measures

Purpose and Justification:
Specify the maximum permissible value of the indicated and/or recorded electrical energy unit by an EVSE. Establish a value for the energy unit of measurement (kilowatt-hour) that is suitable for all commercial transactions and does not significantly lengthen the time (by a factor of 25) to conduct a test of an EVSE.

OWM Executive Summary for EVF-20.1 – S.1.3.2. EVSE Value of the Smallest Unit.

OWM Recommendation: OWM believes the USNWG EVFE Subgoup's "Option 3" alternative to the Item under Consideration as outlined in this analysis provides for a more appropriate resolution for AC and DC systems and will help lessen rounding errors and confusion about the transaction.

- Based on findings over the past six years on the actual power capacity ranges EVSEs operate at and other standard practices in fueling EVs the EVFE Subgroups has deliberated to arrive at an alternate proposal to replace the current Item under Consideration in EVF-20.1.

- At minimum the May-June 2022 EVFE Subgroup's proposed modifications that further refine paragraph S.1.3.2. EVSE Value of Smallest Unit should be adopted in July 2022. The Committee is also requested to consider proposed modifications to seven additional paragraphs for inclusion in EVF-20.1.

- These latest proposed modifications to paragraph S.1.3.2. are similar to a suggested alternative proposal the NCWM S&T Committee reviewed in January 2022. This alternate rework of paragraph S.1.3.2. more appropriately recognizes the differences in AC and DC systems such as power levels.

    - The EVFE Subgroup's alternate reworked proposal (OPTION 3 below) includes a higher resolution for the AC system's displayed kWh (0.0001) but maintains the current handbook kWh (0.001) display resolution for a DC system;

    - further refines requirements for the expression of the kWh (as a value of 1) to lessen rounding errors and confusion about the transaction; and

    - The U.S. standard will follow the SI practice of recognizing only the kWh for electrical energy in EV charging, so the megajoule will be no longer recognized in the EVFS Tentative Code.

- NIST OWM concurs with the EVFE SG's findings and its rework of paragraph S.1.3.2. EVSE Value of Smallest Unit (OPTION 3 below) and seven additional EVFS - Tentative Code requirements.

OWM Executive Summary for EVF-20.1 – S.1.3.2. EVSE Value of the Smallest Unit.

NIST OWM supports the EVFE SG proposed modifications to paragraphs: S.1.3.1. EVSE Units of Measurement; S.2.5.1. Money-Value Divisions Digital; S.8. Minimum Measured Quantity (MMQ); and removing unwarranted paragraphs N.1. No Load Test; N.2. Starting Load Test; T.5. No Load Test; and T.6. Starting Load.

- These latest proposed modifications to paragraph S.1.3.2. are similar to a suggested alternate proposal the NCWM S&T Committee reviewed in January 2022. This January version of paragraph S.1.3.2. was a preview of a requirement that more appropriately recognized the differences in AC and DC systems such as power levels. The EVFE Subgroup's alternate reworked proposal (OPTION 3 below) includes a higher resolution for the AC system's displayed kWh but maintains the current handbook kWh display resolution for DC system and further refines requirements for the expression of the kWh to lessen rounding errors and confusion about the transaction.

Table 3. Summary of Recommendations

EVF-20.1 S.1.3.2. EVSE Value of Smallest Unit.

	V	D	W	A	I	Notes*	Comments
Submitter	✓					1	Developed May 2022 by the USNWG's EVFE SG
OWM	✓					1	Developed May 2022 by the USNWG's EVFE SG. Note OWM's recommendations in its letter of 9/28/20 have changed for this item EVF-20.1.
WWMA	✓						
SWMA	✓						
NEWMA	✓						
CWMA	✓						
NCWM	✓						

	Letters of Support	Letters of Opposition	Notes
Industry			
Manufacturers			
Retailers and Consumers			

***Notes Key:**
1 - Submitted modified language
2 - Item not discussed
3 - No meeting held
4 - Not submitted on agenda
5 - No recommendation or not considered

Item under Consideration:

S.1.3.2. EVSE Value of Smallest Unit. – The value of the smallest unit of indicated delivery by an EVSE, and recorded delivery if the EVSE is equipped to record**~~, shall be 0.005 MJ or 0.001 kWh.~~:**

(a) for AC and DC systems shall not exceed 0.0005 MJ or 0.0001 kWh; and

(b) the value in electrical energy units in terms of:

(1) the megajoule (MJ) shall be expressed as a decimal multiple or submultiple of 5; or

(2) the kilowatt hour (kWh) shall be expressed as a decimal multiple or submultiple of 1.

(Amended 2022)

NIST OWM Detailed Technical Analysis:

In 2020 NIST OWM went forward with the proposed value (i.e., 0.0005 MJ [0.0001 kWh]) because during the 2014 USNWG EVF&S deliberations on the draft code, industry representatives indicated that the size or value of the electrical energy smallest unit of measurement could be inexpensively modified and to align U.S. EVSE design requirements with the EVSE code about to be adopted by California.

NIST OWM notes that the USNWG's EVF&S Electric Vehicle Fueling Equipment Subgroup did not reach a consensus on the proposed or alternate language for this agenda item. On July 7, 2020, the subgroup assigned the proposal to a new subcommittee chaired by Dr. William Hardy to fully address the effect of the EVSE's display resolution and MMQ size on the testing time for AC and DC systems. The proposal is still in subcommittee. Chair Hardy has made several preliminary modifications to paragraph S.1.3.2. The EVFE Subgroup requested input from all sectors (OEMs, Regulators, Consumer Associations, Operators) on their perspective from an ease of testing standpoint, transparency, and for easy comparison to other traditional and alternative vehicle fueling applications, what should the maximum or fixed increment size be for sales of electrical energy vehicle fuel (in the XXXX.X kWh)? Beyond California advocating a higher resolution and New York finding the current increment size as workable no further input has been received. By close of 2021 no weights and measures laboratory/agency has conducted testing on DC systems due to the availability of test apparatus.

NIST OWM recognizes the proposal's status has remained developing throughout 2020-2021 but notes that California adopted and is now enforcing its permanent EVFS Code that requires the smallest unit of electrical energy indicated and recorded be in higher resolution increments either equivalent to but not greater than 0.0001 kWh. As of December 2021, California has issued certificates of type approval to eleven models of EVFSs, eight for systems designed with a 0.0001 kWh and three with a 0.000001 kWh electrical energy unit of measurement. OEMs seeking NTEP and California type approval must design a system that has a fixed 0.001 kWh increment and for systems in commercial use in California the value of that measurement unit shall not exceed 0.0001 kWh, respectively.

Other NIST Handbook 44 measuring devices' codes specify the value of the unit permitted for the display and indication of a delivered or dispensed quantity. In all cases that value shall not be exceeded (i.e., prescribes a maximum numerical value where a lesser value is also permissible) and is suitable for each device-specific application.

After its July 2021 reevaluation of the proposed modifications to this EVSE provision in paragraph S.1.3.2, NIST OWM is renewing its support for the proposal that currently appears in EVF 20.1 Item under

Consideration. In that same spirit NIST OWM also has developed an additional recommendation, a proposed new subparagraph S.1.3.2, which is consistent with the language in other code sections' corresponding requirements which prescribe specific values for indicating units. The newly proposed paragraph is a better option for addressing OWM's earlier concerns about value comparisons and clarity of electrical energy sales when computing and rounding transaction information if an EVSE were ever designed with an electrical energy unit value expressed as 3, 7, or 9. Also now in question would be the expression of the unit in any other numerical value that might introduce questions about rounding calculations and the transparency of the transaction. NIST OWM recommends the community reconsider the original proposed modifications of paragraph S.1.3.2 which does not limit the electrical energy unit to being expressed only as a single fixed numerical value but permits a manufacturer to design a display that measures in a numerical value of 0.0005 MJ or 0.0001 kWh or some other numerical value as long as the chosen value does not exceed those MJ or kWh maximum values specified in paragraph S.1.3.2. Whatever, the quantity unit value it would remain unchangeable during the commercial use of the system or dispenser. Also, the test apparatus' display resolution must be suitable and does not use up the allow error for the EVSE under test. The current proposal does not specify a different value for the smallest display unit for DC systems. However, the USNWG EVFE Subgroup's Technical Advisor was advised that the current required value of 0.001 kWh might be more suitable for DC systems. NIST OWM has revised its earlier proposal and recommends an alternate paragraph S.1.3.2 to include two new subparagraphs that requires the EVSE's smallest value indicated or recorded be the equivalent of and shall not exceed 0.0005 MJ (0.0001 kWh) and specify the permissible electrical energy unit value shall only be expressed as either decimal multiples or submultiples of the number 1 when the unit of measurement is the kWh and 5 when the unit of measurement is the MJ as shown below in:

OPTION 1

> **S.1.3.2. EVSE Value of Smallest Unit. –** The value of the smallest unit of indicated delivery by an EVSE, and recorded delivery if the EVSE is equipped to record**~~, shall be 0.005 MJ or 0.001 kWh.~~:**
>
> **(a) for AC and DC systems shall not exceed 0.0005 MJ or 0.0001 kWh; and**
>
> **(b) the value in electrical energy units in terms of:**
>
> > **(1) the megajoule (MJ) shall be expressed as a decimal multiple or submultiple of 5; or**
> >
> > **(2) the kilowatt hour (kWh) shall be expressed as a decimal multiple or submultiple of 1.**

It should be noted that all four regional associations in fall 2021 supported the Item under Consideration as a Voting item. NIST OWM anticipates the upcoming availability of test data on DC systems may demonstrate that further modifications may be necessary to adequately address DC systems in the code. This may result in modifications to paragraph S.1.3.2 to read in:

OPTION 2

> **S.1.3.2. EVSE Value of Smallest Unit. –** The value of the smallest unit of indicated delivery by an EVSE, and recorded delivery if the EVSE is equipped to record**~~, shall be 0.005 MJ or 0.001 kWh.~~:**
>
> **(a) for AC systems shall not exceed 0.0005 MJ or 0.0001 kWh;**

(b) for DC systems shall not exceed 0.005 MJ or 0.001 kWh; and

(c) the value in electrical energy units in terms of:

(1) the megajoule (MJ) shall be expressed as a decimal multiple or submultiple of 5; or

(2) the kilowatt hour (kWh) shall be expressed as a decimal multiple or submultiple of 1.

NIST OWM supports the May-June 2022 USNWG EVFE Subgroup's alternate proposal shown below that is a rework of EVF-20.1. The USNWG EVF&S's Electric Vehicle Fueling Equipment (EVFE) Subgroup submits the following recommendations for further modification of S&T Committee Agenda Item EVF-20.1, a proposal to modify NIST Handbook 44 Section 3.40 Electric Vehicle Fueling Systems Code paragraph S.1.3.2. EVSE Value of Smallest Unit. The EVFE Subgroup recommends all eight paragraphs shown below move forward for adoption in July 2022 under EVF-20.1. The recommendation is the result of six years of testing and consultations with manufacturers, laboratory evaluators, and officials testing EVSEs. At minimum the EVFE Subgroup proposes its recommended modifications to paragraph S.1.3.2. should be adopted in July 2022 because the AC systems' requirements for a display unit value not greater than 0.0001 kWh are aligned with the national proposal and due to the power levels for DC systems the EVFE Subgroup recommends keeping the value of the kWh unit as it currently appears in the NIST HB 44 design requirement (0.001 kWh or smaller), which is more appropriate. The EVFE Subgroup's recommendation for no change to the value of the DC EVSE smallest display unit is actually less of a change for DC systems than the amendment for DC systems the S&T Committee currently recommends. The 0.0001 kWh resolution for AC EVSE is necessary to conduct testing to determine compliance with accuracy requirements in minimal time. The current resolution of 0.001 kWh required for AC systems would result in 25 % of the EVSE tests being incorrectly evaluated on a pass/fail basis. The EVFE Subgroup also recommends removing all reference in the code to the megajoule (MJ) since this unit of measurement is not recognized for electrical energy in the SI system.

OPTION 3 (May 2022 EVFE Subgroup's rework of paragraph S.1.3.2.)

S.1.3. EVSE Units.

S.1.3.2. EVSE Value of Smallest Unit. **–** The value of the smallest unit of indicated delivery by an EVSE, and recorded delivery if the EVSE is equipped to record**~~, shall be 0.005 MJ or 0.001 kWh.~~:**

(a) for AC systems shall not exceed 0.0001 kWh;

(b) for DC systems shall not exceed 0.001 kWh; and

(c) the value of the kWh shall be expressed only as a decimal submultiple of 1 that satisfy (a) and (b).

(Amended 202X)

The EVFE Subgroup developed recommendations for also modifying the following paragraph and definition to eliminate the use of the megajoule unit of measurement:

S.1.3.1. EVSE Units of Measurement. – EVSE units used to charge electric vehicles shall be indicated and recorded in ~~**megajoules (MJ) or**~~ kilowatt-hours (kWh) and decimal subdivisions thereof.

(Amended 202X)

~~megajoule (MJ). **An SI unit of energy equal to 1 000 000 joules (J). [3.40]**~~

The computed total price for the sale of electrical energy shall be based on an EVSE using a quantity interval that does *not* exceed 0.01 kWh, rather than the interval of 0.1 kWh currently required, and not indicate in units of the megajoule. Consequently, the EVFE Subgroup proposes modifying the quantity value and also recommends removing the megajoule unit of measurement from paragraph S.2.5.1. Money-Value Divisions Digital as shown below:

S.2.5.1. Money-Value Divisions Digital. – An EVSE with digital indications shall comply with the requirements of paragraph G-S.5.5. Money-Values, Mathematical Agreement, and the total price computation shall be based on quantities not exceeding ~~**0.5 MJ or**~~ 0.**0**1 kWh.

(Amended 202X)

The EVFE Subgroup recommends modifying paragraph S.8. Minimum Measured Quantity (MMQ) to recognize an MMQ of 0.1 kWh which is very common among EVSE that have already been type approved. For ANSI C12 compliant meters meter constants of 0.001 kWh are common. In these meters the meter is expected to be fully accurate at deliveries of only a single watthour (i.e., 0.001 kWh). Dispensing a larger amount of energy to determine accuracy is not needed. Additionally, the EVFE Subgroup recommends paragraph S.8 specify an MMQ not to exceed 1.0 kWh as a more appropriate quantity for DC systems and include a new note to encourage a smaller MMQ for EVSEs which in the case of AC systems will result in a shorter time to conduct a test by a factor of five. This proposed modification of paragraph S.8 also resolves the lengthy time required to conduct a proper test of the system; a concern in 2020 that prompted work to modify code requirements that affected the duration of the tests.

S.8. Minimum Measured Quantity (MMQ). – The minimum measured quantity shall satisfy the conditions of use of the measuring system as follows:

(a) Measuring systems shall have a minimum measured quantity not exceeding ~~**2.5 MJ or:**~~

(1) 0.5 kWh for AC EVSE; and

(2) 1.0 kWh for DC EVSE.

Note: To minimize the duration of required testing, manufacturers may want to consider limiting the declared MMQ to the level of 0.1 kWh for AC EVSE.

(Amended 202X)

The EVFE Subgroup also recommends removing the No Load Test and Starting Load Test notes and their corresponding tolerances from the code requirements because these conditions are never encountered by a customer. An EVSE never operates at no load for any significant time. The Starting Load Test should not be required because the EVSE never operates at 0.5A. Consequently, also modify the relevant handbook requirements as follows:

~~N.1. No Load Test. – **A no load test may be conducted on an EVSE measuring system by applying rated voltage to the system under test and no load applied.**~~

~~T.5. No Load Test. – **An EVSE measuring system shall not register when no load is applied.**~~

~~N.2. Starting Load Test. – **A system starting load test may be conducted by applying rated voltage and 0.5-ampere load.**~~

~~T.6. Starting Load. – **An EVSE measuring system shall register a starting load test at a 0.5 ampere (A) load.**~~

Renumber paragraph N.3. Minimum Test Draft (Size) through N.6. Repeatability Tests to become N.1. through N.4., respectively.

Summary of Discussions and Actions:

NCWM 2022 Interim Meeting. The Committee has considered the three options provided by the submitter, NIST OWM. Proposal 1, as it appears in Publication 15 and the two alternative proposals published in NIST OWM's written analysis. The Committee has considered the three proposals and has agreed the item is fully developed and is supported by current AC EVSEs in commercial use. The Committee understands there may be more data available at the time of vote providing additional information on the value of the smallest unit in DC EVSE systems. The Committee agreed with recommendations that Proposal 1, which appeared in the Item under Consideration in the January 2022 S&T Agenda and shown below, should be further modified to clarify the permissible numerical values for expressing the unit of measurement (i.e., MJ or kWh):

S.1.3. EVSE Units.

S.1.3.2. EVSE Value of Smallest Unit. – The value of the smallest unit of indicated delivery by an EVSE, and recorded delivery if the EVSE is equipped to record, shall **not** be **greater than** 0.00**0**5 MJ or 0.00**0**1 kWh**.**

(Amended 2020)

Committee has assigned a voting status for the item as shown below at the 2022 Annual Meeting. This alternate proposal replaces Proposal 1 in the Item under Consideration to read as follows:

S.1.3.2. EVSE Value of Smallest Unit. – The value of the smallest unit of indicated delivery by an EVSE, and recorded delivery if the EVSE is equipped to record**~~, shall be 0.005 MJ or 0.001 kWh.~~:**

(a) for AC and DC systems shall not exceed 0.0005 MJ or 0.0001 kWh; and

(b) the value in electrical energy units in terms of:

(1) the megajoule (MJ) shall be expressed as a decimal multiple or submultiple of 5; or

(2) the kilowatt hour (kWh) shall be expressed as a decimal multiple or submultiple of 1.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearings the following comments were heard:

Kevin Schnepp (California - DMS) : Supports this item. This was adopted in California and helped in time of testing. It would be beneficial to all (less timely). In support.

Tina Butcher (NIST OWM) : Echoes what Kevin Schnepp indicated: the proposed change will align with California standards - no alternative suggestions have been made yet. Move to a vote to get in alignment.

The WWMA S&T Committee recommends that this item be assigned a Voting status. The Committee agrees that this item has merit and is fully developed.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing the committee received no comments on this item. This committee recommends the item move forward as a Voting item.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.

Mr. Jim Willis (New York) commented in-regards to the value of the smallest unit. NY has tested many charging stations that have a resolution to the thousands place and have not experienced any issues with this. The additional decimal place in New York's opinion is not needed and may place an unneeded requirement for some companies in the industry.

Ms. Juana Williams (NIST OWM) commented that the proposed change aligns the requirement with those already adopted and in use by the California Division of Measurement Standards. This alignment is needed to ensure consistency in inspection and testing of Electric Vehicle Fueling Systems in both type evaluation and field inspection and testing. NIST OWM notes that the NIST U.S. National Work Group has discussed the possibility that additional changes may be needed to this paragraph; however, no specific recommendations have been suggested to this point and do not appear to be imminent. Thus, to avoid inconsistencies noted above and delays in inspecting and testing this equipment, the Committee may wish to move this item forward for a vote.

Mr. Jim Willis (New York) commented that alignment with California is not a reason to change something that is working as intended. And that New York does not believe this change is necessary.

The NEWMA Specifications and Tolerances Committee recommends that this item move forward as a Voting item.

During the 2022 Annual Meeting open hearing Ms. Tina Butcher (NIST OWM) commented that the language in the handbook conflicts with what California DMS was applying in the field. The USNWG is still working on the proposal and may have additional changes by the Annual Meeting. Mr. James Cassidy (Massachusetts) commented that due diligence should be made to properly vet any changes to this proposal.

After hearing comments from the floor, the Committee agreed to recommend this item retain Voting status, however, urges the timely submission of proposals for committee to review prior to annual and interim meetings.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearings the committee heard comments from the floor. Diane Lee-NIST and Mrs. Tina Butcher (NIST OWM) recommend this item for Voting as it is in line with California.

CWMA S&T Committee recommends this item as a Voting item.

During the 2022 Annual Meeting Open Hearing no comments were heard from the floor. The CWMA S&T Committee recommends this moves forward as a voting item. CWMA recommends this proposal as a Voting Item on the NCWM agenda.

EVF-21.5 D T.2. Load Test Tolerances.

Source: ABB, BTCPower, Electrify America, Edison Electric Institute, EVConnect, EVgo, Greenlots, Rivian, Siemens, Tesla, Tritium

Purpose and Justification:
To create separate metering requirements for DC EVSE due to significant technology differences and challenges between AC and DC systems.

OWM Executive Summary for T.2. Load Test Tolerances

OWM Recommendation: OWM believes this item requires further development. OWM acknowledges the submitters have been diligently working with the NIST USNWG EVFE Subgroup to identify possible alternatives for the submitters to present to the community for review.

- The EVFE Subgroup's discussions have been ongoing in their review of alternate proposals reworked by the submitters for expanding tolerances to 5 % for DC charging equipment manufactured prior to a specific date and maintaining the 1 % acceptance and 2 % maintenance tolerances for equipment manufactured after that date.
    - Proposals discussed recommend these changes be accompanied by a new marking requirement for those devices not capable of meeting the 1 % acceptance and 2 % maintenance tolerances to alert consumers of the difference in performance levels.
- The EVFE Subgroup was balloted June 17, 2022 on a proposed new 5 % tolerance for DC EVSEs installed prior to 2024 and a corresponding new requirement for marking the accuracy of pre-2024 equipment.
    - The results of this ballot will be provided to the submitters to enable them to assess how and if to modify their original proposal to the S&T Committee.
- OWM notes that a sunset date (retroactive enforcement date) ending a dual tolerance structure would encourage uniformity in equipment performance in the marketplace; facilitate value comparisons by consumers; and phase out less accurate equipment.

OWM Executive Summary for T.2. Load Test Tolerances

- According to information provided to the USNWG by the submitters, not all DC chargers (including those manufactured in recent years) manufactured prior to 2024 can be readily or inexpensively upgraded to meet the existing (1 % and 2 %) tolerances.
  - Of the DC chargers manufactured prior to 2024, including those manufactured in recent years, some are capable of being upgraded to meet the existing (1 % and 2 % tolerances) and some are not.
  - Of those DC chargers that can be upgraded, the cost for such upgrades can vary across a rather wide spectrum.
  - While some estimates of impact have been provided, the details seem to represent the broad spectrum of capabilities and cost, making it difficult to assess the impact on manufacturers, businesses, and consumers as a whole.
  - Details regarding the percentage of equipment that falls into these categories would be helpful to the community in assessing the need for a sunset date and, if a sunset date is deemed appropriate, what represents a reasonable time frame for phasing out the less accurate equipment.
  - Information has also been provided to suggest that newer DC devices being manufactured (including those manufactured today) are more robust than older equipment, extending the lifespan beyond that originally reported in past discussions.

Table 3. Summary of Recommendations

EVF-21.5 D T.2. Load Test Tolerances.

	V	D	W	A	I	Notes*	Comments
Submitter		✓					See also letters of 7/12/21 and 10/6/21 regarding proposed modifications to the original proposal.
OWM		✓					See also OWM's letter of 9/28/20 summarizing key points to consider.
WWMA			✓				
SWMA			✓				
NEWMA		✓					
CWMA		✓					
NCWM		✓					

	Letters of Support	Letters of Opposition	Notes
Industry	1		In addition to submitters' letters noted above.
Manufacturers			
Retailers and Consumers			

Table 3. Summary of Recommendations							
EVF-21.5 D T.2. Load Test Tolerances.							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**

***Notes Key:**
1 - Submitted modified language
2 - Item not discussed
3 - No meeting held
4 - Not submitted on agenda
5 - No recommendation or not considered

Item under Consideration:

T.2. Load Test Tolerances.

T.2.1. AC EVSE Load Test Tolerances. – The tolerances for **AC** EVSE load tests are:

(a) Acceptance Tolerance: 1.0 %; and

(b) Maintenance Tolerance: 2.0 %.

T.2.2. DC EVSE Load Test Tolerances. – The tolerances for DC EVSE load tests:

(a) Devices installed prior to January 1, 2033

i. Acceptance Tolerance: 2.5 %; and

ii. Maintenance Tolerance: 5.0 %

(b) Devices installed January 1, 2033 or later

i. Acceptance Tolerance: 1.0 %; and

ii. Maintenance Tolerance: 2.0 %

NIST OWM Detailed Technical Analysis:

As the weights and measures community continues to consider proposed new paragraph T.2.2 which would widen the tolerances for DC systems "installed" prior to January 1, 2033, NIST OWM asks are there existing devices that can meet the current requirements? If there are, what are the justifications for proposing the relaxing of the tolerances, particularly without a sunset date (i.e., a retroactive date)?

From a technical perspective, OWM would be less reluctant to seeing the adoption of a phase-in date that includes an accompanying sunset date (i.e., a retroactive date). OWM asks what concrete issues can be cited by the submitters to counter any opposing arguments for a phase in period for DC systems? It would be important to have statistics on the population of devices not in compliance with requirements as discussion moves forward on this proposal.

This is not a typical practice to be done on an unlimited basis. This would be more palatable from both a competitive and enforcement standpoint if there are specific technical issues, that necessitate and justify relaxing tolerances on an industrywide basis. An additional concern is that companies are spending money to comply with the existing NIST HB section 3.40 tentative code yet are competing with a population of existing equipment. An additional question is: how big is that population exactly?

NIST OWM also would ask how many devices are out there that would be put into use and competing with AC devices, thus creating a competitive advantage for DC devices?

There will be concerns about a dual tolerance structure since the original proposal didn't include a corresponding marking or some other type of information requirement to alert consumers that purchasing electricity from one fueling device does not provide the same accuracy assurance as it does from another fueling device. Bottom line multiple tolerance tiers frustrate value comparisons. There is not a lot of data being made available on the accuracy of DC devices. Comments from the EVFE Subgroup representatives from industry and national laboratory indicate the current 1 % acceptance and 2 % maintenance tolerances are achievable by existing DC systems. NIST OWM was made aware in June 2022 that at least one jurisdiction is in possession of a DC standard that has traceability. Several EVFE Subgroup members indicate there is a confidentiality issue that prevents release of any data.

Throughout 2021 up through mid-2022 NIST OWM has recommended the submitters revise their 2021 proposals to address concerns previously expressed by the USNWG EVF&S's EVFE Subgroup and weights and measures community prior to submission of any alternate proposals for a review of the EVFE Subgroup.

The submitters provided updates to the community in July 2021 about their work to revise the proposals in NCWM S&T Committee Agenda Items EVF-21.1 A.1. General and EVF-21.5 T.2. Load Test Tolerances. Their work was completed in early November 2021.

On November 20, 2021, NIST OWM provided input on the submitter's alternate proposal. This revised proposal modifies five NIST Handbook 44 Section 3.40 EVFS requirements (that address indicating elements, sealing, identification/marking, and tolerances). The submitters and NIST OWM met on December 7, 2021 to discuss NIST OWM's preliminary review and adjustments suggested for the alternate proposal. Subsequent revisions by the submitters of their alternate proposals were also made available to the EVFE Subgroup in January 2022 and April 2022. The EVFE Subgroup's discussions have been ongoing in their review of the submitters proposals for expanding tolerances to 5 % for older equipment in commercial operation and EVSE marking requirements if a dual tier tolerance structure exists. The EVFE Subgroup was balloted June 17, 2022 on a proposed new 5 % tolerance for DC EVSEs installed prior to 2024 and a corresponding new requirement for marking the accuracy of pre-2024 equipment.

Summary of Discussions and Actions:

NCWM 2022 Interim Meeting. During the Committee work session this item was assigned Developing status. The Committee suggests the submitters take into consideration the comments provided during open hearings. The Committee recommends the submitters work with NIST OWM on the final draft of their 2022 alternate proposal for review and comments.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearing the following comments were heard:

Mr. Kevin Schnepp (California - DMS): this was adopted in California Regulation. Just this past week (September 23rd 2021) a complete analysis was done and clearly identified that they can meet the 1% tolerance. Recommends to be withdrawn.

Mr. Justin Wilson (ChargePoint) : Recommend to be withdrawn - equipment can meet tolerance as is

Mr. Keith Bradley (Electrify America): There are two questions: 1 - can devices in near term meet the tolerance? They are concerned with: when did this become possible? They are continuing to work on this. They are not urging changes to this item - they are working on it. Wants to leave it in developing status - more work to be done.

Mr. Kurt Floren (Los Angeles County): when equipment is out there that is meeting the standards, this is not the time to roll back.

The WWMA S&T Committee recommends this item be Withdrawn. The Committee makes this recommendation based on testimony heard during the open hearings and previous reports including recommendations from other Regions.

Southern Weights and Measures Association

At the 2021 SWMA Open Hearing the committee received no comments on this item.

This Committee recommends this item be Withdrawn because we believe that current tolerances are attainable.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting open hearings, the following comments were heard.

Ms. Francesca Wahl (Tesla) representing the submitting group commented and was supported by Mr. Alex Beaton (EV GO) in-regards to a study and follow up WebEx meeting from Argonne National Lab. In-order to follow up on this study, the submitters are asking for a developing status.

Ms. Juana Williams (NIST OWM) commented below and comments can also be found on the NCWM website.

1. NIST OWM asks if there are existing devices that can meet the current requirements? If there are, what are the justifications for proposing the relaxing of the tolerances, particularly without a sunset date (i.e., a retroactive date)?

2. From a technical perspective, OWM would be less reluctant to seeing the adoption of a phase-in date that includes an accompanying sunset date (i.e., a retroactive date). OWM asks what concrete issues can be cited by the submitters to counter any opposing arguments for a phase in period for DC systems? It would be important to have statistics on the population of devices not in compliance with requirements as discussion moves forward on this proposal.

3. This is not a typical practice to be done on an unlimited basis. This would be more palatable from both a competitive and enforcement standpoint if there are specific technical issues, that necessitate and justify relaxing tolerances on an industrywide basis. An additional concern is that companies are spending money to comply with the existing NIST HB section 3.40 tentative code yet are competing with a population of existing equipment.

4. NIST OWM also would ask how many devices are out there that would be put into use and competing with AC devices, thus creating a competitive advantage for DC devices?

5. There will be concerns about a dual tolerance structure since the proposal doesn't include a corresponding marking or some other type of information requirement to alert consumers that purchasing electricity from one fueling device does not provide the same accuracy assurance as it does from another fueling device. Bottom line multiple tolerance tiers frustrate value comparisons.

NEWMA recommended this as a Developing Item on the NCWM agenda.

During its 2022 Annual Meeting Open Hearing NEWMA heard from:

Mrs. Tina Butcher (NIST OWM) commented that this item was originally submitted by a group of manufacturers. The item went to EV-USNWG, received feedback and the submitters have been working to address comments from national and regional levels.

Mr. Alex Beaton (EVgo) commented as one of the submitters. He indicated that the submitters heard feedback from regulators regarding the originally proposed 10-year exemption for EV meters and has modified the proposal. For DC meters, the submitters are looking to propose that all meters manufactured prior to 2024 will be subject to 5 % accuracy tolerance and those manufactured after 2024 will be subject to a 1 % accuracy tolerance. Both percentages for accuracy have been supported by data. For AC meters, Mr. Beaton indicated that prior changes to the proposal have been removed as the submitters believe with calibration, all meters can meet current code. Mr. Beaton believes the updated proposal will be available prior to the 2022 Annual Meeting.

After hearing comments from the floor, the Committee recognized the need to further develop this item and recommended the item retain developing status. The Committee suggested that the submitters to continue to work with regulatory stakeholders and share data in order to further the development of the item and urges the timely submission of proposals for committee to review prior to annual and interim meetings.

NEWMA recommends this proposal as a Developing Item on the NCWM agenda.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the committee heard comments from the floor. Diane Lee-NIST noted that there were comments regarding this item on the NCWM website.

CWMA S&T Committee recommends this item be withdrawn.

During its 2022 Annual Meeting Open Hearing, the CWMA heard from:

Mr. Keith Bradley (Electrify America) Thanks to NIST for forming the work group. Industry has worked hard to determine compliance for existing devices. DC fast chargers already installed will have a larger retroactive tolerance. Recommended to remain as developing.

Ms. Francesca Wahl (Tesla) Minor modifications outside of tolerances will still be needed in order for manufacturers to comply with changes to devices already in commercial use.

Mr. Charlie Stutesman (Kansas) HB 44 3.40 tentative code has been in place for 7 years. It needs to become active and enforceable.

The CWMA S&T Committee recommends this item remain as a developing item per the request of the submitter.

The CWMA recommends the proposal as a Developing Item on the NCWM agenda.

TXI – TAXIMETERS

TXI-22.1 V Table S.5. Categories of Device and Methods of Sealing

Source: NIST Office of Weights and Measures

Purpose and Justification:
To provide additional electronic means of sealing for taximeters and eliminate confusion regarding the use of the term "electronic link" in that HB 44 Code.

OWM Executive Summary for TXI-22.1 – Table S.5. Categories of Device and Methods of Sealing
OWM Recommendation: OWM believes this item is fully developed and ready for a vote. This change will provide the specificity needed for audit trail criteria for taximeters and will allow this method of security for these devices. • The proposal recognizes other approved means of security, an audit trail for electronically securing taximeter sealable parameters given the limited size of the taximeter and multiple options for electronically adjustable taximeter components. Use of an "electronic link" has been recognized since 2000 and remains a means to ensure the taximeter in operation is calibrated to the vehicle. Paragraph S.5.2. Taximeters Calibrated to Specific Vehicles adequately addresses the requirement for this security feature and does not need to remain in Table S.5.

Table 3. Summary of Recommendations							
TXI-22.1 Table S.5. Categories of Device and Methods of Sealing							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**
Submitter	✓						
OWM	✓						
WWMA	✓						
SWMA	✓						

Table 3. Summary of Recommendations							
TXI-22.1	**Table S.5. Categories of Device and Methods of Sealing**						
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**
NEWMA	✓						
CWMA	✓						
NCWM	✓						

	Letters of Support	**Letters of Opposition**	**Notes**
Industry			
Manufacturers			
Retailers and Consumers			

***Notes Key:**
1 - Submitted modified language
2 - Item not discussed
3 - No meeting held
4 - Not submitted on agenda
5 - No recommendation or not considered

Item under Consideration:

Table S.5. *Categories of Device and Methods of Sealing*	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or* ***<u>two event counters: one for calibration parameters and one for configuration parameters.</u>*** ~~***, for components that may be removed from the vehicle, a combination of physical seals and a physical or electronic link as described in S.5.2. Taximeters Calibrated to Specific Vehicles.***~~

[Nonretroactive as of January 1, 2018]

(<u>Table</u> Added 2017**) <u>(Amended 2022)</u>**

NIST OWM Detailed Technical Analysis:

The current NIST HB 44 Section 5.54 Taximeters Code Table S.5. Method of Sealing Category 1 taximeters recognizes only a physical seal or electronic link as a means for securing a taximeter's metrological parameters. Other approved means of security such as the audit trail is appropriate for securing taximeter sealable parameters given the limited size and options for electronically adjustable taximeter components. This proposal modifies Category 1 sealing requirements to recognize the audit trail form of device security.

Since 2000 the use of an "electronic link" has been recognized as an alternative to a physical seal as a form of security for conditions of use where a taximeter is removed temporarily from service and more specifically from the vehicle it was calibrated to.

Requirements for the design and conditions of use for an "electronic link" are already adequately addressed in paragraph S.5.2. Taximeters Calibrated to Specific Vehicles and do not need to remain in Table S.5.

Summary of Discussions and Actions:

NCWM 2022 Interim Meeting. The Committee agrees the item as having merit and will align this code with other device codes. Based on no opposition and the submitter's request for a vote, the committee has assigned a voting status for this item at the 2022 Annual Meeting with the added three parenthetical dates: enforcement date, date of inclusion in the code, and the 2022 amendment.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearing the following comments were heard:

Tina Butcher (NIST OWM) : They put this forward: the recommended changes are just to clarify what is already in place for audit trails. This is to fill in the blanks for what is considered the minimum for audit trails. This specifies two event counters for the minimum form of an audit trail.

The WWMA S&T Committee recommends that this item be assigned a Voting status. The Committee agrees that this item has merit and is fully developed.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing, the SWMA S&T Committee heard no comments on this item.

The SWMA recommends this item move forward as a Voting item.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.

Ms. Juana Williams (NIST OWM) commented in support and feels the item is fully developed and ready for voting status.

Mr. Jim Willis (New York) and Mr. John McGuire (New Jersey) also supported moving this item forward with a voting status.

The NEWMA Specifications and Tolerances Committee recommends that this item be given a Voting Status.

During the 2022 Annual Meeting Open Hearing comments were heard from Ms. Tina Butcher (NIST OWM) that the goal of this item is to get specificity into the handbook regarding the minimum standards for event counter, electronic audit trails, and eliminate reference to prohibit it.

After hearing comments from the floor, the committee considered the item to be fully developed and recommended that the item retain voting status. CWMA recommends the proposal as a Voting Item on the NCWM agenda.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the committee heard comments from the floor. Tina Butcher-NIST recommends that this item move forward to voting. California has this in type evaluation now.

CWMA S&T Committee recommends this item move forward as a voting item.

During the 2022 Annual Meeting Open Hearing no comments were heard from the floor.

The CWMA S&T Committee recommends this moves forward as a voting item. CWMA recommends the proposal as a Voting Item on the NCWM agenda.

GMA – GRAIN MOISTURE METERS 5.56 (A)

GMA-19.1 D Table T.2.1. Acceptance and Maintenance Tolerances Air Oven Method <u>for All Grains and Oil Seeds.</u>

Source: NTEP Grain Analyzer Sector

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

OWM Executive Summary for GMA-19.1 – Table T.2.1. Acceptance and Maintenance Tolerances Air Oven Method for All Grains and Oil Seeds.

OWM Recommendation: NIST OWM support the collection of data to verify that the proposed reduction in tolerances is appropriate for all grains.

- During the NTEP Grain Analyzer (GA) Sector 2019 meeting, the Sector reviewed data from Arkansas for Long Grain Rough Rice (LGRR) and other grains. The data showed that the proposal to tighten the acceptance and maintenance tolerance may not be appropriate for all grain types. The original data presented and used as a basis for the proposal applied to corn and soybeans. After reviewing the data, the Sector decided to collect inspection data from across the country. An industry representative offered to assist with data analysis and along with the NIST representative will work in producing the inspection data needed for the analysis. A request for State participation will be sent to State weight and measures. The Sector requests that this remain a developing item as they move forward in evaluating additional data.

- North Carolina submitted the requested grain data for review.

- Additional data is expected from other States participating in the grain data submission.

Table 3. Summary of Recommendations

Item GMA-19.1–D–Table T.2.1. Acceptance and Maintenance Tolerances Air Oven Method <u>for All Grains and Oil Seeds.</u>

	V	D	W	A	I	Notes*	Comments
Submitter		✓					
OWM		✓					
WWMA		✓					
SWMA		✓					
NEWMA		✓					
CWMA	✓						
NCWM		✓					

	Letters of Support	Letters of Opposition	Notes
Industry			
Manufacturers			
Retailers and Consumers			

***Notes Key:**
1 - Submitted modified language
2 - Item not discussed
3 - No meeting held
4 - Not submitted on agenda
5 - No recommendation or not considered

Item under Consideration:

Amend 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**)

NIST OWM Detailed Technical Analysis:

During the NTEP Grain Analyzer (GA) Sector 2019 meeting, the Sector reviewed data from Arkansas for Long Grain Rough Rice (LGRR) and other grains. The data showed that the proposal to tighten the acceptance and maintenance tolerance may not be appropriate for all grain types. The original data presented and used as a basis for the proposal applied to corn and soybeans. After reviewing the data, the Sector decided to collect inspection data from across the country. An industry representative offered to assist with data analysis and along with the NIST representative will work in producing the inspection data needed for the analysis. A request for State participation will be sent to State weight and measures. The Sector requests that this remain a developing item as they move forward in evaluating additional data.

At the 2020 Interim Meeting the S&T Committee agreed to retain this item as developing in anticipation of additional data that is being collected to assess the proposed tolerances and the appropriateness of the change to tolerances for other grain types. The NIST Technical Advisor is working with the Grain Analyzer Sector and States to collect additional data on the proposed changes to the tolerances with plans to present data at the next NTEP GA Sector Meeting in August 2021. NIST OWM agrees with the S&T Committee that this item should be given a developing status until additional data is examined.

Ms. Diane Lee (NIST) is working with the Sector to collect data on Unified Grain Moisture Algorithm (UGMA) grain moisture meters and non-UGMA grain moisture meters North Carolina, Arizona, Illinois, and Iowa agreed to provide 2017-2019 inspection data on field meters. The participating States were requested to submit data by December 1, 2021. One state will be unable to participate and North Carolina has submitted their data.

History
The GA Sector originally forwarded this proposal to the regional weights and measures associations with a proposed voting status. All regional weights and measures associations agreed to forward the proposal as a voting item on the 2019 NCWM Interim Agenda and the Sector appreciates their review and support. However, following the regional meetings additional data was submitted to the sector which indicates a need to consider developing different tolerance for some grain types. Through a subsequent ballot, and a majority vote, the sector agreed to recommend changing the status of the item to developing to provide the Sector time to consider additional data and changes to its original proposal. OWM agrees with the Grain Analyzer (GA) Sector's revised decision to change the status of this item to "developing."

This proposal to change the air-oven method tolerances was developed during the 2018 GA Sector meeting. During the 2018 GA Sector Meeting, Dr. Charlie Hurburgh provided the Sector with an analysis of data for 2-corn and 1-soybeans samples which included the average error for UGMA grain moisture meter technology and the average error of 2 MHz grain moisture meter technology from Iowa State weights and measures inspection data for years 2014-2017. Based on the Sectors review of the data, discussion of new tolerances, and the ability of the technologies to meet the new tolerances the Sector agreed to change the tolerances based on the data provided.

During additional discussion of what tolerances to apply to other grains, it was proposed that the same tolerances could apply to all grains, because corn is one of the more difficult grains to test and would likely have one of the largest variations when testing. No objections from States or meter manufacturers were provided during the discussion and voting to forward the item to the State regional weights and measures associations. Following the Sector meeting one State noted that there may be an issue with applying the tolerance to some grain types, specifically long grain rough rice. The GA Sector's technical advisor requested that the State forward field data to review the grain moisture meter results for LGRR and other grains. After review of the data with the proposed tolerances it was determined that a high meter failure rate could result with a change to the tolerances for some grain types.

After the Sector's Technical Advisor discussed the findings with the NTEP laboratory and the Sector members that originally proposed the tolerance change, they agreed with proposing a developing status for this item, the Sector was officially balloted and also agreed to change the originally proposed voting status to Developing to allow the Sector time to review additional data and make changes to its original proposal.

Summary of Discussions and Actions:

At the NCWM 2022 Interim Meeting, the Committee heard comments from Ms. Diane Lee (NIST OWM) who noted that additional data is needed to assess the proposed tolerances. Ms. Lee added that states would be submitting more data. Ms. Lee requested that this item remain Developing. During the Committee's work session, the Committee agreed to a Developing status for this item.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearings the following comments were heard:

Ms. Diane Lee (NIST OWM): This item has been on the agenda since 2019 - when it was proposed there was a study done on only corn and soybean samples (maybe we could lower the tolerances) subsequent to that, they received a report from a state to hold off to look at more data from different grain types (rough rice). Agreed to collect additional data, from a few additional states. A memo has gone out to participating states to collect more data on additional grains. They are in the process of collecting and hope to have a report in the interim on validity. Support as a Developing item.

The WWMA S&T Committee recommends the status remain developmental.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing the Committee heard no comments on this item.

This Committee recommends this item remain Developing so that more data can be collected and presented in the future.

Northeastern Weights and Measures Association

At the 2022 Interim Meeting Open Hearing, no comments were heard. The Committee recommends that this item remain in Developing Status.

At the 2022 Annual Meeting Open Hearing, Mrs. Tina Butcher (NIST OWM) commented on background for this item. There had been concerns if the current tolerances were too broad. The grain sector was looking into expanding the data set to include additional grains but there has been significant delay due to pandemic.

After hearing comments from the floor, the Committee recognized the need to further develop this item and recommended the item retain Developing status.

Central Weights and Measures Association

During the 2022 Interim Meeting Open Hearing the Committee heard comments from the floor. Ms. Diane Lee (NIST OWM) is part of the sector. The sector met in August of this year and four States will be submitting data. Once data is collected, it will be given to the Grain Sector for them to decide what to with the item. Mr. Doug Musick (Kansas): are there old technology that can meet this requirement? Has any data been submitted regarding this?

CWMA S&T Committee recommends this item as Developing.

During the 2022 Annual Meeting Open Hearing, Mr. Doug Musick (Kansas) noted that some feel that rice will not be able to meet the tighter tolerance. Supports moving to voting. No data has been submitted regarding the concern, so they can do this at a later date if desired.

The CWMA S&T Committee recommends this moves forward as a Voting item.

MDM – MULTIPLE DIMENSION MEASURING DEVICES

MDM-22.1 D S.1.7. Minimum Measurement.

Source: Parceltool P/L

Purpose and Justification:
Exempt mobile tape based MDMD devices from the 12D minimum measurement.

OWM Executive Summary for MDM-22.1 – S.1.7. Minimum Measurement.

OWM Recommendation: Unless additional information to justify the proposed changes to the MDMD Code is provided to the Committee by the submitter (or submitter's consultant) on or before the 2022 NCWM Annual Meeting, OWM recommends this item be withdrawn.

- This is the identical proposal that appeared in the S&T Committee's 2019 agenda (as S&T Item MDM-2) and was withdrawn by the Committee in 2019.
- The NCWM MDMD work group also reviewed the MDM-2 proposal during its spring 2019 meeting and recommended the item be withdrawn.
- We have reviewed our comments and recommendations provided to the 2019 S&T Committee for S&T Item MDM-2 and still find them relevant today. Consequently, we provide them again with only few minor changes in our detailed analysis of this item included below.
- There is no additional information provided in the justification section of this item in the Committee's current agenda to explain the reason for resubmission or why the Committee should reconsider its earlier action to withdraw the item in 2019.
- We raised all of the above points during the 2022 NCWM Interim Meeting and recommended the Committee withdraw this item. During that same meeting, however, Mr. Darrell Flocken (NCWM) requested the Committee maintain a developing status based upon a request he had received from the submitter's consultant who indicated the submitter wished to resurrect the item.

Table 3. Summary of Recommendations

MDM-22.1 S.1.7. Minimum Measurement.

	V	D	W	A	I	Notes*	Comments
Submitter							
OWM			✓				
WWMA		✓					
SWMA			✓				
NEWMA		✓					
CWMA			✓				
NCWM		✓					

	Letters of Support	Letters of Opposition	Notes
Industry	• Letter from CubeTape (08-10-2021)		
Manufacturers			
Retailers and Consumers			

Table 3. Summary of Recommendations							
MDM-22.1 S.1.7. Minimum Measurement.							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**

***Notes Key:**
1 - Submitted modified language
2 - Item not discussed
3 - No meeting held
4 - Not submitted on agenda
5 - No recommendation or not considered

Item under Consideration:

Amend 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 **and 20XX**)

NIST OWM Detailed Technical Analysis:

This very same proposal appeared in the S&T Committee's 2019 agenda (as S&T Item MDM-2) and was withdrawn by the Committee in 2019. Additionally, the first two paragraphs included in the Committee's current agenda beneath the heading "Original Justification," are the very same two paragraphs contained in the Committee's 2019 Interim Meeting Agenda in the Background Discussion section of the item. That is, there is no additional information provided in the justification section of this item in the Committee's current agenda to explain the reason for resubmission or why the Committee should reconsider its earlier action to withdraw the item in 2019. OWM notes too that the NCWM MDMD work group also reviewed the MDM-2 proposal during its spring 2019 meeting and recommended the item be withdrawn.

We have reviewed our comments and recommendations provided to the 2019 S&T Committee for S&T Item MDM2 and still find them relevant today. Consequently, we submit them again (shown in the box below to include a few minor changes that we've made) to the Committee as our analysis for the item "MDM-22.1" in the Committee's current agenda.

OWM recognizes there is a potential for introducing excessive error in measurements when they are performed using a process or instrument that does not provide a sufficient level of resolution in the measurement. Minimum measurement requirements are established in NIST Handbook 44 device codes based on the premise, "rounding of digital values and the allowable error in a device from the application of tolerance creates the potential for large errors at small measurements." This effect decreases proportionately as the measurement size is increased along with the number of increments used in the measurement. To put this principle into perspective as it relates to multiple dimension measuring devices (MDMDs), NIST Handbook 44 maintenance and acceptance tolerances applicable to MDMDs are plus or minus 1 division (See paragraph T.3. Tolerance Values). Considering this tolerance in perspective with this proposal, a 1-division error within a 12division measurement (i.e., the minimum measurement currently permitted in accordance with paragraph S.1.7.) represents over 8 percent of the measurement value (1 ÷ 12

= 0.083 ≃ 8.3 %). If the measurement were to include 50 divisions (or increments), that same 1-division error represents only 2 percent of the measurement value (1 ÷ 50 = 0.020 or 2 %).

Compounding the potential for even greater error is the fact that MDMDs are generally used to measure hexahedron-shaped objects by determining values for length, width, and height, and then multiplying these values together to determine the cubic volume occupied by the object. Since there are three measurements needed to determine the volume, the error effect of using a device to make small measurements is multiplied threefold. For example, a 1-division plus error at a 12-division measurement of length, width, and height would result in over a 27 percent error in the volume measurement of the object being measured as illustrated in the table below.

Axis	**Measurement (+ 1 d error)**	**Actual**
Length	13 d	12 d
Width	13 d	12 d
Height	13 d	12 d
Volume	2197 x-unit^3	1728 x-unit^3
Difference: Measurement minus Actual	2197 x-unit^3 – 1728 x-unit^3 = 469 x-unit^3	
Percent error calculation	(469 x-unit^3 ÷ 1728 x-unit^3) x 100 = 27.1 %	

Thus, given the potential that this proposal has for creating such very large measurement errors and the monetary impact those errors can have on commercial transactions, OWM does not believe this item should be advanced.

In addition, OWM also points out the following concerns relating to this item:

- A guiding principle in the development of HB 44 requirements is that the same requirements should apply to devices used in the same application, regardless of technology or design. The proposed change in this item violates the principle by proposing there be an exemption to one of the requirements in the MDMD code for a particular type of MDMD.

- The background/discussion pertaining to this item includes the statement that it is not unusual for measurements to be made of less than 12 divisions. If this is in fact the case, those using these devices commercially to take such measurements are violating the minimum measurement requirement in HB 44. OWM would hope that the submitter of this item, knowing this to be true, would take necessary steps to educate users so that accurate measurements can be ensured. OWM believes that there may also be a problem caused by the use of a device with too large a division size for use in measuring small objects rendering that device unsuitable for the purpose intended. Another potential problem may be created when two devices with different division values are needed due to the wide linear range of the different axes needing to be measured.

- The background/discussion portion of this item also indicates an accepted practice for this type of device is for the measurement to be rounded up to the nearest whole division. OWM notes such rounding conflicts with the instructions provided on the Federal Express and United States Postal Service websites for determining DIM weight, that specify the measurements are to be rounded to the nearest inch.

The current 12 d minimum measurement specified in HB 44 is uniform with the same in OIML R 129. Thus, a change to HB 44 requirement would cause conflict with OIML requirements.

OWM's Comments and Recommendation for Item MDM-22.1 Copied from its 2019 Analysis of MDM-2

Summary of Discussions and Actions:

During Committee open hearings at the 2022 NCWM Interim Meeting, Mr. Rick Harshman (NIST OWM) reported this very same proposal had appeared in the S&T Committee's 2019 agenda (as S&T Item MDM-2) and was withdrawn by the Committee in 2019. Additionally, the first two paragraphs included in the Committee's current agenda beneath the heading "Original Justification," are the very same two paragraphs contained in the Committee's 2019 Interim Meeting Agenda in the Background Discussion section of the item. That is, there is no additional information provided in the justification section of this item in the Committee's current agenda to explain the reason for resubmission or why the Committee should reconsider its earlier action to withdraw the item in 2019. Mr. Harshman noted too that the NCWM MDMD work group also reviewed the MDM-2 proposal during its spring 2019 meeting and recommended the item be withdrawn. For these reasons, OWM recommends the item be withdrawn.

Mr. Darrell Flocken (NCWM) acknowledged he too was aware that the proposal is identical to the one that the Committee had withdrawn in 2019. He noted, however, that he had been contacted by a representative of the submitter and that this person had advised him the submitter desired to further pursue adoption of the proposal. Mr. Flocken indicated he expected new information to be made available to Committee from the submitter to provide better justification for it.

During the Committee's work session members of the Committee agreed to maintain the item on the Committee's agenda as a Developing item to allow the submitter an opportunity to provide additional information that could justify the proposed changes.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearings the following comments were heard:

Mr. Russell Vires (Mettler Toledo): Mettler is opposed to the change proposed here. No reason to eliminate the minimum measurement.

The WWMA S&T Committee recommends that this item be assigned a Developmental status. The Committee recommends that the submitter provide data to support why the devices are unable to meet the 12-division requirement. The Committee also recommends that the submitter consult the MDMD working group.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing Mr. Russ Vires (Mettler Toledo) requested that this item be withdrawn because the justification was invalid.

This Committee recommends this item be Withdrawn due to having no justification provided for the change.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.

Mr. Rick Harshman (NIST OWM) commented that this is a new item and members of NIST OWM's LMDP have not had opportunity to review/consider it. There's little information provided in the background/discussion of this item. If the device has digital indication, by rounding all values up as is specified in the background/discussion, the device would fail to comply with HB 44 paragraph G-S.5.2.2.(c).

Mr. Lou Sakin (Hopkinton/Northbridge, Massachusetts) commented that this item is in-need of further development.

The NEWMA Specifications and Tolerances Committee recommends that this item be given Developing Status.

During the 2022 Annual Meeting Open Hearings the following comments were heard:

Mr. Russ Vires (SMA) rose to oppose the item. He commented that the justification provided by the submitter does not identify issue that is to be resolved. Mr. Vires suggested that the submitter work with MDM Workgroup for a solution and referenced the workgroup meets in May and will be discussing this proposal.

After hearing comments from the floor, the Committee recognized the need to further develop this item and recommended the item retain Developing status.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the Committee heard no comments from the floor.

CWMA S&T Committee has no recommendation for this item.

During the 2022 Annual Meeting Open Hearings, the Committee received the following comments:

Mr. Russ Vires (SMA) - The SMA opposes this item. The justification provided by the submitter does not adequately identify the issue this item is attempting to resolve, and why mobile tape-based MDMD devices should be exempted compared to all other MDMD devices. The SMA recommends that the submitter work with the MDMD Workgroup to develop a suitable solution to this issue.

The CWMA S&T Committee recommends this item to be withdrawn.

SMA

During the 2021 Fall Meeting the SMA opposed this item. The justification provided by the submitter does not adequately identify the issue this item is attempting to resolve, and why mobile tape-based MDMD devices should be exempted compared to other MDMD devices. The SMA recommends that the submitter work with the MDMD Workgroup to develop a suitable solution to this issue.

During the 2022 Spring Meeting the SMA opposed this item.

Rationale: The justification provided by the submitter does not adequately identify the issue this item is attempting to resolve, and why mobile tape-based MDMD devices should be exempted compared to all other MDMD devices. The SMA recommends that the submitter work with the MDMD Workgroup to develop a suitable solution to this issue.

OTH – OTHER ITEMS

OTH-16.1 D Electric Watthour Meters Code under Development

Source: NIST Office of Weights and Measures

Purpose and Justification:

1) Make the weights and measures community aware of work being done within the NIST U.S. National Work Group (USNWG) 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.

OWM Executive Summary for OTH-16.1 Electric Watthour Meters Code Under Development

OWM Recommendation: OWM recommends this item be retained on the Committee's agenda as a Developing item while the USNWG EVF&S EWH Subgroup finalizes a draft code for submission in the 2023 standards development cycle.

- The USNWG on Electric Vehicle Fueling & Submetering Electric Watthour Meter Subgroup (EWH SG) is charged with developing standards and test procedures utility-type watt hour meters.

- The SG has been developing a draft code for inclusion in NIST Handbook 44 and submitted an early draft in September 2021.

  - The draft was posted on the S&T Committee's web site for review and comment with a request for comments by March 2022 to allow the SG to address concerns prior to finalizing the code for submission.

- The SG only received comments from CA DMS at the Fall 2021 WWMA meeting and again from the 2022 NCWM Interim Meeting supporting further development of this item. California concerns include:

OWM Executive Summary for OTH-16.1 Electric Watthour Meters Code Under Development

- identity marking requirements being on a separate document to satisfy model and serial number prefixes;
- the current lack of clarification on what constitutes a separate document;
- electronic versions of this information do not originate from the system;
- testing capabilities should be easily and readily achievable before and after the installation to facilitate the resolution of accuracy complaints;
- An additional observation is that the method of sealing for category II and III devices requires a hard copy of audit trail and event logger information whereas codes are considering the allowance of electronic forms of this information.

- The S&T Committee agreed to include this item as a Developing Item on its agenda to keep the weights and measures community informed of progress and facilitate participation by interested parties.
  - Mrs. Tina Butcher (NIST OWM) has provided regular updates to the NCWM and regional weights and measures association S&T Committees on this work. Details are found in past Committee reports.
- In the Fall 2021 and Spring 2022 all of the regional weights and measures associations have recommended maintaining this item as a Developing item on the Committee's agenda as the SG finalizes its draft.
- The SG continues work on the draft; it held eighteen meetings in 2021 and seven meetings thus far in 2022.
- The SG still hopes to resolve the remaining issues regarding the draft code and submit a draft to the NCWM S&T for consideration in the 2022-2023 NCWM cycle under this agenda item, and asks the Committee to maintain this item as Developing on its agenda to facilitate this submission.

Table 3. Summary of Recommendations

OTH-16.1 Electric Watthour Meters Code under Development

	V	D	W	A	I	Notes*	Comments
Submitter		✓					• Initial Draft Code for Non-Utility Electricity-Measuring Systems (09-01-2021)
OWM		✓					
WWMA		✓					
SWMA		✓					

Table 3. Summary of Recommendations							
OTH-16.1 Electric Watthour Meters Code under Development							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**
NEWMA		✓					
CWMA		✓					
NCWM		✓					

	Letters of Support	**Letters of Opposition**	**Notes**
Industry			
Manufacturers			
Retailers and Consumers			

***Notes Key:**
1 - Submitted modified language
2 - Item not discussed
3 - No meeting held
4 - Not submitted on agenda
5 - No recommendation or not considered

Item under Consideration:

This item was added to the NCWM S&T Committee's agenda as a "Developing Item" to allow a forum in which 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.

Mrs. Tina Butcher (NIST OWM), Chair of the USNWG on Electric Refueling & Submetering, has continued to provide regular updates to the Committee on this work and to encourage input and participation from the weights and measures community since the addition of this item to the Committee's agenda in 2016. See the Committee's 2016 through 2021 Final Reports and 2022 Interim Report for details.

The SG is nearing completion of a draft NIST Handbook code for "Non-Utility Electricity-Measuring Systems." Work continues on a few sections of the draft code; however, the SG would like to begin getting feedback from the weights and measures community on the draft code. The SG requested that the Committee post an early draft of the code on the NCWM website.

The draft code was posted in Fall 2021 and is available for download at **https://www.ncwm.com/publication-15**.

The Subgroup asks the NCWM S&T Committee to consider (and the regional associations to support) the following.

1. Permitting the item to remain in a Developing status on its agenda to allow for further development and input on the draft Handbook 44 Code.

2. Permitting the SG to post the draft code along with other supporting documents on the NCWM S&T Committee's web page. Areas under review and development by the SG will be noted in yellow highlighted text.

3. Encouraging weights and measures officials and industry to study the draft code and provide input to the SG, including proposed changes along with rationale for such changes and any indication of support or opposition.

The SG requested comments be submitted to the SG Chair or Technical Advisor by the end of March 2022. The above approach was intended to allow the SG the opportunity to solicit input and incorporate comments from the weights and measures community on the draft code in advance of proposing it for a vote more broadly.

The SG has continued to meet and revise specific areas of the code and still hopes to finalize a draft for submission in the 2022-2023 NCWM cycle.

The Electric Watthour Meter Subgroup (EWH SG) of the USNWG on Electric Vehicle Fueling & Submetering has held multiple in-person and web meetings since the 2017 NCWM Annual Meeting. This SG has held 15 virtual meetings since January 2021 focused on finalizing a draft code on "Non-Utility Electricity-Measuring Systems."

Those interested in participating in this work are asked to contact SG Chair, Ms. Lisa Warfield, or Technical Advisor, Mrs. Tina Butcher. Contact information is included in the "Background" section of this item.

NIST OWM Detailed Technical Analysis:

- The USNWG on Electric Vehicle Fueling & Submetering Electric Watthour Meter Subgroup (EWH SG) is charged with developing standards and test procedures utility-type watt hour meters.

- The SG developed a proposed addition to NIST Handbook 130's Uniform Regulation for the Method of Sale (MOS) of Commodities specifying a method of sale for electrical energy sold through these systems; "Section 2.38. Non-Utility Transactions of Electrical Energy (Other than Vehicle Fueling Applications)" was adopted by the NCWM in July 2019.

- The SG has been developing a draft code for inclusion in NIST Handbook 44 and submitted an early draft in September 2021 which was posted on the NCWM's web site for review and comment.

    - The SG requested comments by March 2022 to allow the SG to address any concerns in its final recommendations for a draft code.

- The SG received comments from California DMS through the Fall 2021 WWMA meeting and again from the 2022 NCWM Interim Meeting supporting further development of this item. California expressed concerns about identity marking requirements being on a separate document to satisfy model and serial number prefixes, noting the current draft does not clarify what constitutes a separate document (other than specifying a "hard" or "electronic" form) and does not originate from the system. California strongly feels testing capabilities should be easily and readily achievable before and after the installation as well as means for verifying validity of complaints based on inaccuracy. An additional observation is that, as written, the method of sealing for category II and III devices requires a hard copy

of audit trail and event logger information; however, other codes are being considered to allow electronic forms of this information.

  - No other comments have been received.

- Mrs. Tina Butcher (NIST OWM) has provided regular updates to the NCWM and regional weights and measures association S&T Committees on this work. Details are found in past Committee reports.

- In September 2021, Mrs. Butcher submitted a request to NCWM S&T Committee Chair, Mr. Brad Bachelder to:

  1. Permit the item to remain in a Developing status on its agenda to allow for further development and input on the draft NIST Handbook 44 Code.

  2. Permit the SG to post the draft code along with other supporting documents on the NCWM S&T Committee's web page. Areas under review and development by the SG are noted in highlighted text.

  3. Encourage weights and measures officials and industry to study the draft code and provide input to the SG, including proposed changes along with rationale for such changes and any indication of support or opposition.

- Chair Bachelder agreed to post a draft of the code on the NCWM S&T Committee's web site.

- The SG requests this item maintain a Developing status.

  - In their Fall 2021 meetings, all four regional weights and measures associations supported maintaining this item as a Developing item on the Committee's agenda as did the CWMA and NEWMA at their Spring 2022 annual meetings.

- The S&T Committee agreed to include this item as a Developing Item on its agenda to keep the weights and measures community informed of progress and facilitate participation by interested parties.

- Work continues on some sections of the draft code.

- The SG held eighteen meetings in 2021 (February 3; February 4; February 22; March 11; March 25; April 19; April 26; May 26; June 2; June 16; June 24; July 12; July 13; August 23; August 24; November 2; November 16; November 18) and seven meetings thus far in 2022 (February 1, February 17, March 1, April 4, April 13, April 20, May 18, in addition to meetings of small Task Groups focused on specific issues.

- The SG still hopes to resolve the remaining issues regarding the draft code and submit a draft to the NCWM S&T for consideration in the 2022-2023 NCWM cycle under this agenda item.

- Those interested in participating in this work please contact:

  - Subgroup Chair, Ms. Lisa Warfield (NIST OWM)
    Email (**lisa.warfield@nist.gov**) or phone (301-975-3308)

- Technical Advisor, Mrs. Tina Butcher (NIST OWM)
  Email (**tbutcher@nist.gov**) or phone (301-975-2196)

Summary of Discussions and Actions:

NCWM 2022 Interim Meeting

Mr. Matt Douglas (California – DMS) stated that California supports the development of this item but has concerns about identity marking requirements being on a separate document. Also, the devices should be easy to test before and after instillation. This device should allow for electronic data logger. Ms. Juana Williams (NIST OWM) commented that the subgroup had provided a draft code that is on the website. Ms. Williams requested comments be submitted to Mrs. Tina Butcher (NIST OWM) or Ms. Lisa Warfield (NIST OWM) by March 22, 2022. Ms. Williams stated these comments will be used to provide and updated draft for the 2022-2023 submission cycle and the item remain in developing status. The Committee agreed that the item be given a Developing status.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearing the following comments were heard:

Mr. Matt Douglas (California - DMS): California supports further development of this item. Concerns about the identity marking information which allows a separate document to satisfy model and seral number prefixes and doesn't clarify what constitutes a separate document other than hard or electronic and does not originate from the system. We strongly feel that testing capabilities should be easily and readily achievable before and after the installation as well as means for verifying validity of complaints based on inaccuracy. An observation – as written the method of sealing category II and III requires a hard copy of audit trail and event logger information. Other codes are being considered to allow electronic forms of this information.

The WWMA S&T Committee recommends this item remain in a Developing status. The Committee acknowledged that, as referenced in the Committee's agenda, the submitter of the item has asked the item to remain in a Developing status to allow for further refinement and input on the draft NIST HB 44 code. Based upon this information and the comments received during its open hearings, the Committee encourages the NIST USNWG Subgroup to consider the comments provided by CA DMS at the WWMA meeting. The Committee also encourages others in the weights and measures community to continue studying the draft code and provide input to the Subgroup as requested in the agenda item.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing the Committee heard no comments on this item.

This Committee recommends this item remain Developing so that more work can continue at the request of the submitter.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.

Ms. Juana Williams (NIST OWM) commented below and recommended developing status.

- NIST OWM notes that the USNWG Subgroup on Watthour-Type Electric (EWH) Meters is nearing completion of its proposed tentative code for utility-type watthour submeters.

- As noted in the agenda, there are a few sections of the draft code that require additional work by the EWH Subgroup.

    - NIST OWM asks that the item remain in a Developing status while the Subgroup completes these remaining items.

- The Subgroup is asking for feedback on the remaining portions of the draft code thus far.

    - The NCWM S&T Committee has agreed to post the draft on the S&T's website to allow for broader review and comment.

    - NIST OWM encourages review and input on the draft.

    - This input will allow the Subgroup to begin incorporating feedback from the community and better prepare the draft for submission in the 2022-2023 cycle.

The NEWMA Specifications and Tolerances Committee recommends that this item be given Developing Status.

At the 2022 NEWMA Annual Meeting, NEWMA heard from Mrs. Tina Butcher (NIST OWM) who commented that this item pertains to electric submeters. The Subgroup is still working on the proposal and has prepared a draft; however, three or four items need to be resolved with regard to criteria for marking and testing.

After hearing comments from the floor, the Committee recognized the need to further develop this item and recommended the item retain developing status.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the Committee heard comments from the floor. Mrs. Tina Butcher (NIST OWM) noted the item has been on the agenda for five years. Needs a little more work from subcommittee. She recommended item as developing and would like public comments.

The CWMA S&T Committee recommends the item as a developing item.

At the 2022 CWMA Annual Meeting, the CWMA heard from Ms. Lisa Warfield (NIST OWM) who reported that an extensive group of industry and regulators are working to understand each other's roles as this code develops. The NIST work group is quite active and making progress. The CWMA S&T Committee recommends this item to remain as Developing.

OTH-22.1 D Appendix A: Fundamental Considerations, 3. Testing Apparatus

This item was modified and combined with Item GEN-19.1 and resides in Block 8.

OTH-22.2 V Appendix D – Definitions: face

Source: NIST Office of Weights and Measures

Purpose and Justification:
To correct the apparent oversight of *not* referencing the codes that clearly make use of the term "face"; include the missing code section numerical designations of 3.32, 3.37, and 3.39 in the [brackets] following the second meaning definition of the term "face" in NIST Handbook 44 Appendix D. The inclusion of those specific device code designations will clarify the term is applicable to retail devices addressed in the LPG and Anhydrous Ammonia Liquid-Measuring Devices, Mass Flow Meters (MFM), and Hydrogen Gas-Measuring Devices Codes, respectively. The term has special meaning for these types of systems because the "face" of these retail devices is specified as the only permissible location for specific quantity, pricing, and related marking information that provide clarity about the correct computation of each sale by the dispensing system.

OWM Executive Summary for Appendix D – Definitions: face

OWM Recommendation: OWM believes this item is fully developed and ready for a vote. This item corrects an oversight that was made when the term was originally added to NIST Handbook 44 and helps ensure consistency in the application of the term across multiple codes.

- This proposal corrects the inadvertent omission of multiple numerical code designations from the definition of "face" where this unique term is cited in those code's design and user requirements.
- Including the added reference in the definition to the missing three codes sections ensures the manufacturers of these devices has information for the proper placement of transaction information in use by both the buyer and seller and necessary to the regulatory official.
- The current definition of "face" remains broad enough to recognize both customary transaction information as well as the more recent use of nontraditional application-specific information.

Table 3. Summary of Recommendations

OTH-22.2 Appendix D – Definitions: face

	V	D	W	A	I	Notes*	Comments
Submitter	✓						See "Supporting Information from NIST" dated 8/12/21.
OWM	✓						
WWMA	✓						
SWMA	✓						
NEWMA						5	
CWMA	✓						
NCWM	✓						

	Letters of Support	Letters of Opposition	Notes

Table 3. Summary of Recommendations							
OTH-22.2 Appendix D – Definitions: face							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**
Industry							
Manufacturers							
Retailers and Consumers							

***Notes Key:**
1 - Submitted modified language
2 - Item not discussed
3 - No meeting held
4 - Not submitted on agenda
5 - No recommendation or not considered

Item under Consideration:

Modify the definition for "face" in Appendix D definitions as follows:

face. – That portion of a computing-type pump or dispenser which displays the actual computation of price per unit, delivered quantity, and total sale price. In the case of some electronic displays, this may not be an integral part of the pump or dispenser. [3.30**, 3.32, 3.37, and 3.39**]

(Added 1987) **(Amended 2022)**

NIST OWM Detailed Technical Analysis:

This proposal is a housekeeping item intended to correct the omission of multiple numerical designations of applicable code sections from the NIST HB 44 Appendix D definition of the term "face." Those codes' numerical designations should have appeared in the definition at the same time as the term "face" was first recognized in each codes' display and posting requirements.

The consistent and proper placement of specific transaction information on the "face" of the dispenser ensures clear and easy access, selection, and use of that information throughout the entire sale by both the buyer and seller. The appearance of references to those code designations in the definition of the term "face" also benefit the manufacturer designing the device.

The proposal expands the handbook codes referenced in the definition of "face" from one to four sections. The 15 relevant handbook code paragraphs that include requirements for specific information to be either indicated, displayed, posted, or automatically shown on the "face" of device types in addition to retail liquid measuring devices (i.e., code section 3.30) are specified in Code Sections:

(1) 3.32 LPG and NH_3 Liquid-Measuring Devices
(2) 3.37 MFM Code, and
(3) 3.39 Hydrogen Gas-Measuring Devices

The wording of the current definition may seem a bit archaic; however, its scope remains broad enough to recognize both customary transaction information as well as the more recent use of nontraditional

application-specific computational information such as supplemental fuel conversion units or instances where there is the option for use of either a built-in or remote primary display.

Summary of Discussions and Actions:

NCWM 2022 Interim Meeting

Based on no comments in opposition and the submitter's request for voting status, the committee recommends that this item be voted on at the annual meeting.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearing the following comments were heard:

Matt Douglas (California - DMS) : This item seems to be housekeeping. CA DMS supports this code.

The WWMA S&T Committee recommends that this item be assigned a Voting status. The Committee agrees that this item has merit and is fully developed.

Southern Weights and Measures Association

At the 2021 Annual Meeting Open Hearing, the SWMA S&T committee heard no comments on this item.

The SWMA recommends moving this forward as a Voting item.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.

Ms. Juana Williams (NIST OWM) commented that this is a housekeeping item and recommends moving forward as a Voting item.

Mr. Jim Willis (New York) also supports giving this item Voting status.

The NEWMA Specifications and Tolerances Committee recommends that this item be moved forward with a Voting Status.

During the 2022 Annual Meeting Open Hearing no comments were heard on this item. NEWMA makes no recommendation to the NCWM.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the committee heard comments from the floor. Mrs. Tina Butcher (NIST) stated this item is cleaned up and ready to move forward as a Voting item.

CWMA S&T Committee recommends this item move forward as a Voting item.

During the 2022 Annual Meeting Open Hearing no comments were heard from the floor.

The CWMA S&T Committee recommends this moves forward as a Voting item. CWMA recommends this item proposal as a Voting Item on the NCWM agenda.

ITEM BLOCK 1 (B1) W TERMINOLOGY FOR TESTING STANDARDS

(original B1 items)

B1: SCL-18.1 W	N.2. Verification (Testing) Standards
B1: ABW-18.1 W	N.2. Verification (Testing) Standards
B1: AWS-18.1 W	N.1.3. Verification (Testing) Standards, N.3.1. Official Tests, UR.4. Testing Standards
B1: CLM-18.1 W	N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards
B1: CDL-18.1 W	N.3.2. Transfer Standard Test, T.3. On Tests Using Transfer Standards
B1: HGM-18.1 W	N.4.1. Master Meter (Transfer) Standard Test, T.4. Tolerance Application on Test Using Transfer Standard Test Method
B1: GMM-18.1 W	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]
B1: LVS-18.1 W	N.2. Testing Standards
B1: OTH-18.1 W	Appendix A: Fundamental Considerations, 3.2. Tolerances for Standards, 3.3. Accuracy of Standards
B1: OTH-18.2 W	Appendix D – Definitions: fifth-wheel, official grain samples, transfer standard and Standard, Field

(**Note:** During the 2019 NCWM Interim Meeting, the S&T Committee considered comments during Opening Hearings and recommended that the following Items appearing on the 2019 Agenda as GEN-3, B1, B2, LPG-3 and MFM-5 be combined and gave these items an Assigned status. Item Block 1 included previously numbered items: GEN-3; Block 1; Block 2; LPG-3; and MFM-5.

Note: Based on comment heard during the 2021 Annual Meeting, the S&T Committee recommended that all items that were combined with Block 1 "Terminology For Testing Standards" and originally appeared as a separate item or separate block of items on the S&T agenda prior to 2019, be removed from Block 1 and appear as originally presented. As such, the items presented in this block are the original items included in Block 1 "Terminology For Testing Standards".)

Source: NIST Office of Weights and Measures

Purpose and Justification:
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.

OWM Executive Summary for Item Block 1 (B1) Terminology for Testing Standards
OWM Recommendation: The submitter, NIST OWM withdrew this item at the 2022 Interim Meeting. NIST OWM worked with Seraphin on Block 8 items which includes proposed definitions for Standards in NIST HB 44 and these terms and definitions are proposed and being considered.

Table 3. Summary of Recommendations

Item Block 1 (B1) Terminology for Testing Standards

	V	D	W	A	I	Notes	Comments
Submitter			✓				
OWM			✓				
WWMA		✓					
SWMA		✓					
NEWMA						5	This item was not discussed because it was withdrawn at the 2022 Interim Meeting.
CWMA						5	This item was not considered because it was withdrawn at the 2022 Interim Meeting.
NCWM			✓				

	Letters of Support	Letters of Opposition	Notes
Industry			• Comments from Seraphin (06-29-2018) • Comments from Seraphin (07-31-2018) • Comments from Ross Andersen (12-12-2018) • Comments from Weights and Measures Consulting and Seraphin Test Measure Co. (01-13-2021)
Manufacturers			
Retailers and Consumers			

***Notes Key:**
1 - Submitted modified language
2 - Item not discussed
3 - No meeting held
4 - Not submitted on agenda
5 - No recommendation or not considered

Item Under Consideration

B1: SCL-18.1 W N.2. Verification (Testing) Standards

Amend 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-18.1 W N.2. Verification (Testing) Standards

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

N.2. ~~Verification (Testing)~~ Field Standards. – **Field ~~S~~s**tandard 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-18.1 W N.1.3. Verification (Testing) Standards, N.3.1. Official Tests, UR.4. Testing Standards

Amend 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-18.1 W N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards

Amend 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-18.1W N.3.2. Transfer Standard Test, T.3. On Tests Using Transfer Standards

Amend 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-18.1 W N.4.1. Master Meter (Transfer) Standard Test, T.4. Tolerance Application on Test Using Transfer Standard Test Method

Amend 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: GMA-18.1 W 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]

Amend 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-18.1 W N.2. Testing Standards

Amend 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-18.1 W Appendix A: Fundamental Considerations, 3.2. Tolerances for Standards, 3.3. Accuracy of Standards

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

3.2. Tolerances for <u>Field</u> 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.

<u>(Amended 20XX)</u>

3.3. Accuracy of <u>Field</u> 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

<u>(Amended 20XX)</u>

B1: OTH-18.2 W Appendix D – Definitions: fifth-wheel, official grain samples, transfer standard and Standard, Field

Amend 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]

<u>(Amended 20XX)</u>

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

<u>(Amended 20XX)</u>

~~**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)

NIST OWM Detailed Technical Analysis:

Seraphin and NIST OWM worked on revisions to GEN-19.1 and OTH-22.1 which is now Block 8. The definitions and terminology proposed in Block 8 are in conflict with the terminology in Block 1. As such, NIST OWM recommends the withdraw of Block 1 items. NIST OWM may revisit its work with Seraphin to develop revisions to Block 1 Terminology that would agree with Block 8 currently on the 2022 S&T Interim Meeting agenda, at a later date.

Summary of Discussions and Actions:

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)

The Committee received written comments 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 and stating that it is important to be consistent in our use of terms across multiple sections of NIST Handbook 44. The Committee agreed to carryover this group of items on its 2019 agenda to allow for further discussion and development of these proposals.

The Committee received written comments 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 and stating that it is important to be consistent in our use of terms across multiple sections of NIST Handbook 44. The Committee agreed to carryover this group of items on its 2019 agenda to allow for further discussion and development of these proposals.

At the 2019 Interim Meeting the S&T Committee decided to combine the items on the agenda dealing with the issue of transfer standard (including items already combined into blocks) into one block. Block 1 (New) of the Interim Meeting report now includes GEN-3, Block 1 (original items from the 2019 interim agenda that appeared under Block 1), Block 2, LPG-3, and MFM-5, which were all separate items and blocks of items on the S&T Committee's 2019 Interim Meeting agenda (NCWM Publication 15). Agenda items GEN-3, Block 1, Block 2, LPG-3, and MFM-5 are listed separately on the Interim agenda with a note added beneath each individual item referring the reader to the New B1 items. All items under this New B1 have retained the same numbering system for ease in referring to the appendix for discussion on each item.

At the 2019 Annual Meeting, Mr. Brett Gurney (NCWM Chairman) commented regarding the formation of a Task Group assigned to further develop this block proposal. The TG is charged with providing definitions for various types of standards (transfer, field, reference, etc.) as well as the criteria to be met by these types of standards. The completion date given to the TG is July 2021. The Committee agreed to the Assigned status for this block of items and looks forward to hearing updates from the TG. The Chair of the task group was:

Mr. Jason Glass
Kentucky Department of Agriculture
(502) 573-0282, **jason.glass@ky.gov**

At the 2020 Interim Meeting, the Field Standard TG Chair Glass reported that the Task Group met prior to the Interim meeting and has begun discussion of the items under Block 1. Mr. Glass stated that bi-weekly teleconference meetings were scheduled and that the group was optimistic but had significant work to accomplish.

Mr. Russ Vires (speaking on behalf of SMA) supports the Scale item, SCL 18.1; in this block, Mr. Dimitri Karimov (Meter Manufacturers Association) supports the Task Group activities, Mrs. Tina Butcher (NIST OWM) was encouraged with the progress on terminology and provided an update on the Mass Flow Meter

testing reporting that field testing was conducted October 28 to November 1, 2019 and that State and Industry participation included Colorado, Florida, Oregon, Emerson, and Tulsa Gas Technology.

Mr. Kurt Floren (Los Angeles County, California) raised concerns with GEN-19.1. regarding the definition of "Standard, Field" and its reference to "stable" standards and how long a standard is expected to be stable, which is typically 1-year, for which he believes should be longer. Mr. Floren also questioned the statement in the definition "tested over a range of environmental and operational conditions that the measuring devices is used…" Mr. Floren noted that he was unsure if all laboratories will have the capabilities to test over this wide range of conditions. Mr. Floren also expressed concerns with the definition "Standard, Transfer" citing that this standard may not meet the fundamental considerations requirement for standards over a long period of time or wide range of environmental conditions.

Mr. Steve Harrington (Oregon) echoed Mr. Floren's comments. Field Standard TG Chair Glass responded that these are concerns of the TG and these issues will be discussed and considered as the TG develops these items.

During the Committee's work session, the Committee agreed that this item should remain an Assigned item.

At the 2021 Interim Meeting the NCWM Field Standard TG Chair, Mr. Glass provided an update on the Task Group activities. Mr. Glass reported that the Field Standard Task Group is following the activities of the NIST Master Meter Project and that the Task Group reviewed API specifications for use of master meters as a standard and a test protocol that will be used to ensure uniformity in collecting data on master meters used as field standards. He also reported that the TG does not have a recommendation for this item. Mr. Glass also reported that he would be stepping down as the TG Chair. Mr. Mike Keilty (Endress+Hauser AG) thanked Chair Glass and the TG for their work and requested that Block 1, LPG-15.1, N.3. and Block 1 MFM-15.1, N.3 be removed from Block 1 items and to allow those items to move forward separate from the other Block 1 Items. Mr. Keilty stated that similar language was added to the Hydrogen code and that the proposed language in LPG-15.1 N.3. and MFM-15.1, N.3 will allow for the recognition of master meters as field standards. Mr. Henry Oppermann (WM-Consulting), stated that data is needed to ensure that master meters can be used over a range of conditions. Mr. Robert Murnane (Seraphin) stated that jurisdictions have the ability to use meters and that Block 1 LPG-15.1, N.3 and Block 1 MM-15.1, N.3 should remain in Block 1 until data is available to support the use of master meters as a standard. Mr. Keilty mentioned that there has been useful dialog regarding master meters in the TG, but that he is concerned that the TG is not close to deciding and he expressed concerns with the TG's focus on the NIST Master Meter Project. Mrs. Tina Butcher (NIST OWM) provided an update on the NIST Master Meter Project and noted that States have the regulatory powers to accept or reject a standard. She also mentioned that NIST is working with States to collect data needed to assess master meters and preliminary testing was conducted and data was collected on CNG at Tulsa Gas Technology's facility in fall 2019. Ms. Diane Lee (NIST OWM) noted that NIST OWM feels that it is premature to add more language to the Handbook 44 on master meters without data to support its use.

During the Committee's work session, the Committee agreed to keeps all items in Block 1 and that this item should remain with an Assigned status.

At the 2021 Annual Meeting, Mr. Glass reported that he would be stepping down as the Field Standard TG Chair. The Committee heard updates from members of the Task Group during open hearings. Mr. Keilty noted that two of the items had been on the agenda since 2015 and requested that they be removed from the block and recommended recognizing the use of master meters. Other comments were to keep the items together until data is analyzed from the NIST Field Reference Standard Work Group to support the use of

master meters but that if some items were removed from the block, all items should be removed from the block. Based on comments heard during the 2021 Annual Meeting, the S&T Committee recommended that all items that were included in Block 1 "Terminology For Testing Standards" that originally appeared as a separate item or a separate block of items on the S&T agenda in and prior to 2019, be removed from Block 1 "Terminology For Testing Standards" and appear as originally presented.

During the 2021 Committee work session the Committee recognized that the Task Group has accomplished all it is able to at this point and is recommending the Task Group be disbanded and will make said recommendation to the NCWM Chairman. The Committee agreed to break all items in Block 1 into individual items and designate them all as Developing. The Committee thanks the Task Group and its members for their work.

At the 2022 Interim Meeting, Ms. Diane Lee (NIST OWM, submitter) provided written comments recommending withdrawal of the block. Ms. Lee spoke during open hearings to explain that while the items have merit and will continue to be worked on, they should be withdrawn at this time while the language and terms are aligned with other items in the handbook.

Written comments were received from Mr. Russ Vires, representing the Scale Manufacturers Association (SMA). Mr. Vires (representing the SMA) also spoke during the open hearing to express the support for further development. Additional comments were heard from regulatory officials recommending development of the block items.

During the S&T Committee work session, the Committee agreed to recommend this item for withdrawal to allow for the submitter to continue work on this item and allow for alignment as other related items in the Handbook are developed and move forward.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearings the following comments were heard:

Mr. Russell Vires (Mettler Toledo): there are some conflicts now that GEN-19.1 has been removed (from the block). OTH-18.1: some conflicts there. This needs additional work. Recommend that it remains developing to give stakeholders opportunity to properly vet item

Ms. Diane Lee (NIST OWM): Russ is correct. Previous agenda - OTH-18.1 was listed as a separate item on the agenda but it has always been a part of block 1 (concern raised). That is fixed and 18.1 is included. What do we call master meters? What do we call transfer standards? NIST wants to call everything a field standard. All items were in a block - 18.1 should remain in the block but it was removed. NIST supports developing.

Mr. Kurt Floren (Los Angeles County, California): won't comment on tech. aspects. Question on status? SCL-18.1 and OTH-18.3: these are shown as Assigned items. Have they been assigned to a task force? Are they still in the hands of NIST? Need to define the terms (field standard and transfer standard).

Mr. Josh Nelson (Ex-Officio NCWM S&T Committee): to Mr. Floren - it had previously been Assigned but the Task Group disbanded to allow NIST to continue their work on the questions at hand. They are

looking to have members of that group to join the NIST group to gain more understanding. This is a typo - should be changed to developmental.

Mr. Matt Douglas (California - DMS): California supports further development.

Mr. Don Onwiler (NCWM): the report from S&T said that the block would be broken up. National Committee agreed to separate blocks. They just forgot to delete the extra item. National Committee will sort it out. Scratch 18.1 as individual item.

Ms. Cadence Matijevich (Nevada): NIST HB 105 - may be a useful reference doc. To look at the definitions. To avoid conflict bet. NIST HB 44 and NIST HB 105.

The WWMA S&T Committee recommends the status remain developmental.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing Mr. Oppermann (Weights and Measures Consulting, Seraphin) stated that you can't call everything a Field Standard, and that he supports this item remaining Developing so the group can work with OWM to align their terminology.

Mr. Russ Vires (speaking on behalf of SMA) stated they support SCL/ABW/AWS because it is important to use consistent terminology across Handbook 44.

Mr. Russ Vires (speaking on behalf of Mettler Toledo) stated that this item conflicts with Gen 19.1, and that he supported this item remaining Developing.

This Committee feels that more work needs to be done on this item regarding consistent terminology.

This Committee recommends this item remain Developing pending the Field Standard Task Group finding a new Chairperson.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.

Mr. Henry Opperman (W&M Consulting/Seraphin) commented that this item should remain a Developing item along with continued discussions with NIST OWM.

Mr. Lou Straub (SMA) supports the proposal as it applies to the items SCL-18.1, ABW-18.1, and AWS-18.1 items, and looks forward to further development by the Task Group.

Mr. Henry Opperman (Seraphin) commented that this block originally contained (Gen 19.1) that was separated from the block and recommends further development.

The NEWMA Specifications and Tolerances Committee recommends that this item remain in Developing Status.

During the 2022 Annual Meeting Open Hearing this item was not discussed because the item was withdrawn at the 2022 Interim Meeting.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the Committee heard comments from the floor. Ms. Diane Lee (NIST OWM) mentioned that other items have been taken out of this block. Will be working with Seraphin to come up with better language. Is maybe "Meter" more suitable. Should stay as Developing. Mrs. Tina Butcher (NIST OWM) submitted OTH 22.1 and will help develop more. Mr. Lou Straub (SMA) can support ABW-18.1 and AWS-18.1. Mr. Charles Stutesman (Kansas) has issues with term "master meter". Mr. Ivan Hankins (Iowa): why can't we use the term "prover" doesn't understand "transfer meter or master meter".

CWMA S&T Committee recommends item as Developing.

During the 2022 Annual Meeting Open Hearing this item was not discussed because it was withdrawn at the 2022 Interim Meeting.

ITEM BLOCK 2 (B2) A DEFINE TRUE VALUE FOR USE IN ERROR CALCULATIONS

B2: A SCL-20.3	A	S.5.4. Relationship of Minimum Load Cell Verification Interval to the Scale Division
B2: A SCL-20.4	A	Table 3. Parameters of Accuracy Classes.
B2: A SCL-20.5	A	Table S.6.3.a. Marking Requirements, Note 3.
B2: A SCL-20.6	A	T.N.1.2. Accuracy Classes and T.N.1.3. Scale Division.
B2: A SCL-20.7	A	Table 7. Maintenance Tolerances
B2: A SCL-20.8	A	Table 8. Recommended Minimum Load

NOTES:

1. At the 2020 NCWM Interim Meeting the committee agreed that GEN-20.1, SCL-20.1 and SCL-20.2 should be removed from Block 2 and given individual consideration. The items included in this block 2 are SCL-20.3, SCL-20.4, SCL-20.5, SCL-20.6, SCL-20.7 and SCL-20.8.

2. While this item was carried over from the 2020 Interim Meeting, it was not a voting item and therefore not discussed during the continuation of the 2020 Annual Meeting. Instead, it was placed on the 2021 Interim Meeting's agenda and was discussed during that meeting.

Source: Mr. Ross Andersen (Retired)

Purpose and Justification:
This proposal has four parts:

1. Clarify the concepts in determining error in verification,

2. Correct Code references to ensure correct reference to either e or d, as appropriate,

3. Correct Code references regarding issues of scale suitability Table 8, and

4. Explain why e and d are not connected

OWM Executive Summary for Item Block 2 (B2) – Define True Value for Use in Error Calculations

OWM Recommendation: OWM awaits the further revision of various items in this block by the TG assigned.

- The items in this block represent very significant changes to the Scales Code of NIST HB 44 in that they are an attempt to clarify which value: the value of the scale division (d) or verification scale division (e), are the paragraph requirements to be based. It is important that everyone agree, however, but this has not yet been the case.
- OWM disagrees with several of the changes proposed by the different items in this block as shown in the Committee's current agenda.
- The proposals in the Committee's current agenda were never updated, however, to reflect changes that members of the NCWM's Verification Scale Division (e) Task Group (TG) had agreed upon and included in TG's second report to the Committee.
- There seemed to be a misunderstanding between the TG and Committee on who would update the different items in this block to reflect the TG's second report and this effort was never completed.
- It was decided during the 2022 NCWM Interim Meeting that the Block 2 items would be reassigned to the TG for updating to reflect changes decided upon by the TG as indicated in its second report.
- OWM has been asked to continue its participation on the TG following the unexpected passing of Mr. John Barton, who had been serving as OWM's Technical Advisor to the group. Mr. Rick Harshman and Mr. Jan Konijnenburg plan to provide assistance in this regard.
- OWM looks forward to reviewing the updated versions of the different proposals in this block once they are made available by the TG.

Table 3. Summary of Recommendations

B2 – Define True Value for Use in Error

	V	D	W	A	I	Notes*	Comments
Submitter							
OWM				✓			
WWMA					✓		
SWMA				✓			
NEWMA				✓			
CWMA							
NCWM							

	Letters of Support	Letters of Opposition	Notes
Industry			

Table 3. Summary of Recommendations							
B2 – Define True Value for Use in Error							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**
Manufacturers							
Retailers and Consumers							

***Notes Key:**
1 - Submitted modified language
2 - Item not discussed
3 - No meeting held
4 - Not submitted on agenda
5 - No recommendation or not considered

Item under Consideration:

B2: SCL-20.3 A S.5.4. Relationship of Minimum Load Cell Verification Interval to the Scale Division

Amend Handbook 44, Scales Code as follows:

S.5.4. Relationship of Minimum Load Cell Verification Interval Value to the Scale Division *– The relationship of the value for the minimum load cell verification scale interval, v_{min}, to the verification scale division, ~~d~~ e, for a specific scale using National Type Evaluation Program (NTEP) certified load cells shall comply with the following formulae where N is the number of load cells in a single independent[1] weighing/load-receiving element (such as hopper, railroad track, or vehicle scale weighing/load-receiving elements):*

(a) $v_{min} \leq \frac{\sout{d}\ e}{\sqrt{N}}$ *for scales without lever systems; and*

(b) $v_{min} \leq \frac{\sout{d}\ e}{\sqrt{N} \times (scale\ multiple)}$ *for scales with lever systems.*

[1] "Independent" means with a weighing/load-receiving element not attached to adjacent elements and with its own A/D conversion circuitry and displayed weight.

~~*[*When the value of the scale division, d, is different from the verification scale division, e, for the scale, the value of e must be used in the formulae 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.N.8.1. Temperature under the 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 January 1, 1994]

(Added 1993) (Amended 1996**, ~~and~~** 2016**, and 20XX**)

B2: SCL-20.4 A Table 3. Parameters of Accuracy Classes.

Amend Handbook 44, Scales Code as follows:

Table 3. Parameters for Accuracy Classes			
Class	***Value of the Verification Scale Division e[1] ~~(d or e[1])~~***	***Number of Scale[4] Divisions (n)***	
		Minimum	***Maximum***
SI Units			
I	*equal to or greater than 1 mg*	*50 000*	*--*
II	*1 to 50 mg, inclusive*	*100*	*100 000*
	equal to or greater than 100 mg	*5 000*	*100 000*
III[2,5]	*0.1 to 2 g, inclusive*	*100*	*10 000*
	equal to or greater than 5 g	*500*	*10 000*
III L[3]	*equal to or greater than 2 kg*	*2 000*	*10 000*
IIII	*equal to or greater than 5 g*	*100*	*1 200*
U.S. Customary Units			
III[5]	*0.0002 lb to 0.005 lb, inclusive*	*100*	*10 000*
	0.005 oz to 0.125 oz, inclusive	*100*	*10 000*
	equal to or greater than 0.01 lb	*500*	*10 000*
	equal to or greater than 0.25 oz	*500*	*10 000*
III L[3]	*equal to or greater than 5 lb*	*2 000*	*10 000*
IIII	*greater than 0.01 lb*	*100*	*1 200*
	greater than 0.25 oz	*100*	*1 200*

[1] ~~For Class I and II devices equipped with auxiliary reading means (i.e., a rider, a vernier, or a least significant decimal differentiated by size, shape, or color), the value of the verification scale division "e" is the value of the scale division immediately preceding the auxiliary means.~~ The manufacturer may design a scale such that the verification scale division e does not be equal to the scale division d. To ensure the correct value for e is used, refer to marking requirements in footnotes 3 and 4 to Table S.6.3.a. and Table S.6.3.b.
(Amended 20XX)

[2] A Class III scale marked "For prescription weighing only" may have a verification scale division (e) not less than 0.01 g.

(Added 1986) (Amended 2003)

[3] The value of ~~*a*~~ ***the verification*** *scale division* ***(e)*** *for crane and hopper (other than grain hopper) scales shall be not be less than 0.2 kg (0.5 lb). The minimum number of scale divisions shall not be less than 1000.*

(Amended 20XX)

[4] On a multiple range or multi-interval scale, the number of divisions for each range independently shall not exceed the maximum specified for the accuracy class. The number of scale divisions, n, for each weighing range is determined by dividing the scale capacity for each range by the verification scale division, e, for each range. On a scale system with multiple load-receiving elements and multiple indications, each element considered shall not independently exceed the maximum specified for the accuracy class. If the system has a summing indicator, the n_{max} for the summed indication shall not exceed the maximum specified for the accuracy class.

(Added 1997)

[5] The minimum number of scale divisions for a Class III Hopper Scale used for weighing grain shall be 2000.)

[*Nonretroactive as of January 1, 1986*]

(Amended 1986, 1987, 1997, 1998, 1999, 2003, ~~**and**~~ 2004**, and 20XX)**

B2: SCL-20.5 A Table S.6.3.a. Marking Requirements, Note 3.

Amend Handbook 44, Scales Code as follows:

3. The device shall be marked with the nominal capacity. *The nominal capacity shall be shown together with the value of the scale division "****d"*** *(e.g., 15 × 0.005 kg, 30 × 0.01 lb, or capacity = 15 kg, d = 0.005 kg) in a clear and conspicuous manner and be readily apparent when viewing the reading face of the scale indicator unless already apparent by the design of the device. Each scale division value* ~~***or weight unit***~~ ***with its associated nominal capacity*** *shall be marked on multiple range or multi-interval scales.* ***In the absence of a separate marking of the verification scale division "e" (see Note 4), the value of the verification scale division e shall be equal to the value of the scale division d.***

   [Nonretroactive as of January 1, 1983]

   (Amended 2005 ***and 20XX****)*

B2: SCL-20.6 A T.N.1.2. Accuracy Classes and T.N.1.3. Scale Division.

Amend Handbook 44, Scales Code as follows:

T.N.1.2. Accuracy Classes. – Weighing devices are divided into accuracy classes according to the number of scale divisions (n) and the value of the verification scale division ~~(d)~~ (e).

T.N.1.3. Scale Division. – **This Code contains references to two types of scale divisions, the verification scale division (e) and the scale division (d) (see definitions in Appendix D.).** The tolerance for a weighing device is **in the order of magnitude of ~~related to the value of the scale division (d) or the value of~~** the verification scale division (e) and is generally expressed in terms of **~~d or~~ e. Other technical requirements may reference either the verification scale division (e) or scale division (d) as appropriate. The values of (e) and (d) are chosen by the manufacturer and are marked on the device pursuant to S.6.3., except that d is not used in reference to an analog device, such as an equal-arm balance, where the graduations do not correspond to units of weight.**

B2: SCL-20.7 A Table 6. Maintenance Tolerances

Amend Handbook 44, Scales Code as follows:

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

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

B2: SCL-20.8 A Table 8. Recommended Minimum Load

Amend Handbook 44, Scales Code as follows:

Table 8.
Recommended Minimum Load

Class	Value of Scale Division (d or e~~*~~)*	Recommended Minimum Load (d or e~~*~~)*
I	equal to or greater than 0.001 g	100
II	0.001 g to 0.05 g, inclusive	20
	equal to or greater than 0.1 g	50
III	All**	20
III L	All	50

Table 8. Recommended Minimum Load		
IIII	All	10
~~*For Class I and II devices equipped with auxiliary reading means (i.e., a rider, a vernier, or a least significant decimal differentiated by size, shape or color), the value of the verification scale division "e" is the value of the scale division immediately preceding the auxiliary means. For Class III and IIII devices the value of "e" is specified by the manufacturer as marked on the device; "e" must be less than or equal to "d."~~ ***Scales manufacturers are permitted to design scales where the value a verification scale division e differs from the displayed scale division d. If the marked value of e is less than the value of d, use e in interpreting the Table. In all other cases use the value of d. Refer to marking requirements for d and e in footnotes 3 and 4 to Table S.6.3.a. and Table S.6.3.b.*** ***(Amended 20XX)*** **A minimum load of 10 ~~d~~ **e** is recommended for a weight classifier marked in accordance with a statement identifying its use for special applications.		

(Amended 1990) **(Amended 20XX)**

NIST OWM Detailed Technical Analysis:

OWM looks forward to reviewing updates to the various items in this block once the NCWM Verification Scale Division (e) Task Group (TG) has completed its work amending the current proposals to reflect the agreed upon changes reported by the TG in its second report. Since there have been no updates to the different items in Block 2 since they were first submitted, OWM's analysis of this group of items remains unchanged from the 2022 NCWM Interim Meeting as follows:

It remains clear that not everyone agrees with the changes proposed by this block of items given that none of the four regional weights and measures associations, nor the SMA, all of which met in the fall of 2021, could recommend to the national S&T committee advancement of this block of items to a voting status. Two of the regional associations recommended the block be reassigned to the Verification Scale Division Task Group. The other two regional associations recommended the block be developing. The SMA supported further development and the work of the Verification Scale Division (e) Task Group. We too disagree with some of the changes proposed. Consequently, as a group of items considered together, OWM cannot support them.

Although we are aware of the existence of a second draft report from the Verification Scale Division (e) Task Group that we think proposes, or at least suggests, additional changes/updates to the items in this block, we do not believe any of the items in Block 6 have changed since that report was first made available to us. We are hopeful, however, that some of the proposals in this block have been updated (but not yet published) or will be updated in the very near future and those updates will resolve, at least some concerns. We base this hope on comments made by Mr. Henry Oppermann (Weights and Measures Consulting, LLC) during Committee open hearings at the 2021 NEWMA Interim Meeting. Mr. Oppermann reported during open hearings that he had talked to the submitter of this block of items and the two had reached agreement on some needed changes to the proposals. Mr. Oppermann commented also, that he thought those agreed upon changes had perhaps already been made. Consequently, the draft of Block 2 items in NEWMA's 2021 S&T Interim Meeting agenda was not, in Mr. Oppermann's opinion, the most recent draft. We are

somewhat encouraged by this news because we share at least some of Mr. Oppermann's concerns with respect to the current items in this block.

Further evidence that the proposals in the Committee's 2022 Interim Meeting agenda (i.e., NCWM Publication 15) may have been updated, but not yet published or widely distributed, are comments made by the Chairman of the Verification Scale Division (e) Task Group during Committee open hearings at the 2021 CWMA Annual meeting. That is, the CWMA's S&T 2021 Annual Report indicates that Mr. Doug Musick, who was Chairman of the Verification Scale Division (e) Task Group during its existence, provided updates from the Task Group and would be providing changes to the item to NCWM S&T Committee before the July NCWM Annual meeting. Based on our review and comparison of the Block 2 items in the CWMA's 2021 S&T Annual Meeting Agenda and the Committee's 2022 Interim Meeting agenda (i.e., NCWM Publication 15) none of the proposals have changed.

If there does, in fact, exist a more current draft of the proposals in Block 2 and that draft gets introduced on or before the 2022 NCWM Interim Meeting, we encourage the Committee to provide adequate time for review and discussion opposed to simply advancing any new draft for vote during the 2022 NCWM Interim Meeting. There are many changes proposed by this block of items (i.e., there are six individual items in all) and their significance should be of great enough concern to warrant, in our opinion, sufficient time for review and discussion, especially in light of the fact there still exists disagreement on the current proposals. As noted in earlier OWM comments and recommendations, the different proposals included in this block present several very significant changes to the Scales code of HB 44 with respect to the application of HB 44 requirements to scales having different values of e and d. Given these two values most often differ by a factor of ten, it is of utmost importance that everyone agree on which value is the application of the different HB 44 requirements to be based.

Summary of Discussions and Actions:

During the 2022 NCWM Interim Meeting, Mr. Rick Harshman (NIST OWM) commented that the items in this block represent very significant changes to the Scales Code of NIST HB 44 in that they are an attempt to clarify which value, the value of the scale division (d), or verification scale division (e), are the paragraph requirements to be based. It is important that everyone agree; however, but this has not yet been the case. Mr. Harshman noted that OWM disagreed with several of the changes proposed by the different items in this block as shown in the Committee's current agenda. Mr. Harshman also reported that the various Block 2 items in the Committee's current agenda fail to reflect changes agreed to by members of the NCWM's Verification Scale Division (e) Task Group (TG) as indicated in its second report to the Committee. That is, the proposals hadn't been updated following the TG's submission of its second report to the Committee. There seemed to be a misunderstanding between the TG and Committee on who would perform this work and it never got done. OWM looked forward to reviewing the proposals once this updating had been completed.

Mr. Doug Musick (Kansas) Chairman of the Verification Scale Division (e) TG acknowledged the accuracy of Mr. Harshman's reporting of the misunderstanding between the TG and Committee. He then requested the Committee either reassign the Block 2 items to the TG, or, if the Committee preferred, the Committee could perform the updating itself based on the TG's most recent report. Mr. Musick also noted that the TG's second report was included in Appendix A of the Committee's 2022 Interim Agenda (NCWM Publication 15).

Mr. Russ Vires (Mettler Toledo, LLC) speaking on behalf of the SMA stated that the SMA supports the further development of this item and the work of the Verification Scale Division (e) Task Group. The SMA

would also like to encourage the use of the terminology "Verification Interval" for "e" and "Scale Division" for "d" in every instance that it appears in this item.

The Committee also received several comments in support of reassigning the block of items to the TG for further revision.

The Committee, in consideration of the comments received, agreed to reassign the block of items to the Verification Scale Division (e) TG for additional updating.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearing the following comments were heard:

Mr. Matt Douglas (California - DMS): the language is not clear, recommend that this item be withdrawn. (the whole block)

Mr. Russell Vires (Scale Manufactures Association): this is a carryover item. SMA supports further development of this item, recommend that the SMA encourage the use of term: Verification Scale Interval for (e) and Scale Division for (d). (He can send info.) States that his comments are the same from the Annual meeting.

Ms. Diane Lee (NIST OWM): NIST OWM comments on this item are posted on NCWM website.

The WWMA S&T Committee recommends that this item remain Informational with concern given to the comments given during the WWMA open hearings. During the Committee work session, clarification was given regarding Committee member Mr. Matt Douglas' (California - DMS) testimony questioned whether or not the item provides assistance to an Inspector in the field in the performance of their job.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing Mr. Russ Vires (SMA) supported further development of this item and recommended the descriptive name changes for "e" and "d" as posted on the NCWM website.

This Committee recommends this item move forward with an Assigned status.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.

Mr. Rick Harshman (NIST OWM) recommends keeping this item in informational status due to the fact that the National S&T Committee has taken ownership and interpretations have been provided at NTEP and weighing sector meetings. Meeting notes are available on NCWM website.

Mr. Henry Opperman (Weights and Measures Consulting) objected to many of the blocked items and recommend to keep this item in Informational status.

Mr. Lou Staub (SMA) suggested the use of the term "verification scale interval" for "e" and "scale division" for "d".

Mr. John McGuire (New Jersey)- Recommends keeping the item in Informational status.

The NEWMA Specifications and Tolerances Committee recommends that this item be kept in Informational status.

During the 2022 Annual Meeting Open Hearings, Mr. Russ Vires (Mettler Toledo, LLC) speaking on behalf of the SMA recommended the identical changes to the individual items in Block 2 as shown in the SMA reporting contained within this report for the SMA's Spring 2022 meeting. Mrs. Tina Butcher (NIST OWM) indicated she believes the latest revisions from task group have addressed concerns.

After hearing comments from the floor, the Committee recognized the need to further develop this block and recommended the block retain Assigned status.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the Committee heard comments from the floor. Mr. Lou Straub (SMA) supports item. Would like to see it written that "scale division" will have value of "d" and "verification scale interval" for "e".

CWMA S&T Committee recommends that item be assigned back to the Verification Scale Division Task Group.

During the 2022 CWMA Annual Meeting Open Hearings the Committee received the following comments:

Mr. Russ Vires (SMA) - The SMA supports the further development of this item and the work of the Verification Scale Division (e) Task Group. Recommendation: The SMA would also like to encourage the use of the terminology "Verification Interval" for "e" and "Scale Division" for "d" in every instance that it appears in this item.

Mr. Loren Minich (Kansas) - Items shown under consideration are not the items the task group has submitted. The SMA recommendations conflict with current task group verbiage.

Mr. Doug Musick (Kansas) – This proposal got put into the National Committee Agenda Appendix for some reason. Hope to rebuild the task group and get cleaned up before 2022 national. "verification interval" should be "verification scale division" (e), and "displayed scale division" (d). Having (d) and (e) in the same original table was confusing to inspectors. The current task group changes won't be in Pub 16 for the 2022 National meeting.

Mr. Loren Minich (Kansas) - Prefers the S&T Committee to evaluate the Appendix since it's more up to date.

The CWMA S&T Committee recommends this item remain as Assigned.

SMA

During the 2021 Fall Meeting the SMA supports the further development of this item and the work of the Verification Scale Division (e) Task Group. The SMA would also like to encourage the use of the terminology "Verification Interval" for "e" and "Scale Division" for "d" in every instance that it appears in this item. The following changes are recommended to the individual items in this block:

B2: SCL-20.3 S.5.4 Relationship of Minimum Load Cell Verification Interval: No change
B2: SCL-20.4 Table 3. Parameters of Accuracy Classes
Recommendation: The SMA recommends the following change to Table 3, Footnote 1: ***The manufacturer may design a scale such that the ~~verification scale division~~ verification interval e does not ~~be~~ equal ~~to~~ the scale division d.***
B2: SCL-20.5 Table S.6.3.A. Marking Requirements, Note e: No Change
B2: SCL-20.6 T.N.1.1. Accuracy Classes and T.N.1.3. Scale Division
Recommendation: The SMA recommends the following change: **"… except that (d) is not used in reference…"**
B2: SCL-20.7 Table 7. Maintenance Tolerances
Recommendation: The SMA recommends the following change: **Table 6. Maintenance Tolerances**
B2: SCL-20.8 Table 8 Recommended Minimum Load
Recommendation: The SMA recommends the following change: ***Scales ~~manufacturers are permitted~~ may have ~~to design scales where the value~~ a verification ~~scale~~ interval ~~division~~ e ~~differs~~ not equal to ~~from~~ the displayed scale division d.***

During the 2022 Spring Meeting, the SMA reported it supported the further development of this item and the work of the Verification Scale Division (e) Task Group. The SMA would also like to encourage the use of the terminology "Verification Interval" for "e" and "Scale Division" for "d" in every instance that it appears in this item.

The SMA recommended the following changes to the individual items in Block 2:

B2: SCL-20.3 S.5.4 Relationship of Minimum Load Cell Verification Interval: No change
B2: SCL-20.4 Table 3. Parameters of Accuracy Classes
Recommendation: The SMA recommends the following change to Table 3, Footnote 1: ***Class I and II scales may be designed such that the ~~verification scale division~~ verification interval e does not ~~be~~ equal ~~to~~ the scale division d.***
B2: SCL-20.5 Table S.6.3.A. Marking Requirements, Note 3: No Change
B2: SCL-20.6 T.N.1.2. Accuracy Classes and T.N.1.3. Scale Division
Recommendation: The SMA recommends the following change: **"… except that (d) is not used in reference…"**
B2: SCL-20.7 Table 7. Maintenance Tolerances
Recommendation: The SMA recommends the following change: **Table 6. Maintenance Tolerances**
B2: SCL-20.8 Table 8. Recommended Minimum Load
Recommendation: The SMA recommends striking the following language from the submitter's proposal: ***~~Scales manufacturers are permitted to design scales where the value a verification scale division e differs from the displayed scale division d.~~***
Rationale: When taken with the SMA's recommendation for SCL-20.4, this will avoid duplication in the HB44 code.

Item Block 2 – Final Report of the Verification Scale Division Task Group

Participants:
Mr. Doug Musick, Chair (Kansas)
Mr. Ross Andersen (New York, Retired and original submitter of the item)
Mr. John Barton (NIST OWM)
Mr. Luciano Burtini (Measurement Canada)
Mr. Anthony Bong Lee (Orange County, California)
Mr. Steve Cook (California, Retired)
Mr. Darrell Flocken (NTEP)
Mr. Eric Golden (Cardinal Scale)
Mr. Jan Konijnenburg (Rice Lake Weighing Systems)
Mr. Richard Suiter (Richard Suiter Consulting)
Mr. Steve Timar (New York)
Mr. Howard Tucker (Florida)

The mission of the task group, as defined by the S&T Committee, is to review Handbook 44, Section 2.20. Scales and relevant portions of OIML R76, using the items included in S&T Agenda Items: Block 2 as a reference point, and recommend changes as necessary to:

1. Clarify how the error is determined in relation to the verification scale division (e) and the scale division (d)

2. Clarify which is the proper reference; the verification scale division (e) or the scale division (d) throughout this section

3. Ensure proper selection of a scale in reference to the verification scale division (e) and the scale division (d)

4. Clarify the relationship between the verification scale division (e) or the scale division (d)

This report is divided into three sections:

1. Clarify the relationship between e and d, i.e., ensure we understand the terms. (Mission items 4 and1)

2. Propose changes to the Scales Code, if necessary, to ensure the code correctly identifies e or d as appropriate to the code paragraph. (Mission items 2 and 3)

3. Address other issues that arose as potential problems that might require additional investigation beyond the scope of this workgroup.

PART 1. Clarify the Relationship Between e and d.

We begin by looking at current HB 44 definitions. The verification scale division e is used to express tolerance values and it is used in classification. The designations of e and the accuracy class are made by the manufacturer. The scale division d is a function of the actual scale function and display. Note that for weight classifiers, the weighing instrument may never display quantity at the resolution of e, and for ungraduated devices there is no scale division d to permit comparison to e.

verification scale division, value of (e). – A value, expressed in units of weight (mass) and specified by the manufacturer of a device, by which the tolerance values and the accuracy class applicable to the device

are determined. The verification scale division is applied to all scales, in particular to ungraduated devices since they have no graduations. The verification scale division (e) may be different from the displayed scale division (d) for certain other devices used for weight classifying or weighing in pre-determined amounts, and certain other Class I and II scales.[2.20]

scale division, value of (d). – The value of the scale division, expressed in units of mass, is the smallest subdivision of the scale for analog indication or the difference between two consecutively indicated or printed values for digital indication or printing. (Also see "verification scale division.") [2.20, 2.22]

scale division, number of (n). – Quotient of the capacity divided by the value of the verification scale division. [2.20]

$$n = \frac{Capacity}{e}$$

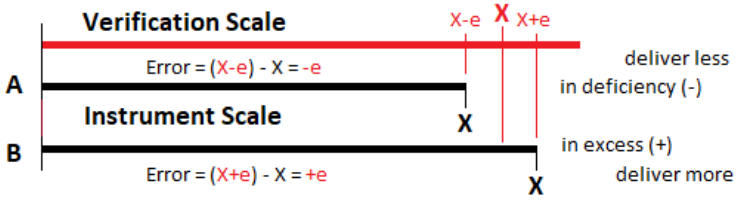
The values of e and d must be understood as referring to different things. The verification scale refers to the scale of measurement for the reference (or true value), think of the reference standard. The instrument scale refers to the scale of measurement of the instrument under test. Consider this assortment of instruments in the table below. It should be clear that the divisions of the verification scale do not always equal those on the instrument scale and may not even be in the same units. In addition, when we employ an artifact, like a test weight or slicker plate measure, the divisions of the verification scale are not visible since the artifact represents a single point on the measurement scale of the reference.

Instrument Scale	Scale div d	Verification "True Value" Scale	Scale div e	Relation e to d
Rule	$^1/_{16}$ in	Standard Rule or Tape	$^1/_{16}$ in	e = d
Taximeter	$^1/_{10}$ mi	Road Course	2 ft	e < d
LMD's	0.1 gal	Prover indication	5 cu in	e > d
Mass Flow Meter	1 lb	Reference Scale	0.01 lb	e < d
Weighing Devices	0.01 lb	Test Weight (artifact)	mfr choice	e < d, e = d, e > d
Test Measure	1 cu in	Slicker Plate (artifact)	?	e ? d

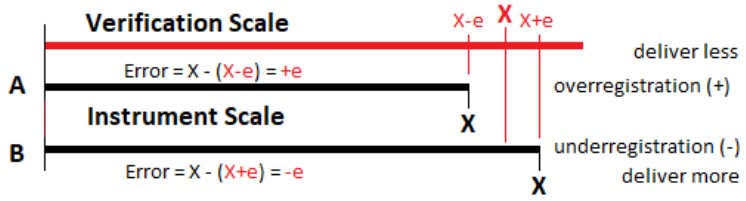
For weighing instruments, it turns out that e and d have no fixed relationship. It is different for weight classifiers (e < d), for most instruments (e = d), and for high resolution instruments (e>d). The critical point is that the instrument scale and the verification scale are independent of each other. Once you have disconnected e (declared by the manufacturer) from d (displayed on the instrument), it may now become evident that much of our confusion arose because we thought of them as connected in some way.

In the graphics below both error and tolerance are always expressed in terms of the divisions (e) of the verification scale. The primary assumption is that the verification scale is constant, and it is the displayed scales of the instruments we test that move. The scales in black are depicted as in error by +1 e or –1 e.

Error of delivery =
verification scale – instrument scale
+ in excess
– in deficiency

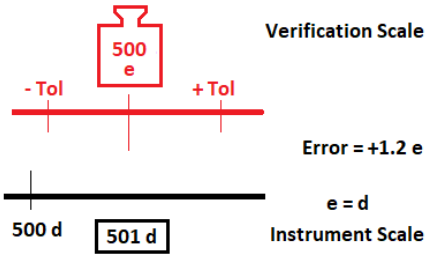


Error of Indication =
instrument scale – verification scale
+ overregistration
– underregistration

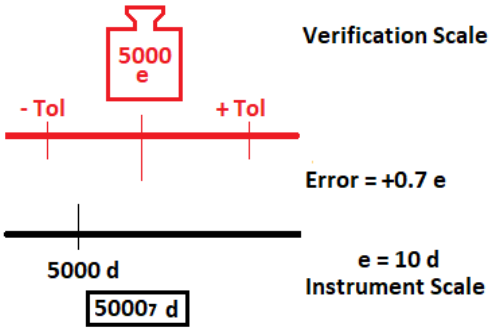


Much of our confusion arises because scales are tested using artifacts with no visible scale divisions. We could mirror this in the test of a fuel dispenser. Normally you stop the test at 5 gallons on the instrument scale and read the error as – 3 cu in from the test measure (verification) scale. Now change that procedure and stop the test at the zero mark on the test measure. How would you determine the error? Assume the instrument now reads 5.012 gal. The error is -0.012 gal (-3 cu in), and we calculate it as verification scale – instrument scale. We determined the error from the instrument scale. The verification scale division, however, did not switch from the test measure to the instrument simply because we changed the procedure. The verification scale division remains 1 cu in and is still on the test measure, the reference.

Consider the Class III scale at right where e = d. Technically you can't see divisions on either scale since the artifact has no visible divisions and the instrument is digital. The correct instrument indication of 500 d is 1.2 e short of 500 e on the verification scale. You could mirror this by applying 498.8 e of test weights to get indication of 500 d. It is not in tolerance, but only if you apply error weights in your test.



Consider the Class II scale at right where e = 10 d. You can't see divisions on either scale because the test weight is an artifact and the instrument are digital. The correct instrument indication of 50,000 d is short of the 5,000 e on the verification scale by 7 d. Thus, we say the error is +0.7 e. Error = instrument scale – verification scale. This instrument is clearly in tolerance. No error weights are necessary to see to finer than 1 e.



The principles of classification are found in the following HB 44 paragraphs. In principle, the manufacturer tells the official what accuracy is to be applied to the instrument.

T.N.1. Principles.

T.N.1.1. Design. – The tolerance for a weighing device is a performance requirement independent of the design principle used.

T.N.1.2. Accuracy Classes. – Weighing devices are divided into accuracy classes according to the number of scale divisions (n) and the value of the scale division (d).

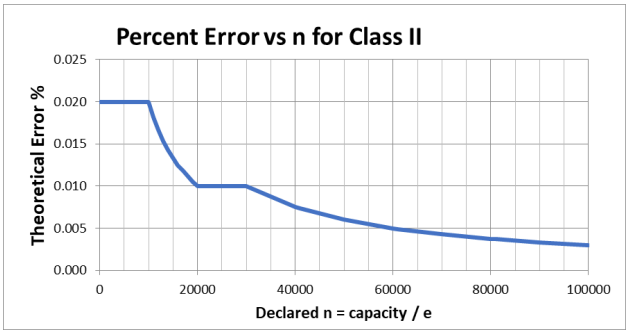
T.N.1.3. Scale Division. – The tolerance for a weighing device is related to the value of the scale division (d) or the value of the verification scale division (e) and is generally expressed in terms of d or e.

Yet, the T.N.1.2. and T.N.1.3. paragraphs conflict with the definitions. According to the definition of e, it is e "by which the tolerance values and the accuracy class applicable to the device are determined." When the Scales Code was drafted prior to adoption in 1984, it appears some things were lost in translation from the OIML R76 on which it was based. What was lost can be expressed as those things not included in HB44 and those things incorrectly translated in HB 44.

For example, R76 expresses the classification information in four required markings, and one auxiliary marking. R76 requires marking of Class, Max, e, and Min, and requires marking of d if different from e. Those markings describe the maximum and minimum loads and the relative accuracy. In contrast, HB44 requires marking of Class, capacity, and d, and requires marking of e if different from d. HB 44 does not require marking of minimum load. While R76 considers minimum load part of the class structure, HB 44 does not.

It is this switch of e and d that causes confusion because the translation of R76 to HB 44 lost some of the meaning. Much of the second part of this report covers the changes required to rectify the situation. The work group is attempting to ensure the Code states e when the requirement applies to e and d when it applies to d. The work group is also proposing to add important material from R76 that is missing.

Some additional confusion comes from the stepped tolerance structure. For example, it is common to think that the instrument gets 1 division of error over the first tolerance step (maintenance). The correct interpretation of the code requires the instrument maintain a % accuracy based on the number of divisions of load at the break points. The space under the step riser is not supposed to be used by the instrument provided you eliminate the rounding error.



Between 1 division and 10,000 divisions for Class II in R76, this is 0.02 %. At 10,000 e, 0.02 % is 2 e. At 1,000 e, 0.02 % is 0.2 e, and at minimum load of 50 e, 0.02 % is 0.01 e. The principle is: the larger the number of verification scale divisions (n) the more accurate the instrument must be, i.e. relative error. Section 2.2 of R76 makes this clear by stating that e represents absolute accuracy and n represents relative accuracy. The Scales Code has no parallel section. It is the relative accuracy that should be our focus, but that's not found in HB 44.

PART 2. Proposed changes to the Scales Code (related issues are grouped for convenience)

Group 1. Changes to clarify definitions relating to e.

verification scale division, value of (e). – A value, expressed in units of weight (mass) and specified by the manufacturer of a device, by which the tolerance values and the accuracy class applicable to the device are determined. The verification scale division is applied to all scales, in particular to ungraduated devices since they have no graduations. ~~The verification scale division (e) may be different from the displayed scale division (d) for certain other devices used for weight classifying or weighing in pre-determined amounts, and certain other Class I and II scales.~~[2.20]

(Amended 20XX)

The last sentence is explained fully in the technical requirements in the Code. The work group finds it unnecessary and believe it contributes to confusion.

verification scale division, number of (n). – Quotient of the capacity divided by the value of the verification scale division. [2.20]

$$n = \frac{Capacity}{e}$$

(Amended 20XX)

scale division, number of (n). – See "verification scale division, number of (n)"

The addition of the word "verification" to the definition of n is essential since without it the section refers to the scale division d. The second definition for n was added as a cross reference since the revision will move from the s section to the v section.

Group 2. Changes to ensure proper classification of instruments.

T.N.1.2. Accuracy Classes. – Weighing devices are divided into accuracy classes according to the number of verification scale divisions (n) and the value of the verification scale division ~~(d)~~ (e).

(Amended 20XX)

T.N.1.3. Verification Scale Division. – The tolerance for a weighing device is ~~related to the value of the scale division (d) or the value of the~~ in the order of magnitude of the verification scale division (e) and is generally expressed in terms of ~~d or~~ e.

(Amended 20XX)

These changes bring the principles in the T.N. section in agreement with the definitions. Classification is exclusively based on e.

Table 3.
Parameters for Accuracy Classes

Class	*Value of the Verification Scale Division (~~d or~~ e[1])*	*Number of Verification Scale[4] Divisions (n)*	
		Minimum	*Maximum*
	SI Units		
I	*equal to or greater than 1 mg*	*50 000*	--
II	*1 to 50 mg, inclusive*	*100*	*100 000*
	equal to or greater than 100 mg	*5 000*	*100 000*
III[2,5]	*0.1 to 2 g, inclusive*	*100*	*10 000*
	equal to or greater than 5 g	*500*	*10 000*

Table 3.
Parameters for Accuracy Classes

III L[3]	*equal to or greater than 2 kg*	*2 000*	*10 000*
IIII	*equal to or greater than 5 g*	*100*	*1 200*

The middle section of the table was not included for brevity. Notes continue below:

[1] ***~~For Class I and II devices equipped with auxiliary reading means (i.e., a rider, a vernier, or a least significant decimal differentiated by size, shape, or color), the value of the verification scale division "e" is the value of the scale division immediately preceding the auxiliary means.~~ <u>The verification scale division e does not always equal the displayed scale division d. To ensure the correct value for e is used, refer to required markings on the device (see also notes 3 and 4 in Table S.6.3.b.).</u>***

[2] *A Class III scale marked "For prescription weighing only" may have a verification scale division (e) not less than 0.01 g.*
(Added 1986) (Amended 2003)

[3] *The value of a <u>verification</u> scale division for crane and hopper (other than grain hopper) scales shall be not less than 0.2 kg (0.5 lb). The minimum number of <u>verification</u> scale divisions, <u>n,</u> shall be not less than 1000.*

[4] *On a multiple range or multi-interval scale, the number of <u>verification</u> divisions, <u>n,</u> for each range independently shall not exceed the maximum specified for the accuracy class. The number of <u>verification</u> scale divisions, n, for each weighing range is determined by dividing the scale capacity for each range by the verification scale division, e, for each range. On a scale system with multiple load-receiving elements and multiple indications, each element considered shall not independently exceed the maximum specified for the accuracy class. If the system has a summing indicator, the n_{max} for the summed indication shall not exceed the maximum specified for the accuracy class.*
(Added 1997)

[5] *The minimum number of <u>verification</u> scale divisions, <u>n,</u> for a Class III Hopper Scale used for weighing grain shall be 2000.*)

[*Nonretroactive as of January 1, 1986*]
(Amended 1986, 1987, 1997, 1998, 1999, 2003, ~~and~~ 2004 <u>and 20XX</u>)

The changes to the header of Table 3 ensure the classification is based on e consistent with the definitions and the principles in T.N.1. The scale division d is not involved in classification. This change should reduce confusion. The changes to the notes at the bottom of the table again ensure e is correctly referenced instead of d or the "scale division." Referencing "n" in notes 3, 4, and 5 ensure that it is referring to e since n = capacity / e.

Table S.6.3.a. Marking Requirements					
To Be Marked With ⇓	**Weighing Equipment**				
	Weighing, Load-Receiving, and Indicating Element in Same Housing or Covered on the Same CC[1]	**Indicating Element not Permanently Attached to Weighing and Load-Receiving Element or Covered by a Separate CC**	**Weighing and Load-Receiving Element Not Permanently Attached to Indicating Element or Covered by a Separate CC**	**Load Cell with CC (11)**	**Other Equipment or Device (10)**
Manufacturer's ID (1)	X	X	X	X	X
Model Designation and Prefix(1)	X	X	X	X	X
Serial Number and Prefix (2)	X	X	X	X	X (16)
Certificate of Conformance Number (CC) (23)	X	X	X	X	X (23)
Accuracy Class (17)	X	X (8)	X (19)	X	
Nominal Capacity (3)(18)(20)	X	X	X		
Value of Scale Division, "d"(~~3~~ 4)	X	X			
Value of Verification Scale Division, "e" (4 3)	X	X			
Temperature Limits (5)	X	X	X	X	

Note: The remainder of the table was not included for brevity.

The changes to column 1 in the 7th and 8th rows simply reverse the references to the notes in Table S.6.3.b. They reflect the primacy of e in classification, which is addressed in parallel changes to notes 3 and 4 in Table S.6.3.b. (see changes to Table S.6.3.b. below).

Table S.6.3.b.
Notes for Table S.6.3.a. Marking Requirements

1. Manufacturer's identification and model designation and *model designation prefix.**
   *[*Nonretroactive as of January 1, 2003*]

   (Also see G-S.1. Identification.) *[Prefix lettering may be initial capitals, all capitals or all lower case]*
   (Amended 2000)

2. *Serial number [Nonretroactive as of January 1, 1968] and prefix [Nonretroactive as of January 1, 1986].* (Also see G-S.1. Identification.)

3. The device shall be marked with the nominal capacity. *The nominal capacity shall be shown together with the value of the verification scale division, "e" (e.g., 15 × 0.005 kg, 30 × 0.01 lb, or capacity = 15 kg, ~~d~~ e = 0.005 kg) in a clear and conspicuous manner and be readily apparent when viewing the reading face of the scale indicator unless already apparent by the design of the device. Each verification scale division value ~~or weight unit~~ with its associated nominal capacity shall be marked on multiple range or multi-interval scales. In the absence of a separate marking of the scale division "d" (see Note 4), the value of the scale division "d" shall be equal to the value of the verification scale division "e."*
   [Nonretroactive as of January 1, 1983]
   (Amended 2005 and 20XX)

4. *Required only if different from ~~"d"~~ "e." This does not apply to an ungraduated device (equal arm scale) where the graduations do not refer to a fixed weight value.*
   [Nonretroactive as of January 1, 1986]
   (Amended 20XX)

The original Scales Code adopted 1984 made d the primary mandatory marking but this resulted in confusion. The changes make e the mandatory marking and now requires d only if different from e.

The changes regarding multiple range and multi-interval scales makes the note say what we have always been applying. The intent was for each range or subrange of the instrument to have marking of capacity and e. The "or weight unit" could refer to lb or kg, but that is clearly not the intent.

There is some concern if this might pose problems for existing equipment. If the marking is of the form "capacity 30 lb x 0.01 lb" the workgroup sees not conflict. However, markings in the form "capacity = 30 lb d = 0.01 lb" would cause a conflict as devices using that form would no longer conform with the proposed changes. The work group decided to refer this to the scale manufacturers to see if there are any devices in the marketplace that would be affected. We also learned that this might cause a conflict with Measurement Canada as they do see devices with markings of capacity= d=. Note this is not an issue when e ≠ d as both markings is already required by the combination of notes 3 and 4. If necessary, a note with qualification "devices manufactured before January 1, 20XX" could be added to accept existing scales marked with d = provided d = e.

S.1.2.2. Verification Scale ~~Interval~~ Division

The magnitude of the verification scale division e relative to the scale division d for different types of devices is given in Table S.1.2.2. Relative Magnitude of e to d.

Table S.1.2.2.
Relative Magnitude of e to d

Type of device (see Note)	Relative magnitude of e to d
Graduated, without an auxiliary indicating device	e = d
Graduated, with an auxiliary indicating device	e > d and e is chosen by the manufacturer according to Table 3. and S.1.2.2.1.
Graduated, and marked for use in special applications (weight classifier)	e ≤ d and e is chosen by the manufacturer according to Table 3. and S.1.2.2.4.

Note: Ungraduated devices, e.g. equal arm balances where the scale graduations do not represent a fixed weight quantity, are not included in this table since they have no scale divisions (d) to permit comparison with (e).

S.1.2.2.1. Class I and II Scales and Dynamic Monorail Scales. – If e ≠ d, the verification scale ~~interval~~ division "e" shall be determined by the expression:

$$d < e \leq 10\ d$$

If the displayed scale division (d) is less than the verification scale division (e), then the verification scale division shall be less than or equal to 10 times the displayed **scale** division.

The value of e must satisfy the relationship, $e = 10^k$ of the unit of measure, where k is a positive or negative whole number or zero. This requirement does not apply to a Class I device with d < 1 mg where e = 1 mg. If e ≠ d, the value of "d" shall be a decimal submultiple of "e," and the ratio shall not be more than 10:1. If e ≠ d, and both "e" and "d" are continuously displayed during normal operation, then "d" shall be differentiated from "e" by size, shape, color, etc. throughout the range of weights displayed as "d."

(Added 1999) **(Amended 20XX)**

S.1.2.2.2. Class I and II Scales Used in Direct Sales. *– When accuracy Class I and II scales are used in direct sale applications the value of the displayed division "d" shall be equal to the value of the verification scale interval "e."*
[Nonretroactive as of January 1, 2020; to become retroactive as of January 1, 2023]

(Added 2017)

S.1.2.2.3. Deactivation of a "d" Resolution. – It shall not be possible to deactivate the "d" resolution on a Class I or II scale equipped with a value of "d" that differs from "e" if such action affects the scale's ability to round digital values to the nearest minimum unit that can be indicated or recorded as required by paragraph G-S.5.2.2. Digital Indication and Representation.

(Added 2018)

S.1.2.2.4. Class III and IIII Scales. The value of "e" is specified by the manufacturer as marked on the device. Except for dynamic monorail scales, "e" must be less than or equal to "d."

(Added 1999)

~~**S.5.3.**~~ **S.1.2.2.5.** **Multi-Interval and Multiple Range Scales~~, Division Value~~.** – On a multi-interval scale ~~and~~ or a multiple range scale, the value of "e" shall be equal to the value of "d."

(Added 1986) (Amended 1995 and 20XX)

S.1.2.2.6. Class IIIL Scales. On Class IIIL scales the value of "e" shall equal the value of "d."

(Added 20XX)

Add new definition:

auxiliary indicating device. – a means to increase the display resolution of a weighing device, such as a rider or vernier on an analog device, or a differentiated least significant digit to the right of the decimal point on a digital device. [2.20]

(Added 20XX)

Section S.1.2.2. is a key part of understanding application of e and d. The first change was to make references uniform to verification scale "division" as used in all other parts of the code. This section currently uses the term verification scale "interval". Several additions of the term "scale' were also added to S.1.2.2.1. for clarity. Of note, R76 exempts Class I from the e not greater than 10 d requirement when e = 1 mg or less.

A major addition is the new text and table in T.1.2.2. This would create a parallel section in HB 44 to R76 section 3.1.2 and Table 2. This section describes four types of instruments:

1. Graduated without an auxiliary indicating device – most instruments e = d
2. Graduated with an auxiliary indicating device – Class I and II with high resolution e > d
3. Graduated & marked for special applications – weight classifiers (round down instruments) e < d
4. Ungraduated – equal arm balances where graduations don't refer to fixed weight quantities. No d

These four types also impact application of minimum load in Table 8.

The current S.5.3. was moved to this section as S.1.2.2.5. to keep these paragraphs dealing with the magnitude of e and d together. A new paragraph S.1.2.2.6. was added to address Class IIIL where e should always equal d. Now all classes (I, II, III, IIIL, and IIII) are covered in S.1.2.2. to clarify relative magnitude of e and d.

The addition of the definition rounds out the expansion of this section

~~S.5.4.~~ S.5.3. Relationship of Minimum Load Cell Verification Interval Value to the Verification Scale Division. *– The relationship of the value for the minimum load cell verification scale interval, v_{min}, to the verification scale division, ~~d~~ e, for a specific scale using National Type Evaluation Program (NTEP) certified load cells shall comply with the following formulae where N is the number of load cells in a single independent[1] weighing/load-receiving element (such as hopper, railroad track, or vehicle scale weighing/load-receiving elements):*

(a) $v_{min} \leq \frac{d^* e}{\sqrt{N}}$ *for scales without lever systems; and*

(b) $v_{min} \leq \frac{d^* e}{\sqrt{N} \times (\text{scale multiple})}$ *for scales with lever systems.*

~~*[*When the value of the scale division, d, is different from the verification scale division, e, for the scale, the value of e must be used in the formulae 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.N.8.1. Temperature under the 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 January 1, 1994]

(Added 1993) (Amended 1996, ~~and~~ 2016, and 20XX)

The renumbering resulted from the move of S.5.3. to the S.1.2.2. section as S.1.2.2.5. The other changes correctly reference e instead of d in this section. Technically, v_{min} for load cells corresponds to verification scale division e for weighing instruments. They are accuracy ratings declared by the manufacturer. There is no significant change for the inspector in properly referring to e since for scales where e = d the issue is moot and when e ≠ d the section already directed the use of e. With the change the inspector will always use e.

Group 3. Changes to clarify appropriate application of tolerances (Marked Scales)

Table 6.
Maintenance Tolerances
(All values in this table are in **verification** scale divisions **"e")**

	Tolerance ~~in Scale Divisions~~			
	1	**2**	**3**	**5**
Class	**Test Load**			
I	0 - 50 000	50 001 - 200 000	200 001 +	
II	0 - 5 000	5 001 - 20 000	20 001 +	

Table 6. Maintenance Tolerances (All values in this table are in **verification** scale divisions **"e")**						
	Tolerance ~~in Scale Divisions~~					
III	0 - 500	501 - 2 000	2 001 - 4 000	4 001 +		
IIII	0 - 50	51 - 200	201 - 400	401 +		
III L	0 - 500	501 - 1 000	(Add 1 ~~d~~ **e** for each additional 500 ~~d~~ **e** or fraction thereof)			

The proper reference in this section has always been e, and this is how it has always been interpreted. The current language says "scale divisions" which technically refers to d. This means we weren't following the Code. The removal of "in Scale Divisions" after Tolerances in the second row was made to provide parallel construction with the header for Test Load. The parenthetical at the top should be sufficient to cover both sections of the table.

The change for Class IIIL was made since e should be used to specify tolerances and we added S.1.2.2.6. requiring that d = e for this class.

T.N.3.4. Crane and Hopper (Other than Grain Hopper) Scales. – The maintenance and acceptance tolerances shall be as specified in T.N.3.1. Maintenance Tolerance Values and T.N.3.2. Acceptance Tolerance Values for Class IIIL, except that the tolerance for crane and construction materials hopper scales shall not be less than 1 e ~~d~~ or 0.1 % of the scale capacity, whichever is less.
(Amended 1986 and 20XX)

T.N.4.3. Single Indicating Element/Multiple Indications. – In the case of an analog indicating element equipped with two or more indicating means within the same element, the difference in the weight indications for any load other than zero shall not be greater than one-half the value of the verification scale division (e) ~~(d)~~ and be within tolerance limits.
(Amended 1986)

The reference to tolerances in T.N.3.4. and T.N.4.3. should follow the principle of expressing tolerances in e.

Group 4. Changes to clarify appropriate application of tolerances (Unmarked Scales)

T.1. General. – The tolerances applicable to devices not marked with an accuracy class shall have the tolerances applied as specified in Table T.1.1. Tolerances for Unmarked Scales.

Note: When Table T.1.1. refers to T.N. sections it shall be accepted that the scale division d on the unmarked scale always equals the verification scale division e.
(Amended 20XX)

Prior to 1984, tolerances were based on percentage of load for most scales. There was no concept of verification scale division e. In the T.N. section all tolerances are expressed in e. The note is added to clarify that d for the T. section is always equal to e from the T.N. section.

The work group noted that several specific paragraphs in the T. section for unmarked scales refer to tolerances in terms of d. Those sections are shown below. With the addition of the note to T.1. General, it was decided that it was not appropriate or necessary to change the d to e in these paragraphs.

T.2.2. General. – Except for scales specified in paragraphs T.2.3. Prescription Scales through T.2.8. Railway Track Scales: 2 d, 0.2 % of the scale capacity, or 40 lb, whichever is least.

T.2.4.2. With More Than One-Half Ounce Capacity. – 1 d or 0.05 % of the scale capacity, whichever is less.

T.2.7. Vehicle, Axle-Load, Livestock, and Animal Scales.

T.2.7.1. Equipped With Balance Indicators. – 1 d.

T.2.7.2. Not Equipped With Balance Indicators. – 2 d or 0.2 % of the scale capacity, whichever is less.

T.2.8. Railway Track Scales. – 3 d or 100 lb, whichever is less.

Group 5. Changes to clarify appropriate scale selection (reference Table 8)

Table 8.
Recommended Minimum Load

Class	Value of Verification Scale Division "e" ~~(d or e*)~~	Recommended Minimum Load in scale divisions "d" (See notes) ~~(d or e*)~~
I	equal to or greater than 0.001 g	100
II	0.001 g to 0.05 g, inclusive	20
	equal to or greater than 0.1 g	50
III	All**	20
III L	All	50
IIII	All	10

~~***For Class I and II devices equipped with auxiliary reading means (i.e., a rider, a vernier, or a least significant decimal differentiated by size, shape or color), the value of the verification scale division "e" is the value of the scale division immediately preceding the auxiliary means. For Class III and IIII devices the value of "e" is specified by the manufacturer as marked on the device; "e" must be less than or equal to "d."**~~

The displayed scale division d is not always equal to the verification scale division e. To ensure the correct values are used, refer to required markings on the device (see also notes 3 and 4 in Table S.6.3.b.).

For an ungraduated device, the scale division d shall be replaced with the verification scale division e in the last column.

******A minimum load of ~~**10 d**~~ **5 e** is recommended for a weight classifier marked in accordance with a statement identifying its use for special applications.

In the header, the change in column 2 references e and the change in column 3 references d and directs you to the notes. Currently, the Code references (d or e) in both columns which causes confusion. We're never sure which one to use. The justification for d in the last column follows below.

It is vital to understand that Table 8. is tied closely to Table 3. You will find that header to the first two columns in both tables, with these changes, will be identical. The work group also revised the * note to remove the * and use parallel text to revised note 1 of Table 3. The notes section contains two special exceptions to the general values in column 3 the table. The first directs you to use e in the last column for ungraduated instruments, as these have no d values. The second directs you to use a minimum load of 5 e for weight classifiers. This aligns the value with R76. Note that the use of d for weight classifiers leads to unusual situations. Two weight classifiers with 100 lb capacity and e of 0.05 lb should have the same minimum load. However, they might have very different d values, say 1 lb and 0.2 lb. Declaring minimum load as 10 d for these result in very large differences of 10 lb minimum load for the first instrument and 2 lb for the second. Since e < d for weight classifiers, the minimum load is correctly expressed in e.

Understanding Minimum Load

In R76, minimum load "Min" is included in the principles of classification, see 2.2. below. There are 4 mandatory markings; Class, Max, Min and e. When R76 was translated into HB 44 a conscious decision was made to remove Min from the classification and make it a user requirement. Thus, HB 44 only has 3 mandatory markings; Class, Capacity, and d. We have already proposed to change the d to e above.

> **2.2 Principles of the metrological requirements**
>
> The requirements apply to all instruments irrespective of their principles of measurement.
>
> Instruments are classified according to:
>
> - the verification scale interval, representing absolute accuracy; and
> - the number of verification scale intervals, representing relative accuracy.
>
> The maximum permissible errors are in the order of magnitude of the verification scale interval. They apply to gross loads and when a tare device is in operation they apply to the net loads. The maximum permissible errors do not apply to calculated net values when a preset tare device is in operation.
>
> A minimum capacity (Min) is specified to indicate that use of the instrument below this value is likely to give rise to considerable relative errors.

In R76, the issue of instrument accuracy is focused on Class, Max and e, parallel to HB 44. Absolute accuracy in terms of e and relative accuracy in terms of n. When the load is very small, i.e. less than Min, it might appear that R76 is addressing the large relative errors resulting in 1 e tolerance for some small number of e in load. However, this is not the case. The distinction is that Min applies to use of the instrument and not to testing of the instrument.

In testing under R76 tolerances, rounding errors are eliminated (see 3.5.3.2.). In practice this usually means error weights are used to resolve the instrument errors to at least 0.2 e (NTEP generally uses 0.1 e). In addition, R76 expects that instrument divisions are relatively uniform throughout the series. In order to get a +1 e error at 1 e load and still meet the requirement that the zero division be +/- 0.5 division wide, would require the 1 e divisions be 0 e wide (i.e. be skipped). To visualize in analog, imagine an indicator that starts at zero and jumps immediately to the 2 graduation. A load of 1 e would indicate 2 e. Likewise a load of 2 e would indicate 3 e and this pattern would repeat until the tolerance breakpoint, a load of 500 e would indicate 501 e. Then the second graduation after the break point would be skipped, i.e. the 502 e graduation.

A load of 501 e would indicate 503 e with a +2 e error. All the loads up to 20,000 e would now show a +2 e error. Instruments obviously should not, and DO NOT, operate that way.

If we assume instrument divisions are uniform, as R76 does, then the divisions should be accurate to about the relative % of the accuracy class. For Class II in the first step this is 0.02 %. Thus at 20 e load the maximum expected error (after eliminating rounding) should be in the order of 0.004 e, and not the 1 e permitted in the tolerance structure. So, what relative error can R76 be addressing when dealing with Min?

When an instrument is used in commerce, it is the rounding of the indication to ½ scale division that results in large relative errors. Consider a cannabis sale of 1.05 g when the division size is 0.1 g. The instrument must round off to either 1.0 g or 1.1 g. Either one produces an error in the weighment of 0.05 g. That's 4.8 % relative error in the weighment (0.05 g / 1.05 g) with an instrument that's supposed to be accurate to 0.02 %. It is this rounding error "in use" that produces the large relative errors addressed in Min in R76 and the minimum load in HB 44. This rounding error is a function of d, the displayed scale division, and not e. It is not a tolerance issue.

The confusion comes from the presentation of Min in terms of e in the last column of R76 Table 3. The table in R76 has an additional column for Min not found in HB 44. In HB 44 it has been relocated to Table 8. Looking closely at Table 8, you will find that the first two columns correspond to the first two columns in Table 3 in HB 44. So why does R76 express this column in e instead of d? I suspect they did it because all other values in Table 3 are in e. For instruments where e = d, the issue is moot. Note however, that R76 reveals the ties to d for the Class I and II instruments with an auxiliary indicating device (differentiated least significant digit). In 3.4.3. R76 directs that d replace e in the Min column of Table 3 for instruments with an auxiliary indicating device.

On an instrument where e = 10 d, we can create the same scenario as before but now with a load of 1.005 g. The instrument must now round to either 1.00 g or 1.01 g. The rounding error is now 0.50 % of the weighment (0.005 / 1.005). That is 10 times smaller at the same 20 e load.

Returning to the four types of instruments from revised S.1.2.2. and applying revised Table 8.:

1. Graduated without an auxiliary indicating device: minimum load in d
2. Graduated with an auxiliary indicating device: minimum load in d
3. Graduated and marked for special use (weight classifier): minimum load 5 e
4. Ungraduated (equal arm scales): minimum load in e

Group 6. Changes to correctly reference to e or d as appropriate.

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 verification scale division.

(b) A digital indicating device shall either automatically maintain a "center-of-zero" condition to ± ¼ verification scale division or less, or have an auxiliary or supplemental "center-of-zero" indicator that defines a zero-balance condition to ± ¼ of a verification 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) For electronic cash registers (ECRs) and point-of-sale systems (POS systems) the display of measurement units shall be a minimum of 9.5 mm ($^3/_8$ inch) in height.
[Nonretroactive as of January 1, 2021]

(Added 2019)

(Amended 1992, 2008, ~~and~~ 2019, and 20XX)

The changes correctly reference e in this section as this is an issue of ensuring the zero indication is accurate to ¼ e. Hence it is a tolerance properly expressed in terms of e.

T.N.9. Radio Frequency Interference (RFI) and Other Electromagnetic Interference Susceptibility. – The difference between the weight indication due to the disturbance and the weight indication without the disturbance shall not exceed one verification scale division ~~(d)~~ (e); or the equipment shall:

(a) blank the indication; or

(b) provide an error message; or

(c) the indication shall be so completely unstable that it cannot be interpreted, or transmitted into memory or to a recording element, as a correct measurement value.

The tolerance in T.N.9. Radio Frequency Interference (RFI) and Other Electromagnetic Interference Susceptibility is to be applied independently of other tolerances. For example, if indications are at allowable basic tolerance error limits when the disturbance occurs, then it is acceptable for the indication to exceed the applicable basic tolerances during the disturbance.

(Amended 1997 and 20XX)

This is a tolerance for reaction to a disturbance and is properly expressed in e.

Group 7. Identify appropriate application of code sections (in order of appearance)

When the paragraph references d it is referring to the actual scale division and the concern is how the instrument operates. When the paragraph references e it is referring to the verification scale division and the concern is in classification of the instrument or in accuracy of the displayed values.

The sections in the table below currently correctly reference e or d as appropriate. The text of each section is not included for brevity. The justification may help explain the general rules above.

Code Section	Applies to	Justification
G-S.5.2.2.(c)	d	Rounding is a function of instrument operation not accuracy
G-S.5.2.2.(d)	d	Requires "d" to be an indicated zero and all digits to the left of "d" to be zero when d<1.

Code Section	Applies to	Justification
		Requires "d" to be an indicated zero and all digits to the right of "d" to be zero when d>5.
S.1.2.	d	1, 2, or 5 refers to d which is rounded. When e ≠ d refer to section S.1.2.2. for value of e.
S.1.2.1	d	Refers to rounded values of d.
S.1.2.3.	e	This is a classification issue. It ensures accuracy of the piece counts.
S.1.7.(b)	e	This is a classification issue addressing maximum indication above capacity.
S.2.1.2.	d	They must be in terms of d since stability of zero setting applies to d.
S.2.1.3.(all)	d	These limit the window for action of AZT. They must be in terms of d since zero setting applies to d.
S.2.3.	d	Tare division must equal smallest increment displayed.
T.N.7.	d	Discrimination requires an instrument to discriminate to the displayed scale division (zone of uncertainty). This relates to the rounding of the smallest increment.
UR.3.7.	d	Minimum load is correctly expressed in d. (see Group 5 above)
UR.3.10.	e	As written, this is clearly e. (See issues for additional study)

PART 3. Issues Identified as Requiring Additional Study (outside the scope of this workgroup)

A. The work group was in consensus that we should expand requirements in S.2.1.2. relating to semi-automatic zero to apply to all scales and not just scales used in direct sale. In first place, suitability is a User Requirement and not a specification. Second, correct operation to set zero should be applicable to all digital instruments as it is in R76.

B. The application of tolerances to net loads has always been assumed, even before the Scales Code adoption in 1984. Comparing T.2. for unmarked scales and T.N.2.1. for marked scales reveals important differences particularly regarding net loads. As written, T.N.2.1. exempts calculated net, but it appears to apply to both semi-automatic tare and preset tare. A comparison to R76 shows that OIML limits applicability of tolerances. Their MPE's do not apply to calculated net values or when preset tare (keyboard or programmed tare) is in operation (section 2.2). It appears net loads have MPE's applied only when the net zero is set in compliance with S.1.1.1.(b) which requires accuracy of zero to ¼ division. This cannot be assured with preset tare or when net is based on two gross values. This has further ramifications to any case where all three (gross, tare and net) values are indicated/recorded for a transaction. OIML requires the gross and net weights be accurate but does not apparently require that the equation gross – tare = net be in mathematical agreement due to rounding issues. Note that in most transactions, the customer only gets one or two of the gross, tare or net values. Rounding issues do not arise for this reason. This may impact a current issue before NCWM dealing with printing tare on POS transaction receipts. Consider a POS transaction where the customer saw 1.02 lb on the weight display and sees 1.00 lb net and 0.03 lb tare. These are all accurate weights (and correct per R76) but the numbers don't' add up. The customer will claim they were overcharged by 0.01 lb since 1.02 lb – 0.03 lb = 0.99 lb.

C. The resolution of errors in testing scales was identified as an issue. The original proposal included a revision requiring resolution of error to at least 0.2 e. R76 specifically declares that errors be resolved to at

least 0.2 e to eliminate rounding error. HB 44 has no such provision and it might appear that rounding error is included in the tolerance. Instead of tolerance steps of 1, 2, etc., it could be argued that the tolerances are 1.5, 2.5, etc. as the result of direct reading. NTEP uses the R76 approach exclusively in testing, but it has no technical basis in the Code. There are obvious issues involved in using error weights in the field. The challenge is that you either eliminate rounding in determining tolerances or you don't. We have two standards at play at present. In addition, it can be argued that Class IIIL instruments are already high resolution somewhat similar to Class I and II instrument with e >d. Class IIIL devices have enough resolution to read errors to 0.2 e or 0.1 e of the equivalent Class III instrument without using error weight.
D. The UR.3.10. requirement that transactions from dynamic monorail scales be based on e raises issues. It was discussed since it involves both e and d. The displayed scale divisions equal to e (i.e. 10 d) are not normally rounded. If e = 10 d then the rounding point is not 5 up/4 down, as it is for d, but rather 9.5 up/0.5 down. Does this requirement mean the scale design has to produce a properly rounded value for the transaction that may be different from the display, e.g. 943.7 lb to d of 0.1 lb now must be recorded for the transaction as 944 lb? In addition, in brief discussion, it seemed there were many ways this could be interpreted. The workgroup concluded it would be beneficial to open some discussions with USDA and the manufacturers to explores some of these questions. This also addresses similar issues to the proposal to delete S.1.2.2.2. where questions of using e or d are impacting high precision scales in cannabis and jeweler's sales.

ITEM BLOCK 3 (B3) D TOLERANCES FOR DISTANCE TESTING IN TAXIMETERS AND TRANSPORTATION NETWORK SYSTEMS

B3: TXI-20.1 D T. Tolerances
B3: TNS-20.1 D T. Tolerances

Source: New York Department of Agriculture and Markets

Purpose and Justification:
Provide the same distance-measurement tolerances for the Taximeters Code and Transportation Network Systems Code.

OWM Executive Summary for Item Block 3 (B3) – Tolerances for Distance Testing in Taximeters and Transportation Network Systems

OWM Recommendation: OWM concurs with the three regional weights and measures associations that recommended additional development on this item. OWM continues to encourage the submitter to work with the USNWG and others to ensure that the modified proposal fully considers the technology used in TNMS as noted in the summary below.

- The submitters' March 2022 alternate proposal would permit a dual tolerance structure for vehicles within a single company or operating in the same geographic area.
- Work may need to be stepped up to address issues identified in the areas of design and function of indicating elements, provisions for sealing, and location services signal loss so that these provisions are in the code for properly operating this newer technology in taxis.

Table 3. Summary of Recommendations							
Item B3: TXI-20.1 D T. Tolerances							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**
Submitter	✓					1	Submitted modified proposal 3/23/22.
OWM		✓					
WWMA		✓					
SWMA		✓					
NEWMA		✓					
CWMA	✓					1	Recommendation based on the submitter's March 2022 modifications to the proposal.
NCWM		✓					

	Letters of Support	**Letters of Opposition**	**Notes**
Industry			
Manufacturers			
Retailers and Consumers			

***Notes Key:**
1 - Submitted modified language
2 - Item not discussed
3 - No meeting held
4 - Not submitted on agenda
5 - No recommendation or not considered

Item under Consideration:

The Item under Consideration published in the Committee's 2022 Interim Report is shown below.

B3: TXI-20.1 D T. Tolerances

Amend Handbook 44, Taximeters Code as follows.

T. Tolerances

T.1. Tolerance Values.

T.1.1. On Distance Tests. – Maintenance and acceptance tolerances for taximeters shall be as follows:

(a) On Overregistration: 1 % of the interval under test **when the distance is 1.6 km (1 mile) or less. 2.5 % of the interval under test when the distance is greater than 1.6 km (1 mile).**

B3: TNS-20.1 D T. Tolerances

Amend Handbook 44, Transportation Network Systems Code as follows:

T. Tolerances

T.1.1. Distance Tests. – Maintenance and acceptance tolerances shall be as follows:

(a) On Overregistration: ~~**2.5 %**~~ **1 % of the interval under test when the distance is 1.6 km (1 mile) or less. 2.5 % of the interval under test when the distance is greater than 1.6 km (1 mile).**

(b) On Underregistration: ~~**2.5 %**~~ **4 % of the interval under test.**

On March 23, 2022, the submitter requested the Committee replace the Item under Consideration shown in the 2022 S&T Interim Report with the following.

Modify NIST Handbook 44 Section 5.54 Taximeters Code as follows:

T.1. Tolerance Values.

T.1.1. On Distance Tests. – Maintenance and acceptance tolerances for taximeters shall be as follows:

T.1.1.1. Meters Using Distance generated from sources physically connected to the vehicle (e.g OBD sensor).

(a) On Overregistration: 1 % of the interval under test.

(b) On Underregistration: 4 % of the interval under test, with an added tolerance of 30 m or 100 ft whenever the initial interval is included in the interval under test.

T.1.1.2. Meters Using Distance generated from sources not physically connected to the vehicle (e.g navigation satellite system such as GPS and /or other location services).

(a) On Overregistration: 2.5 %

(b) On Underregistration: 2.5 %

Withdraw the TNMS portion of the original proposal and leave the existing TNMS Code as it currently appears in NIST Handbook 44.

NIST OWM Detailed Technical Analysis:

OWM appreciates the efforts of the submitter to harmonize the tolerance requirements in the Taximeters Code and the TNMS Code although, we do not believe it is necessary to increase the tolerance allowed since taximeters have been required to comply with the existing tolerances for decades.

OWM also notes that TNMS do not typically assess fare charges based on intervals as do taximeters. Taximeters will accumulate fare charges by summing the number of intervals comprising the trip's distance traveled and time elapsed and multiplying by the appropriate rate. In contrast, TNMS typically base the fare charges on the total distance (and time in some cases) for the trip. For this reason, we do not believe it is necessary to amend paragraphs T.1.1.(a) and (b) to refer to "interval under test" as is shown in the proposal. OWM recommends that this proposal be further developed with the assistance of the NIST USNWG on Taximeters in such a way that will better align the HB 44 Taximeters and TNMS Codes.

The NIST led U.S. National Work Group (USNWG) on Taximeters has held virtual meetings in May, June, and October 2020 and June 2021 to further develop standards for both taximeters and TNMS. The focus of these meetings was the merger of the existing HB 44 Taximeters Code and the tentative TNMS Code. Those members attending these meetings were in general agreement that this is the appropriate direction the work group should take. The USNWG also began discussions on some of the areas to be addressed in a unified "Transportation-for-Hire Systems" Code that could present challenges in the development of appropriate requirements. Those areas included the design and function of indicating elements, provisions for sealing, and location services signal loss.

The submitter of the proposal (New York or NYS) has agreed to work with the USNWG to further develop this proposal and is actively participating in those meetings. The submitter explained to the USNWG that some of the more recent systems submitted to the state of New York for type approval have not been able to comply with the existing taximeter tolerances. This failure was seen in systems that attempted to use location services (i.e., GPS) to measure distance. In response to that point, it was noted that other systems have been able to meet those tolerances and to expand the tolerances would be an approach that is not supported by most in the weights and measures community.

Also included as a topic in the meetings was this proposal submitted to the NCWM S&T Committee to amend the HB 44 Taximeters and TNMS Codes. The USNWG agreed that the two HB 44 Codes should be merged and that this could be accomplished by continuing its efforts in the future.

NIST OWM is aware that the developer of the proposal was not able to provide updates to the proposal in January 2022 because of technical difficulties with audio-visual equipment at the NCWM Interim Meeting. The NYS alternate proposal modifies only the Taximeter Code tolerances and was made available on March 23, 2022 on the NCWM website. This update was noted in the CWMA and NEWMA Annual Meeting summaries. The NYS alternate proposal establishes a new set of taximeter over- and under-registration tolerances at 2.5 % which are equivalent to those applied to TNMS. The current tolerances remain in place when the taximeter source for distance measurements is connected to the vehicle. The proposed new tolerances apply when the taximeter's source for distance measurement is generated from equipment not physically connected to the vehicle such as a GPS. This mechanism for generating measurement data from sources not physically connected to the vehicle is similar in the operation of a TNMS.

On March 23, 2022, NYS also withdrew the portion of Block 3 designated as B3: TNS-20.1 T. Tolerances, and no longer recommends modifying Transportation Network Measurement Systems -Tentative Code paragraph T.1.1. Distance Tests maintenance and acceptance tolerances for over- and under-registration and to reestablish the limits of permissible error of the TNMS under test as a percentage of the interval under test and distance traveled over the test course.

Based on the methodology used to determine distance traveled the proposal would permit a dual tolerance structure for vehicles within a single company or operating in the same geographic area. Work may need to be stepped up to address issues identified in the areas of design and function of indicating elements,

provisions for sealing, and location services signal loss so that these provisions are in the code for properly operating this newer technology in taxis.

Summary of Discussions and Actions:

At the 2022 NCWM Interim Meeting, the Committee assigned a developing status for this item at the 2022 Interim Meeting. The committee recommends the submitter work with the USNWG on this proposal. As noted in open hearings this is an item on the USNWG agenda and there may be efforts on the way to address this issue by other means.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearing the following comments were heard:

Mr. Kurt Floren (Los Angeles County, California): This coincides with previous comments: new tech with GPS tracking and network companies are out. We are now taking age-old tech that's meeting 1 % tolerance and proposing to expand the tolerance (existing equipment has been meeting with no issues). He does not support this item until the data has been evaluated. He recommends this item to remain developmental until more data is available.

The WWMA S&T Committee recommends the status remain Developmental.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing the Committee heard no comments on this item.

This committee recommends this item remain a Developing item so that the involved parties have more time to find a way to align the tolerances in the Handbook.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.

Mr. Jim Willis commented to explain the relationship of the two systems. Taxi Meters vs Transportation Network Systems and the different tolerances that are applied. The tolerances are different in the HB 44 and therefor when a taxi meter using satellite technology is used, the tolerance is tighter and therefore the playing field is not level.

Mr. Lou Sakin (Hopkinton/Northbridge, Massachusetts) asked if industry has commented or questioned this procedure. Jim Willis (New York) was not aware at the time. Lou Sakin (Hopkinton/Northbridge, Massachusetts) further commented that if the playing field is not level, then he recommends a Voting status.

Ms. Juana Williams (NIST OWM) commented and recommended that the submitter work with the work group to fully develop the code.

The NEWMA Specifications and Tolerances Committee recommends that this item be given Developing Status with continued involvement with the National Taxi Meter Work Group.

During the 2022 Annual Meeting Open Hearing comments were heard from the floor. Mr. Jim Willis (New York) has submitted some updated language and asks that this item continue to be developing.

After hearing comments from the floor, the Committee recognized the need to further develop this block and recommended the block retain developing status. NEWMA recommends this proposal as a Developing Item on the NCWM agenda.

Central Weights and Measures Association

During the 2021 Interim Meeting: The committee heard comments from the floor. Ms. Diane Lee (NIST) comments are in report on NCWM website.

CWMA S&T Committee recommends the item move forward as a developing item.

During the CWMA 2022 Annual Meeting limited questions were heard and an update to the proposal from the submitter. Charlie Stutesman (Kansas) – Interested to know why the tolerance isn't consistent with underregistration and overregistration. The submitter of this item provided an updated proposal on March 23, 2022, which is posted on the NCWM website. This update clarified the tolerances for TXI-20.1 and recommended withdrawal of TNS-20.1.

The CWMA S&T Committee recommends withdrawal of TNS-20.1 per the submitter's request. The Committee recommends that TXI-20.1 proceed to voting status as presented in the March 23, 2022, updated proposal:

T.1. Tolerance Values.

T.1.1. On Distance Tests. – Maintenance and acceptance tolerances for taximeters shall be as follows:

T.1.1.1. Meters Using Distance generated from sources physically connected to the vehicle (e.g., OBD sensor).

(a) On Overregistration: 1 % of the interval under test.

(b) On Underregistration: 4 % of the interval under test, with an added tolerance of 30 m or 100 ft whenever the initial interval is included in the interval under test.

T.1.1.2. Meters Using Distance generated from sources not physically connected to the vehicle (e.g., navigation satellite system such as GPS and/or other location services).

(a) On Overregistration: 2.5 %

(b) On Underregistration: 2.5 %

CWMA recommends withdrawal of TNS-20.1 and that TXI-20.1 as modified be presented as a Voting Item on the NCWM agenda.

ITEM BLOCK 4 (B4) D ELECTRONICALLY CAPTURED TICKETS OR RECEIPTS

(**Note:** The Item under Consideration reflects changes that were received by the committee from the submitter of the item and that the Committee agreed to during its 2021 Interim Meeting work session. The changes are highlighted.)

B4: GEN-21.2	D	G-S.5.6. Recorded Representations.
B4: LMD-21.2	D	S.1.6.5. Money Value Computations., UR.3. Use of a Device.
B4: VTM-21.1	D	S.1.1. Primary Elements., UR.2. User Requirements
B4: LPG-21.1	D	S.1.1. Primary Elements., UR.2. User Requirements
B4: CLM-21.1	D	S.1.4.1. ~~Printed Ticket~~ Recorded Representation., UR.2.6.3. ~~Printed Ticket~~ Recorded Representation.
B4: MLK-XX-X	D	S.1.4.2 ~~Printed Ticket~~ Recorded Representation., UR.2.2. ~~Printed Ticket~~, Recorded Representation.
B4: MFM-21.2	D	S.6. ~~Printer~~ Recorded Representations., UR.2.6. ~~Ticket Printer~~, Customer Ticket, Recorded Representation., UR.3.4. ~~Printed Ticket~~. Recorded Representation.
B4: CDL-21.1	D	S.1.4.1. ~~Printed Ticket~~ Recorded Representations., UR.2.4.2. ~~Tickets or Invoices.~~ Recorded Representation.
B4: HGM-21.1	D	S.2.6. Recorded Representations, Point of Sale Systems., S.6. ~~Printer.~~ Recording Element., UR.3.2. Vehicle-mounted Measuring Systems ~~Ticket Printer~~ Recording Element., UR.3.3. ~~Printed Ticket.~~ Recorded Representation.
B4: OTH-21.2	D	Appendix D - Definitions.: recorded representations, recording element.

Source: Kansas Department of Agriculture, Division of Weights and Measures

Purpose and Justification:
Allow recorded values to be captured electronically as an alternative to a printed ticket or receipt.

In 2014 G-S.5.6. was added to Handbook 44 to allow for the issuance of electronic receipts. At that time the use of the term “print”, and all variations on the word “print” was not fully addressed.

The Oxford Dictionary defines print as “a mechanical process involving the transfer of text, images, or designs to paper.”

The Oxford Dictionary defines record as: to “set down in writing or some other permanent form for later reference, especially officially.”

Values that are delivered via electronic means are recorded values and not necessarily printed vales. Printed indicates that a value has been transferred on to a hard document. While the intent of the 2014 amendment was to allow for the use of electronic receipts the terminology used is incorrect. In addition to receipts, there are instances where other information may be transmitted electronically.

When applying G-A.2. to weighing and measuring devices,

> **G-A.2. Code Application.** – This General Code shall apply to all classes of devices as covered in the specific codes. The specific code requirements supersede General Code requirements in all cases of conflict.
>
> (Amended 1972)

Multiple conflicts arise in the implementation of the 2014 Amendment of G-S.5.6. This is to clarify the terminology in Handbook 44 and to recognize the changing technology in how transactions are recorded, and the information is disseminated.

OWM Executive Summary for Item Block 4 (B4) – Electronically Captured Tickets or Receipts

OWM Recommendation: Although NIST OWM feels that all proposed changes would benefit from additional review, NIST OWM believes that the additional changes made to G-S.5.6 provides clarity. NIST OWM believes a Developing status is appropriate so that changes to the B4 specific codes are carefully reviewed to ensure the proposed changes do not change the original intent of the specific section before moving these items forward for a vote.

- Most of the changes proposed by NIST OWM are included in the proposal, except for the recommendation that "However" be removed from the General Code requirement in this proposal. We recommend that "However" be removed.

Table 3. Summary of Recommendations

Item Block 4 – Electronically captured tickets or receipts

	V	D	W	A	I	Notes*	Comments
Submitter							• Proposed Revisions by Submitter (09-28-2020) • Further Comments (01-13-2021)
OWM		✓					
WWMA		✓					
SWMA		✓					
NEWMA		✓					
CWMA		✓					
NCWM							

	Letters of Support	Letters of Opposition	Notes
Industry			
Manufacturers			
Retailers and Consumers			

***Notes Key:**

1 – Submitted modified language
2 – Item not discussed
3 – No meeting held
4 – Not submitted on agenda
5 – No recommendation or not considered

Item under Consideration:

B4: GEN-21.2D G-S.5.6. Recorded Representations.

Amend Handbook 44, General Code as follows**:**

G-S.5.6. Recorded Representations. – Insofar as they are appropriate, the requirements for indicating and recording elements shall also apply to recorded representations. All recorded values shall be ~~**printed provided**~~ **presented** digitally. In applications where recorded representations are required **by a specific code**, the customer may be given the option of not receiving the recorded representation. **Unless otherwise specified, recorded representations referenced in specific codes shall be made available to the customer as a minimum in hard copy form. However,** for systems equipped with the capability of issuing an electronic receipt, ticket, or other recorded representation, the customer may be given the option to receive any required information electronically (e.g., via cell phone, computer, etc.) in lieu of or in addition to a hard copy.

(Amended 1975, 2014 and **20XX**)

B4: LMD-21.2 D S.1.6.5. Money Value Computations., UR.3. Use of a Device.

Amend Handbook 44, Liquid Measuring Devices Code as follows**:**

S.1.6.5. Money-Value Computations

…

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

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

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

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

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

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

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

[Nonretroactive as of January 1, 2008]

(Added 2007) **(Amended 20XX)**

S.1.6.7. Recorded Representations. *– Except for fleet sales and other price contract sales and for transactions where a post-delivery discount is provided, a* ~~***printed***~~ *receipt providing the following*

information shall be available through a built-in or separate recording element for all transactions conducted with point-of-sale systems or devices activated by debit cards, credit cards, and/or cash:

*(a) the total volume of the delivery;**

(b) the unit price;**

*(c) the total computed price;**

(d) the product identity by name, symbol, abbreviation, or code number; and*

*(e) the dispenser designation by either an alphabetical or numerical description.***
[Nonretroactive as of January 1, 1986] *[Nonretroactive as of January 1, 2021]*
(Added 1985) (Amended 1997, 2012, 2014, 2018 and **20XX**)

S.1.6.8. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided. – Except for fleet sales and other price contract sales, a ~~**printed**~~ receipt providing the following information shall be available through a built-in or separate recording element that is part of the system for transactions involving a post-delivery discount:

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

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

(1) total volume of the delivery;

(2) unit price; and

(3) total computed price of the fuel sale.

(c) an itemization of the post-delivery discounts to the unit price;

(d) the final total price of the fuel sale after all post-delivery discounts are applied; and

(e) the dispenser designation by either an alphabetical or numerical description.
[Nonretroactive as of January 1, 2021]
(Added 2012) (Amended 2014**,** ~~**and**~~ 2018**, and 20XX**)

…

UR.3. Use of a Device

…

UR.3.3. Computing Device – Any computing device used in an application where a product or grade is offered for sale at one or more unit prices shall be used only for sales for which the device computes and displays the sales price for the selected transaction.
(Became retroactive 1999)
(Added 1989) (Amended 1992)

The following exceptions apply:

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

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

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

(Added 1993)

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

(Added 1993)

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

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

(Amended 2014)

(2) all purchases of fuel are accompanied by a receipt recorded by the system. The receipt shall contain:

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

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

1. total volume of the delivery;

2. unit price; and

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

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

d. the final total price of the fuel sale.

(Added 2012) (Amended 2014)

(Added 1989) (Amended 1992, 1993, 2012, ~~**and**~~ 2014**, and 20XX**)

UR.3.4. ~~**Printed Ticket.**~~ **Recorded Representation.** – 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**~~ **recorded** by the device ~~**or in clear hand script,**~~ on any ~~**printed ticket issued by a device and**~~ **recorded representation** containing any one of these values **and shall comply**

with G-S.5.6. Establishments where no product grades are repeated are exempt from the dispenser designation requirement.
**[Nonretroactive as of January 1, 2021]*
(Amended 2001, 2018, ~~and~~ 2019**, and 20XX**)

B4: VTM-21.1 D S.1.1. Primary Elements., UR.2. User Requirements

Amend Handbook 44, Vehicle Tank Meter Code as follows**:**

S.1.1. Primary Element

S.1.1.1. General. – A meter shall be equipped with a primary indicating **element.** ~~**and may also be equipped with a primary recording element.**~~ **Except for systems used solely for the sale of aviation fuel into aircraft and for aircraft-related operations, a meter shall be equipped with a primary recording element.**
(Amended 1993 **and 20XX**)

~~**Note: Except for systems used solely for the sale of aviation fuel into aircraft and for aircraft-related operations, vehicle-tank meters shall be equipped with a primary recording element as required by paragraph UR.2.2. Ticket Printer; Customer Ticket. Recorded Representation**~~
~~**(Amended 1993 and 20XX)**~~

…

S.1.4.2. ~~**Printed Ticket.**~~ **Recorded Representation.** – If a computing-type device issues a ~~**printed ticket**~~ **recorded representation** which displays the total computed price, the ~~**ticket**~~ **recorded representation** shall ~~**also have printed clearly thereon**~~ **record** the total quantity of the delivery, the appropriate fraction of the quantity, and the price per unit of quantity.
(Amended 1989, **and 20XX**)

…

UR.2. User Requirements.

…

UR.2.2. ~~**Ticket Printer, Customer Ticket**~~ **Recording Element.** – Vehicle-Mounted metering systems shall be equipped with ~~**a ticket printer which shall be used for**~~ **means to record** all sales where product is delivered through the meter **and shall comply with G-S.5.6.** A copy of the ticket issued by the device shall be ~~**left with**~~ **provided to** the customer at the time of delivery or as otherwise specified by the customer.
(Added 1993) (Amended 1994**, and 20XX**)

B4: LPG-21.1 D S.1.1. Primary Elements., UR.2. User Requirements

Amend Handbook 44, LPG and Anhydrous Ammonia Liquid-Measuring Devices Code as follows**:**

S.1.1. Primary Elements.

S.1.1.1. General. – A meter shall be equipped with a primary indicating element and may also be equipped with a primary recording element.

Note: Vehicle-mounted metering systems shall be equipped with a primary recording element as required by paragraph UR.2.6. ~~**Ticket Printer; Customer Ticket**~~.**Recorded Representation (Amended 20XX)**

…

S.1.1.6. ~~Printed Ticket.~~ Recorded Representation – Any ~~**printed ticket issued**~~ **recorded representation created** by a device of the computing type ~~**on**~~ which ~~**there is printed**~~ **includes** the total computed price, shall ~~**have printed clearly**~~ **also include** thereon the total volume of the delivery in terms of liters or gallons, and the appropriate decimal fraction of the liter or gallon, and the corresponding price per liter or gallon.
(Added 1979) (Amended 1987**, and 20XX**)

…

S.1.5.5. Recorded Representations for Transactions Where a Post-Delivery Discount(s) is Provided. – Except for fleet sales and other price contract sales, a ~~**printed receipt**~~ **recorded representation** providing the following information shall be available through a built-in or separate recording element that is part of the system for transactions involving a post-delivery discount:

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

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

(1) total volume of the delivery;

(2) unit price; and

(3) total computed price of the fuel sale.

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

(d) the final total price of the fuel sale after all post-delivery discounts are applied.

(Added 2016) **(Amended 20XX)**

…

UR.2. User Requirements.

…

UR.2.6. ~~Ticket Printer, Customer Ticket.~~ Recorded Representation– Vehicle-Mounted metering systems shall be equipped with ~~**a ticket printer which shall be used for**~~ **means to record** all sales where product is delivered through the meter **and shall comply with G-S.5.6**. A copy of the ~~**ticket**~~ **recorded representation** issued by the device shall be ~~**left with**~~ **provided to** the customer at the time of delivery or as otherwise specified by the customer.

(Added 1993<u>2</u>) (Amended 1994**<u>, and 20XX</u>**)

…

UR.2.7.2. Computing Device. – Any computing device used in an application where a product or grade is offered for sale at one or more unit prices shall be used only for sales for which the device computes and displays the sales price for the selected transaction. The following exceptions apply:

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

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

(1) all purchases of fuel are accompanied by a ~~**printed receipt**~~ **<u>recorded representation</u>** of the transaction containing the applicable price per unit of measure, the total quantity delivered, and the total price of the sale; and

(2) unless a dispenser complies with S.1.5.1. Display of Unit Price, the price posted on the dispenser and the price at which the dispenser is set to compute shall be the highest price for any transaction which may be conducted.

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

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

(2) all purchases of fuel are accompanied by a receipt recorded by the system for the transaction containing:

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

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

1. total volume of the delivery;

2. unit price; and

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

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

d. the final total price of the fuel sale after all post-delivery discounts are applied.

(Added 2016) **<u>(Amended 20XX)</u>**

B4: CLM-21.1 D S.1.4.1. ~~Printed Ticket~~Recorded Representation., UR.2.6.3. ~~Printed Ticket~~Recorded Representation.

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

S.1.4.1 ~~Printed Ticket~~ Recorded Representation –Any **~~printed ticket~~ recorded representation** issued by a device of the computing type ~~on~~ which **~~there is printed~~ includes** the total computed price shall **~~have printed clearly thereon~~** also **include** the total quantity of the delivery, and the price per unit.

(Amended **20XX**)

And

UR.2.6.2. ~~Tickets or Invoices~~. Recorded representation– Any **~~written invoice, or printed ticket,~~ recorded representation** based on a reading of a device that is equipped with an automatic temperature or density compensator shall have shown thereon that the quantity delivered has been adjusted to the quantity at the NBP of the specific cryogenic product or the equivalent volume of gas at NTP.

(Amended 20XX)

UR.2.6.3. ~~Printed Ticket.~~ Recorded Representation. – Any **~~printed ticket issued~~ recorded representation provided** by a device of the computing type **~~on~~** which **~~there is printed~~ includes** the total computed price, the total quantity of the delivery, or the price per unit, shall also **~~show~~ include** the other two values**~~. (either printed or in clear hand script).~~ and shall comply with G-S.5.6**.

(Amended 20XX)

B4: MLK-21.1 D S.1.4.2. ~~Printed Ticket~~ Recorded Representation., UR.2.6.3. ~~Printed Ticket~~Recorded Representation.

Amend Handbook 44, Milk Meter Code as follows**:**

S.1.4.2. ~~Printed Ticket~~ Recorded Representation – If a computing-type device issues a **~~printed ticket~~ recorded representation** which **~~displays~~ includes** the total computed price, the **~~ticket~~ recorded representation** shall **~~also have printed clearly thereon~~ include** the total quantity of the delivery, the appropriate fraction of the quantity, and the price per unit of quantity.

(Amended 1989, **and 20XX**)

UR.2.2. ~~Printed Ticket.~~ Recorded Representation. – Any **~~printed ticket issued~~ recorded representation created** by a device of the computing type **~~on~~** which **~~there is printed~~ includes** the total computed price, the total quantity, or the price per unit of quantity, shall also **~~show~~ include** the other two values **~~(either printed or in clear hand script)~~**. **and shall comply with G-S.5.6**.

(Amended 1989 **and 20XX)**

B4: MFM-21.2 D S.6. ~~Printer~~Recorded Representations., UR.2.6. ~~Ticket Printer, Customer Ticket,~~ Recorded Representation., UR.3.4. ~~Printed Ticket.~~ Recorded Representation.

Amend Handbook 44, Mass Flow Meter Code as follows**:**

S.6. ~~Printer.~~ Recording Element – When an assembly is equipped with means for ~~**printing**~~ **recording** the measured quantity, the following conditions apply:

(a) the scale interval shall be the same as that of the indicator;

(b) the value of the ~~**printed**~~ **recorded** quantity shall be the same value as the indicated quantity;

*(c) the ~~**printed**~~ **recorded** quantity shall also include the mass value if the mass is not the indicated quantity;*
[Nonretroactive as of January 1, 2021]

(d) a quantity for a delivery (other than an initial reference value) cannot be recorded until the measurement and delivery has been completed;

(e) the ~~**printer**~~ **recording element** is returned to zero when the resettable indicator is returned to zero; and

(f) the ~~**printed**~~ **recorded** values shall meet the requirements applicable to the indicated values.

(Amended 2016**, and 20XX**)

S.6.1. ~~Printed Receipt~~ Recorded Representations. – ~~**Any**~~ **When a quantity is** delivered, ~~**printed quantity**~~ **the recorded representation** shall include an identification number, the time and date, and the name of the seller. This information may be printed by the device or pre-printed on the ticket.

(Amended 20XX)

And

UR.3.3 ~~Ticket Printer, Customer Ticket,~~ Recorded Representation. – Vehicle-Mounted metering systems shall be equipped with ~~**a ticket printer which shall be used for**~~ **means to record** all sales where product is delivered through the meter **and shall comply with G-S.5.6**. A copy of the ~~**ticket**~~ **recorded representation** issued by the device shall be ~~**left with**~~ **provided to** the customer at the time of delivery or as otherwise specified by the customer.

(Added 199~~3~~4) (**Amended 20XX**)

…

UR.3.4. ~~Printed Ticket.~~ Recorded Representation. – The total price, the total quantity of the delivery, and the price per unit shall be ~~**printed**~~ **provided** on any ~~**ticket**~~ **recorded representation** issued by a device of the computing type and containing any one of these values.

(Added 1993) **(Amended 20XX)**

B4: CDL-21.1D S.1.4.1. ~~Printed Ticket~~Recorded Representations., UR.2.4.2. ~~Tickets or Invoices.~~ Recorded Representation.

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

S.1.4.1. ~~Printed Ticket.~~ Recorded Representation– Any **~~printed ticket~~ recorded representation** issued by a device of the computing type **~~on~~** which **~~there is printed~~ includes** the total computed price shall **~~have printed clearly thereon~~** also **include** the total quantity of the delivery and the price per unit.

(Amended 20XX)

UR.2.4.2. ~~Tickets or Invoices~~ Recorded Representation. – Any **~~written invoice or printed ticket~~ recorded representation** based on a reading of a device that is equipped with an automatic temperature or density compensator shall **~~have shown thereon~~ include** that the quantity delivered has been temperature or density compensated.

(Amended 20XX)

B4: HGM-21.1 D S.2.6. Recorded Representations, Point of Sale Systems., S.6. Printer. Recording Element., UR.3.2. Vehicle-mounted Measuring Systems Ticket Printer Recording Element., UR.3.3. Printed Ticket. Recorded Representation.

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

S.2.6. Recorded Representations, Point of Sale Systems. – A **~~printed~~** receipt shall be available through a built-in or separate recording element for transactions conducted with point-of-sale systems or devices activated by debit cards, credit cards, and/or cash. The **~~printed~~** receipt shall contain the following information for products delivered by the dispenser:

(a) the total mass of the delivery;

(b) the unit price;

(c) the total computed price; and

(d) the product identity by name, symbol, abbreviation, or code number.

(Amended 20XX)

…

S.6. ~~Printer.~~ Recording Element – When an assembly is equipped with means for **~~printing~~ recording** the measured quantity, the **~~printed~~ recorded** information must agree with the indications on the dispenser for the transaction and the **~~printed~~ recorded** values shall be clearly defined.

(Amended 20XX)

S.6.1. ~~Printed Receipt.~~ Recorded Representation – **~~Any~~ When a quantity is delivered, ~~printed quantity~~ the recorded representation** shall include an identification number, the time and date, and the name of the seller. **~~This information may be printed by the device or pre- printed on the ticket.~~**

(Amended 20XX)

And

UR.3.2. Vehicle-mounted Measuring Systems ~~Ticket Printer~~ Recording Element.

(Amended 20XX)

UR.3.2.1. ~~Customer Ticket~~ Recording Element. – Vehicle-Mounted metering systems shall be equipped with **~~a ticket printer which shall be used for~~ means to record** all sales where product is delivered through the device **and shall comply with G-S.5.6**. A copy of the **~~ticket~~ recorded representation** issued by the device shall be **~~left with~~ provided to** the customer at the time of delivery or as otherwise specified by the customer.

(**Amended 20XX**)

…

UR.3.3. ~~Printed Ticket.~~ Recorded Representation. – The total price, the total quantity of the delivery, and the price per unit shall be **~~printed~~ provided** on any **~~ticket~~ recorded representation** issued by a device of the computing type and containing any one of these values.

~~(Added 1993)~~ **(Amended 20XX)**

B4: OTH-21.2 D Appendix D - Definitions.: recorded representations, recording element.

Amend Handbook 44, Appendix D - Definitions as follows**:**

recorded representation. – The printed, embossed, **electronic,** or other representation that is recorded as a quantity**, unit price, total price, product identity or other information required** by a weighing or measuring device. [1.10**, 2.20, 2.21, 2.22, 2.24, 2.25, 3.30, 3.31, 3.32, 3.33, 3.34, 3.35, 3.36, 3.37, 3.38, 3.39, 3.40, 5.54, 5.55, 5.56(a), 5.56(b), 5.57, 5.58, 5.60**]

recording element. – An element incorporated in a weighing or measuring device by means of which ~~its~~ **the device's** performance relative to quantity or money value is permanently recorded **~~electronically~~ or** on a tape, ticket, card, or the like, in the form of a printed, stamped, punched, or perforated representation **or recorded electronically in instances where that option is permitted by specific code**. [1.10, **2.20,** 2.21**, 2.22, 2.24, 2.25, 3.30, 3.31, 3.32, 3.33, 3.34, 3.35, 3.36, 3.37, 3.38, 3.39, 3.40, 5.54, 5.55, 5.56(a), 5.56(b), 5.57, 5.58, 5.60**]

NIST OWM Detailed Technical Analysis:

Although NIST OWM feels that all proposed changes would benefit from additional review, NIST OWM believes that the additional changes made to G-S.5.6 provides clarity. NIST OWM believes a Developing status is appropriate so that changes to the B4 specific codes are carefully reviewed to ensure the proposed changes do not change the original intent of the specific section before moving these items forward for a vote.

NIST OWM provided the previous comments. The key purpose of this block of proposals is to broaden the requirements by eliminating the term "print/printed" in specific NIST HB 44 codes and clarifying that providing an electronic recorded representation in lieu of a printed recorded representation is an acceptable option as was adopted in G-S.5.6. Recorded Representations in 2014. NIST OWM provides the following technical points for consideration.

Paragraph G-S.5.6. Recorded Representation addresses multiple points relative to recorded representations:

1. Any NIST Handbook 44 requirement applicable to indicating and recording elements also apply to recorded representations.

2. Recorded values must be printed in a numerical or "digital" form. The reference to the term "digitally" refers to the use of that term as described in the definition for "digital type," which describes "digitally" as being presented in numbers.

3. Providing the customer with an option of "not receiving a receipt" is acceptable, so long as the *customer* is making that choice to not receive a receipt.

4. For systems that are capable of issuing an electronic receipt, the customer may be given the option of receiving the receipt in an electronic form. However, providing the option for an electronic receipt does not negate any requirement for the system to provide the customer with the option of a hard copy receipt for those specific codes where a hard copy receipt is required. That is, the system may offer additional options beyond the hard copy form; however, the hard copy form must remain an option for the customer to choose. The first part of this also sentence recognizes that not all systems are capable of providing an electronic option (though this would not preclude some codes from requiring such an option), but when such an option is available, the customer may choose that option over other options provided.

The current Item under Consideration presents the recommended changes to G-S.5.6. Recorded Representations as follows:

Current Item under Consideration in 2021 S&T Committee Interim Report:

G-S.5.6. Recorded Representations. – Insofar as they are appropriate, the requirements for indicating and recording elements shall also apply to recorded representations. All recorded values shall be ~~**printed provided**~~ **presented** digitally. In applications where recorded representations are required **by a specific code**, the customer may be given the option of not receiving the recorded representation. **Unless otherwise specified, recorded representations referenced in specific codes shall be made available to the customer as a minimum in hard copy form. However,** for systems equipped with the capability of issuing an electronic receipt, ticket, or other recorded representation, the customer may be given the option to receive any required information electronically (e.g., via cell phone, computer, etc.) in lieu of or in addition to a hard copy.

(Amended 1975, 2014 and **20XX**)

With regard to the specific changes proposed to G-S.5.6., NIST OWM offers the following technical comments:

- **Sentence 2:** "All recorded values shall be ~~**printed provided**~~ **presented** digitally."

  OWM believes the proposed change to the second sentence in G-S.5.6. are appropriate. The original intent of the second sentence was to address the need for a numerical format. As noted above, the reference in that sentence to the term "digitally" refers to the use of that term as described in the definition for "digital type," which describes "digitally" as being presented in numbers. The definition from NIST HB 44 Appendix D:

  - **digital type. –** A system of indication or recording of the selector type or one that advances intermittently in which all values are presented digitally, or in numbers. In a digital indicating or recording element, or in digital representation, there are no graduations. [1.10]

The word "printed" reflects the technology that was available at the time the requirements were written; the use of the word "printed" was not intended to limit recorded representations to only hard copy form. Thus, the use of the word "presented" in place of "printed" does not change the original intent of that statement and helps to recognize that other forms of recorded representations are now available.

As an editorial comment, OWM notes that the word "provided" is not part of the current language in G-S.5.6. Although the intent of showing the term as struck was to distinguish it from earlier versions of the proposal, this term should be struck from the proposal when presenting it for consideration.

- **Sentence 3:** "In applications where recorded representations are required **by a specific code**, the customer may be given the option of not receiving the recorded representation."

  OWM believes the proposed change to the third sentence by adding the term "by a specific code" is appropriate and simply emphasizes that individual codes may specify the need for a recorded representation.

- **Sentence 4: "Unless otherwise specified, recorded representations referenced in specific codes shall be made available to the customer as a minimum in hard copy form."**

  OWM believes the addition of this new fourth sentence clarifies that the *customer* must have the option of receiving the recorded representation in hard copy form, but recognizes there may be some codes (such as the tentative code 3.40 for Electric Vehicle Fueling Systems) in which offering only an electronic form is acceptable.

- **Sentence 5:** "**However,** for systems equipped with the capability of issuing an electronic receipt, ticket, or other recorded representation, the customer may be given the option to receive any required information electronically (e.g., via cell phone, computer, etc.) in lieu of or in addition to a hard copy."

  OWM believes the addition of the word "However" is unnecessary and may cause confusion. The current form of the sentence is appropriate. Thus, OWM recommends striking the proposed addition of the word "However" at the start of that sentence.

Based on the assessment above OWM recommended the final proposal be modified to recommend the following:

G-S.5.6. Recorded Representations. – Insofar as they are appropriate, the requirements for indicating and recording elements shall also apply to recorded representations. All recorded values shall be ~~**printed**~~ **presented** digitally. In applications where recorded representations are required **by a specific code**, the customer may be given the option of not receiving the recorded representation. **Unless otherwise specified, recorded representations referenced in specific codes shall be made available to the customer as a minimum in hard copy form.** For systems equipped with the capability of issuing an electronic receipt, ticket, or other recorded representation, the customer may be given the option to receive any required information electronically (e.g., via cell phone, computer, etc.) in lieu of or in addition to a hard copy.

(Amended 1975, 2014 and **20XX**)

These changes are represented in the 2022 Interim Meeting Report, Item under Consideration with the exception of striking "However" as recommended above.

At the 2021 CWMA Annual Meeting, a suggestion was made to simplify G-S.5.6 by removing changes that were added to G-S.5.6 in 2014 to address systems with the capability of issuing an electronic receipt and, instead, specify the electronic receipt option as an acceptable form of receipt in each specific code. Although NIST OWM agrees that the General Code requirement may benefit from a restructuring of the paragraph to improve its use, NIST OWM believes there is value in providing information on options for recorded representation in the general code requirements. The specific intent of the decision made in 2014 to include this language in the General Code was to avoid the need to add specific language to each code. By doing so, this avoids a situation in which a given code is inadvertently overlooked and the potential option for an electronic form of recorded representation may be in question. Thus, OWM does not believe the reference to electronic receipts should be removed from the General Code.

Nevertheless, if there is a desire to streamline the paragraph, the Submitter and the Committee may wish to consider using an alternate format such as sub-paragraphs or bulleted points to help clarify the various sections of the paragraph. For example, G-S.5.6. might be restructured as follows:

G-S.5.6. Recorded Representations. – **The following shall apply to recorded representations.**

(a) Insofar as they are appropriate, the requirements for indicating and recording elements shall also apply to recorded representations.

(b) All recorded values shall be ~~**printed**~~ **presented** digitally.

(c) In applications where recorded representations are required **by a specific code**, the customer may be given the option of not receiving the recorded representation.

(d) **Unless otherwise specified, recorded representations referenced in specific codes shall be made available to the customer as a minimum in hard copy form.** For systems equipped with the capability of issuing an electronic receipt, ticket, or other recorded representation, the customer may be given the option to receive any required information electronically (e.g., via cell phone, computer, etc.) in lieu of or in addition to a hard copy.

(Amended 1975, 2014 and **20XX**)

In addition to its comments regarding the proposed changes to paragraph G-S.5.6. Recorded Representations, NIST OWM also recommends the following editorial changes to this block of items:

B4: LMD-21.2 - UR.3.4. ~~Printed Ticket.~~ Strike out "Printed Ticket"

B4: VTM-21.1 - S.1.4.2. ~~Printed Ticket~~ Strike out "Printed Ticket"

These changes are represented in the 2022 Interim Meeting Report, Item under Consideration.

Summary of Discussions and Actions:

At the 2021 Interim Meeting Mr. Charles Stutesman (Kansas), submitter of the item, agreed that the item should be Developing and noted that updates to the Item under Consideration were provided to the S&T Committee based on reviews that he had with NIST OWM. Mr. Dmitri Karimov (MMA) commented that

the proposed changes to recognize electronically captured tickets are needed, editorial corrections are needed to some parts of the proposal, and he agreed with a developing status for this item. Ms. Diane Lee (NIST OWM) commented that there are two proposed changes to HB 44, Mass Flow Meter Code, Paragraph U.R.3.3 in the 2021 Interim Agenda. One proposal is Block 4 MFM-21.2 UR.3.3. (which was incorrectly number as UR.2.6 in the Item under Consideration in the 2021 Interim Meeting agenda) and the other is item MFM-21.1. UR.3.3. on the 2021 Interim Meeting agenda. The submitters should work together to provide one proposed change.

During the Committee work session, the Committee assigned a Developing status to Item Block 4.

At the 2021 Annual Meeting Mr. Charles Stutesman (Kansas) stated that he looks forward to maintaining developing status between now and the 2022 Interim. Mr. Stutesman explained that when the electronic receipt provision was added to NIST HB 44 General Code requirements, a change to the specific Codes were needed because the specific Codes supersede the General Code. All the code sections included in this block have printer requirements. As such, it was not the goal to remove printers but to add the option for electronic receipts if customer wants it. Mr. Stutesman would appreciate comments and suggestions for changes to the proposal.

During the Committee work session, the Committee assigned a Developing status to Item Block 4.

At the 2022 Interim Meeting Mr. Charles Stutesman (Kansas), submitter of the item noted that some editing and additional work is needed before forwarding as a Voting item. Mr. Stutesman recommended that the item remain Developing. California DMS recommended a Developing status for this item. Mr. Dmitri Karimov (MMA) commented that proposed changes to recognize electronically captured tickets are needed and that editorial corrections are needed to some parts of the proposal. Mr. Dmitri agreed with a developing status for this item. An SMA representative also commented on support for this item because it recognizes the importance of providing flexible options for recorded representations to customers. SMA sees value in the item and agreed with a Developing status for this item. NIST OWM agreed with the need to address current language in the proposal and supports development.

During the Committee work session, the Committee assigned a Developing status to Item Block 4. The Committee supports the work and recommends the continued work of all stakeholders. For more information or to provide comment, please contact:

Mr. Charles Stutesman
Kansas Department of Agriculture
(785) 564-6683, **charles.stutesman@ks.gov**

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearing the following comments were heard:

Mr. Matt Douglas (California - DMS): California supports further development of the block.

Mr. Russell Vires (SMA): SMA supports 2 of the items GEN-21.2, OTH-21.2.

Ms. Diane Lee (NIST OWM): carryover item. NIST has comments on this item posted. They support it as a Developing item going forward.

The WWMA S&T Committee recommends the status remain Developmental. The Committee recommends that the submitter continue to work with NIST OWM to further develop the item.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing Mr. Russ Vires (SMA) stated that he supports this item.

Mr. Tim Chesser (Arkansas) suggested changing the wording in Gen 21.1. His suggestion is to change "presented" to "available".

This Committee recommends this item remain Developing, so they have an opportunity to work with the NIST OWM to clarify and clean up the language.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.

Mr. Jim Willis (New York) commented that it is important to recognize that the future will bring us to electronically captured tickets or receipts.

Mr. Lou Straub (SMA), John McGuire (New Jersey), and Jim Willis (New York) all recommended to move this item forward as Voting.

The NEWMA Specifications and Tolerances Committee recommends that this item be given Voting Status.

During the 2022 Annual Meeting Open Hearing Mr. Russ Vires (SMA) rose in support of GEN-21.2 and OTH-21.2. He commented that he supports the option for electronic receipts and tickets, and recognizes the need to provide options for consumers. No other comments were heard on this block.

After hearing comments from the floor, the committee recognized the need to further develop this block and recommended the block retain developing status.

Central Weights and Measures Association

During the 2021 Interim Meeting the Committee heard comments from the floor. Mr. Charles Stutesman (Kansas) (submitter) mentioned that he hoped to have more information to NCWM Interim Meeting and supported this item staying as Developing. Ms. Diane Lee (NIST OWM) stated there are comments on this item in OWM's Analysis that was sent to the Committee. Supports this item as Developing. Mr. Lou Straub (SMA) supports OTH-21.2.

CWMA S&T Committee recommends item as Developing.

During the 2022 Annual Meeting Open Hearing Mr. Charlie Stutesman (Kansas) stated that the item should remain as Developing. The item will be ready to present for status upgrade during the 2023 Interim Meeting or will be withdrawn.

Mr. Russ Vires (SMA) - The SMA supports this item. The SMA recognizes the importance of providing flexible options for recorded representations to the consumer.

The CWMA S&T Committee recommends this item remain as Developing per the submitter's request.

ITEM BLOCK 5 (B5) W DEFINE "FIELD REFERENCE STANDARD"

(**Note:** In 2019 this block of items was combined with Block 1 "Terminology For Testing Standards" and other items that addressed terminology for standards and the use of "master meters." Based on comment heard during the 2021 Annual Meeting, the S&T Committee recommended that all items that were included in Block 1 "Terminology For Testing Standards" that originally appeared as a separate item or a separate block of items on the S&T agenda prior to 2019, be removed from Block 1 "Terminology For Testing Standards" and appear as originally presented.

Item Block 5 "Define "Field Reference Standard"" was removed from Block 1 "Terminology For Testing Standards" and now appears as a separate block of items on the 2022 Interim Meeting agenda.)

B5: CLM-18.2 W N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards
B5: CDL-18.2 W N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards
B5: HGM-18.2 W N.4.1. Master Meter (Transfer) Standard Test and T.4. Tolerance Application on Test Using Transfer Standard Test Method
B5: OTH-18.3 W Appendix D – Definitions: field reference standard meter ~~and transfer standard~~

Source: Endress + Hauser Flowtec AG USA (2018)

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

OWM Executive Summary for Item Block 5 (B5) Define "Field Reference Standard"
OWM Recommendation: No Recommendation. This item was withdrawn at the 2022 Interim Meeting.

Table 3. Summary of Recommendations

	V	D	W	A	I	Notes*	Comments
Submitter			✓				• Letter from Endress+Hauser requesting withdrawal of item (10-04-2021)
OWM			✓				
WWMA		✓					
SWMA			✓				
NEWMA						5	• This item was not discussed because it was withdrawn at the 2022 NCWM Interim Meeting

Table 3. Summary of Recommendations							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**
CWMA						5	• This item was not discussed because it was withdrawn at the 2022 NCWM Interim Meeting
NCWM			✓				

	Letters of Support	**Letters of Opposition**	**Notes**
Industry		• Comments from Seraphin (09-22-2021)	
Manufacturers			
Retailers and Consumers			

***Notes Key:**
1 – Submitted modified language
2 – Item not discussed
3 – No meeting held
4 – Not submitted on agenda
5 – No recommendation or not considered

Item under Consideration:

B5: CLM-18.2 W N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards

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

N.3.2. Field Reference ~~Transfer~~ 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 Reference~~Transfer~~ 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 reference~~transfer~~** standard **meter** when compared to a basic reference standard.

(Added 1976)

B5: CDL-18.2W N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards

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

N.3.2. Field Reference~~Transfer~~ 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.

(Amended 20XX)

T.3. On Tests Using Field Reference~~Transfer~~ 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 reference~~transfer~~** standard when compared to a basic **field reference~~reference~~** standard **meter**.

(Amended 20XX)

B5: HGM-18.2 W N.4.1. Master Meter (Transfer) Standard Test and T.4. Tolerance Application on Test Using Transfer Standard Test Method

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

N.4.1. Field Reference~~Master Meter (Transfer)~~ Standard Meter Test. – When comparing a measuring system with a calibrated **field reference~~transfer~~** 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 Reference~~Transfer~~ 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 reference~~transfer~~** standard **meter** when compared to a basic reference standard.

B5: OTH-18.3 W Appendix D – Definitions: field reference standard meter ~~and transfer standard~~

Amend 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.~~

NIST OWM Detailed Technical Analysis:

This item Block 5 was removed from Block 1 items of previous agendas and now appears as a separate item Block 5 on the 2022 Interim meeting agenda. NIST OWM provided previous comments in general to all items that were included in Block 1. These comments have been updated to address specific issues concerning this individual item.

The submitter of this item Mr. Michael Keilty recommended that this item be withdrawn. NIST OWM supports the withdraw of this item. This item was submitted when other definitions were submitted and being considered. There were those in opposition to the terms used in this proposal and introducing these new terms in the handbook. The Field task group assigned to developing items concerning the use of field standard meters to test meters in the field discussed these and other terms but did not decide on a term for use.

Summary of Discussions and Actions:

At the 2022 Interim Meeting, Mr. Michael Keilty (the submitter of the items) provided written comments to the committee requesting that the block of items be withdrawn. Mr. Keilty also requested during the open hearing that these items be withdrawn. Ms. Diane Lee (NIST) agreed with the submitter and recommended that the items be withdrawn.

During the S&T Committee work session, the Committee agreed to recommend this item for withdrawal.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearing the following comments were heard:

Mr. Michael Keilty (Endress + Hauser): he submitted these in 2017, sept. in response to NIST comments. NIST committed a form 15 in that same year with the language from Block 1. He had hoped that the task group formed in 2019 would have addressed block 1 and 5 items. Lang. in block 5 is in line with (LPG-15.1 and MFM-15.1). Language in documents was copied and inserted. Asks Committee to look at language specific to the item and not the general block.

Mr. Kurt Floren (Los Angeles County, California): last reference was to block 5, error.

Mr. Keilty would like to move from Developing to a Voting status in the 2022 cycle.

Mr. Bob Murnane (Seraphin): new terminology that does not exist in HB currently. The definition proposed is vague. It does not limit the tolerance for field standard. W/M officials needs to know that enforcement is legally enforceable. HB 44 recognizes use of transfer standards and their uncertainty exceeds the 1/3. Several companies have proposed that mass flow meters be used. NIST is collecting data to evaluate Coriolis meter to possibly use as a field standard. It would be wrong to recognize Coriolis meter as a field standard (and that is what this is doing) without the proper tests. Doesn't think we need new terminology. The existing terms (transfer standard / field standard) be worked on. Recommends that this item be withdrawn.

Mr. Josh Nelson (Ex-Officio NCWM S&T Committee): question: can he submit to the Committee his notes? He will. Recommend entire block be withdrawn?

Mr. Bob Murnane (Seraphin): yes (in reference to above testimony), withdraw entire block.

Mr. Keilty: to follow up on Mr. Murnane: these were not submitted to undermine the 1/3 tolerance. It is just assumed that the device will perform and the data will be provided. This is just enabling language.

The WWMA S&T Committee recommends the status remain Developmental. The Committee recommends that items MFM-15.1 and LPG-15.1 be inserted into Block 5 items as they refer to the same terminology in HB 44. A letter was submitted to the Committee by Mr. Bob Murnane (Seraphin) and will be posted to the NCWM website.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing Mr. Keilty (Endress + Hauser), who is the submitter of this item, stated that he hoped the Field Standard Task Group would have worked on Blocks 1 and 5, but, unfortunately, that was not the case. He recommended this item be Withdrawn. Mr. Russ Vires (Mettler Toledo) recommended the Withdrawal of this item. Mr. Oppermann (Weights and Measures Consulting, Seraphin) supports Withdrawal of this item.

This Committee recommends this item be Withdrawn at the submitters request.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.

Mr. Michael Keilty (Endress + Hauser Flowtec) has submitted comments and is requesting withdrawal of the items in this block.

Further comments were heard form Ms. Juana Williams (NIST OWM) on the history of the item. Comments were received in support of withdrawal.

The NEWMA Specifications and Tolerances Committee recommends Withdrawal of this item.

During the 2022 Annual Meeting Open Hearing this item was not discussed because it was withdrawn at the 2022 NCWM Interim Meeting.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the Committee heard comments from the floor. Mr. Michael Keilty (Endress+Hauser Flow, submitter) recommends that item be Withdrawn. CWMA S&T Committee recommends that item be Withdrawn.

During the 2022 Annual Meeting Open Hearing this item was not discussed because it was withdrawn at the 2022 NCWM Interim Meeting.

ITEM BLOCK 6 (B6) D COMMERCIAL AND LAW ENFORCEMENT, AXLE AND AXLE GROUP WEIGHTS

B6: SCL-22.1	D	S.1.14. Recorded Representation of Axle or Axle Group Weights
B6: SCL-22.3	D	UR.3.3. Single-Draft Vehicle Weighing., and UR.3.4. Axle and Axle Group Weight Values.

Source: NIST Office of Weights and Measures

Purpose and Justification:
This proposed change is intended to add clarification regarding the implications of using weighing and measuring devices for transactions that may be considered by some as commercial while there is no clear guidance provided.

OWM Executive Summary for Item Block 6 (B6) Commercial and Law Enforcement, Axle and Axle Group Weights

OWM Recommendation: The items in this block are in a Developing status. OWM is most interested at this time in receiving additional feedback from the community on each of these items in the block.

- When item SCL-22.1 of this block was originally proposed there was a lag in the publication process for 2020 and 2021; so the numbering of the paragraph in the Item under Consideration has been updated below to S.1.15.

- SCL-22.1 adds two new HB 44 Scales Code specification requirements to address how weight information generated from multi-independent platform vehicle scale systems is to be identified on a weigh ticket.

- The first proposed sub-paragraph of SCL-22.1 (i.e., S.1.15.1) requires the ticket to clearly identify the particular independent scale platform associated with each printed weight value.

- The second proposed sub-paragraph of SCL-22.1 (i.e., S.1.15.2.) requires the summed total of all platforms to be identified as the vehicle's total weight in instances where all axle and axle groups of the vehicle being weighed fit onto a live portion of the scale system and are weighed simultaneously as a single draft. In instances where the vehicle being weighed cannot be weighed as a single draft (e.g., oversized vehicles that do not fit onto the scale) thus necessitating weighing the vehicle in two drafts, the ticket must provide clear indication that the total weight is "not legal-for-trade" or similar text to make known the gross vehicle weight is not valid for use in commercial transactions.

- SCL-22.3 adds a new HB 44 Scales Code User Requirement to make clear the acceptable use of multi-platform vehicle scale systems to charge a fee for the commercial service of providing customers (usually truckers) axle weights, axle group weights, and total weight of their vehicles to enable them to determine compliance with state and federal legal load limits.

- Since the 2022 NCWM Interim Meeting, OWM has amended the proposal in SCL-22.3. and recommends it replace the current proposal for this item. An electronic copy of the revised proposal has been provided to the S&T Committee and has also been posted on NCWM's website.

Table 3. Summary of Recommendations

Block 6 Items (B6) – Commercial and Law enforcement, Axle and Axle Group Weights							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**
Submitter							
OWM		✓ **both SCL items**					
WWMA		✓				1	
SWMA		✓					
NEWMA		✓					
CWMA		✓					

Table 3. Summary of Recommendations							
Block 6 Items (B6) – Commercial and Law enforcement, Axle and Axle Group Weights							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**
NCWM							
	Letters of Support			**Letters of Opposition**		**Notes**	
Industry							
Manufacturers							
Retailers and Consumers							

***Notes Key:**
1 – Submitted modified language
2 – Item not discussed
3 – No meeting held
4 – Not submitted on agenda
5 – No recommendation or not considered

Item under Consideration:

B6: GEN-22.1 G.A.1. Commercial and Law-Enforcement Equipment.

(**NOTE:** This item was removed from Block 6 and is now a standalone item. See the General Code Section in this report.)

B6: SCL-22.1 Recorded Representation of Axle or Axle Group Weights

Amend NIST Handbook 44, Scales Code as follows:

S.1.15. Recorded Representations, Multi-Independent Platform[1] Vehicle Scale Systems

S.1.15.1. Axle and Axle Group Loads. - All recorded representations of the different axle and axle group loads of a vehicle weighed on a multi-independent platform vehicle scale system shall be identified by providing indication of either:

(a) the portion of the vehicle to which they represent (e.g., "axle-group 1, axle group 2, axle group 3," or if using axle and axle group descriptions, "steering axle, drive axles, trailer axles"), or

(b) the particular independent scale platform from which they were obtained (e.g., "Platform 1, Platform 2, Platform 3").

S.1.15.2. Total Vehicle Weight. - If a summed total of all axle and axle group loads of a vehicle weighed on a multi-independent platform vehicle scale system is recorded, the recorded value shall be clearly identified as:

(a) "Total Vehicle Weight," "Vehicle Weight," (or other similar terms that clearly identify the value as the vehicle's total weight) providing all axle(s) and axle groups of the vehicle weighed were positioned on a live portion of the weighing/load-receiving elements and weighed simultaneously when the summed total was determined[2], or

(b) "Not-Legal-For-Trade" unless all axle and axle groups of the vehicle weighed were simultaneously positioned on a live portion of the weighing/load-receiving elements when the summed total was determined, or the vehicle was weighed using the alternative method described in footnote 2 of this paragraph.

[1] Multi-independent platform means each platform of the scale is a single independent weighing/load-receiving element unattached to adjacent elements and with its own A/D conversion circuitry and displayed weight.

[2]Alternatively, the individual components of the vehicle being weighed may be uncoupled, positioned completely on the live elements of the scale, weighed separately, and then totaled.

B6: SCL-22.3 D UR.3.3. Single-Draft Vehicle Weighing., and UR.3.4. Axle and Axle Group Weight Values.

Amend Handbook 44, Scales Code as follows:

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 highway-law-enforcement scales and scales used for the collection of statistical data.**~~

~~**(Added 1992)**~~

And

UR.3.4. Axle and Axle Group Weight Values. – Weight values of axles or axle groups of highway motor vehicles are necessary to verify compliance with highway weight limit enforcement. When a fee is charged for the use of an axle-load scale or vehicle scale to determine the weight of axles or axle-groups, the transaction is considered to be "commercial" as defined by General Code paragraph G-A.1. Commercial and Law Enforcement Equipment and the scale shall comply with all applicable requirements for commercial weighing systems.

When weight values for axles or axle groups are obtained using multiple-platform vehicle scales and where all parts of the motor vehicle are simultaneously resting on live elements of the scale, the weight values for axles or axle groups may be summed together to represent a commercial total gross weight of the motor vehicle. Weight values for axles or axle groups may also be summed to represent a commercial total gross weight of the motor vehicle if the individual components are uncoupled, positioned completely on the live elements, and weighed separately on the scale.

Weight values of axles or axle groups obtained from these weighing devices as individual weighing operations where all parts of the motor vehicle are not simultaneously resting on live portions of the scale shall not be used in commercial transactions and may only be used to verify compliance with highway weight limits.

(Renumber existing paragraphs UR.3.4 through UR.3.12.)

NIST OWM Detailed Technical Analysis:

OWM developed the two proposals in SCL-22.1 and SCL-22.3 to address perceived gaps in HB 44 Scales Code requirements pertaining to the design and use of multi-independent platform vehicle scale systems commercially used to charge a fee for the service of providing axle- and axle-group weights, as well as total vehicle weight to those needing them (typically commercial truck drivers). These systems are most often used commercially to verify compliance with federal and state vehicle load limits but at times may also be used to establish the net loads of products that are bought and sold by weight, establish transportation charges, and for other commercial purposes.

These proposals were developed as the result of an OWM inquiry from a state questioning the permissible use of a multi-independent platform vehicle scale system (each platform having its own A/D conversion circuitry and weight indicator) that printed total vehicle weight from summing the axle- and axle-group loads of vehicles weighed when not all parts of those vehicles were able to fit onto a live portion of the scale and be weighed simultaneously. That is, the scale was being used on occasion to "split weigh" in two different drafts the different axle and axle groups of "over-sized" coupled-vehicle combinations because not all axle and axle groups would fit onto a live portion of the scale at the same time, which thus necessitated weighing those particular vehicles in multiple drafts. Even though the printed ticket for those weight determinations provided clear indication that the total vehicle weight value recorded was "non certifiable," it is questionable whether or not a scale system is permitted to record this weight since HB 44 Scales Code paragraph UR.3.3. Single-Draft Vehicle Weighing currently requires a vehicle or coupled-vehicle combination to be commercially weighed on a vehicle scale only as a single draft. Note: The manufacturer of this particular scale system advised us that most vehicles and coupled-vehicle combinations that are weighed on the scale can be weighed as a single draft. That is, all axle and axle groups can be positioned onto a live portion of the scale to be weighed simultaneously. It is only the occasional oversized vehicle or coupled-vehicle combination that exceeds the length of the scale that must therefore be split weighed.

We purposely chose to simplify these proposals to only address multi-independent platform vehicle scale systems. These systems have been installed at truck stops (and perhaps other locations) throughout the US for many years and are used primarily to determine axle loads, axle-group loads, and total vehicle weight of vehicles and coupled-vehicle combinations for a fee. Although we recognize that single-platform vehicle scales may also sometimes be used for this same purpose, we don't view them as being suitable for the application. This is because the approach requirements for vehicle scales and axle-load scales in NIST HB44 are very different and few vehicle scales in commercial service have approaches that comply with

the approach requirements for axle-load scales. Axle-load scales are required to have a straight paved approach in the same plane as the platform on each end of the platform. The approaches must be the same width as the platform and of sufficient length to ensure the level positioning of vehicles during weight determinations. If vehicles aren't level when the different axle and axle groups are weighed, a portion of the force of the load transfers to other axle and axle groups that aren't positioned on the scale resulting in false indication. It is important to recognize that not all multi-independent platform vehicle scale systems may be installed with approach requirements meeting the HB 44 approach requirements for an axle-load scale. Many do, but we are unable to confirm that all do. We view this somewhat of an important concern given that these proposals, if adopted, would make it permissible to split weigh vehicles and coupled-vehicle combinations for a fee providing the only use of the weighing results from doing so is to verify whether or not the different axle-, axle-group loads, and total vehicle weight are compliant with highway weight limits.

Another reason we elected to limit these proposals to only address multi-independent platform vehicle scale systems is that we do not believe it to be a very common practice to use single-platform vehicle scales to determine axle loads and axle-group loads of vehicles and coupled-vehicle combinations to verify compliance with federal and state vehicle load limits. Those that are using them for this purpose usually don't charge a fee, i.e., the weighing is usually done as a complimentary service.

NIST HB 44 does not currently require a multi-independent platform vehicle scale system to be equipped with a ticket printer and whether or not one should be required, is something to be considered. We have not proposed it, but perhaps others will conclude this would be an important HB 44 addition. We believe most (perhaps all) of the multi-independent platform vehicle scale systems currently in commercial service have been equipped with a ticket printer and this is likely because the few scale manufacturers of these systems recognize the need for the multiple indications displayed by these systems to be made available in printed form to the operator and customer. We also believe most of the systems currently in service comply with both newly proposed sub-paragraphs of S.1.14. We developed these two new sub-paragraphs (S.1.14.1. and S.1.14.2.) because it is important for scale operators, customers, and enforcement officials to be able to clearly identify from a weigh ticket the different scale platforms utilized at the time a vehicle was weighed and their corresponding scale indications so that the accuracy of those values (including the summed total) can be verified. It is also important to clearly specify on a weigh ticket generated from one of these scale systems that any recorded total vehicle weight value determined from summing the different axle- and axle-group loads of a vehicle or coupled-vehicle combination weighed in multiple drafts (i.e., split weighed) is "Not-Legal-For-Trade."

Paragraph UR.3.3. needs to be amended to address the current use of multi-independent vehicle scale systems to split weigh oversized vehicles for a fee. The current paragraph does not take into consideration both the past and present use of these scales to provide a total vehicle weight that's most often only used to verify compliance with maximum legal load limits and safe distribution of the load. These systems have been in existence at truck stops for many years and their primary commercial use is to provide axle weights, axle group weights, and total vehicle weight to commercial haulers for a fee so that those haulers are able to determine whether or not their loads are distributed safely and within legal load limits. Years ago, (prior to the existence of multi-independent platform vehicle scale systems) axle-load scales served this same purpose at truck stops throughout the US and summing of the different axle and axle groups to determine total vehicle weight was undoubtedly done to ensure total vehicle weight didn't exceed maximum legal load limits when using those scales. It is also important to recognize that the weight values corresponding to the different axle- and axle-group loads of vehicles weighed on a multi-independent platform vehicle scale system are not constant; but rather fluctuate/change depending on the position of those axles and axle groups on the different platforms of the system when the vehicle is weighed. That is, a change of the scale indication of one platform is offset by a change in the opposite direction of the indication from one or both

of the other platforms if the position of a vehicle being weighed is changed slightly forward or backwards from its initial position. It is only the summed total of all indications that is constant; although it too changes minimally since not all sections of all platforms are typically adjusted the same. For these reasons, OWM has provided the Committee an updated proposal to amend Scales Code paragraph UR.3.3., which would make it permissible to weigh in multiple drafts (i.e., split weigh) a vehicle or coupled-vehicle combination and charge a fee for the service of providing weights of the different axle- and axle-group loads when the only use of those values is to determine compliance with highway legal load limits.

Summary of Discussions and Actions:

Mr. Rick Harshman (NIST OWM) provided the Committee a high-level summary of its analysis of the two remaining items in Block 6, which included much of background information that had led OWM to submit the two proposals in Block 6 as well as the GEN-22.1 G.A.1. Commercial and Law-Enforcement Equipment item, which the Committee had previously removed from Block 6. Mr. Harshman reported that OWM had recently provided the Committee an updated version of the proposal in SCL-22.1 and requested the Committee replace the version of SCL-22.1 in its current agenda with the updated version recently received. Mr. Harshman also reported that OWM planned to revise the proposal in SCL-22.3 and would later (sometime following the 2022 NCWM Interim Meeting) submit the revised version to the Committee in hopes it could be reviewed by one or more of the regional weights and measures associations meeting in the Spring and/or Fall of 2022. Mr. Harshman recommended both items remain in a developing status to allow stakeholders time to review and recommend any changes they felt necessary.

Mr. Russ Vires (Mettler Toledo LLC) speaking on behalf of the SMA reported that the SMA recommends Block 6 be broken apart into three individual items (i.e., GEN-22.1 Commercial and Law-Enforcement Equipment, SCL-22.1 Recorded Representation of Axle or Axle Group Weights, and SCL-22.3 UR.3.3. Single-Draft Vehicle Weighing and UR.3.4. Axle and Axle Group Weight Values). Mr. Vires then provided the SMA's position and rationale for each of these items speaking verbatim from the SMA's November 2, 2021 report titled "SMA Positions on the NCWM Specification and Tolerances Committee Report (For the NCWM Interim Meeting, January 2022, Developed November 2, 2021). *NIST Technical Advisors note: Refer to the subheading shown below titled, "Scale Manufacturers Association (SMA-Fall 2021 Meeting)" to view the different positions and rationales provided by Mr. Vires on behalf of the SMA for the items in Block 6.* Mr. Vires also reported that the SMA had had the opportunity during its Fall 2021 meeting to review the updated version of the proposal in SCL-22.1 that OWM had provided the Committee for replacement of the one in its current agenda and that the SMA supported the changes OWM had made.

These were several officials who spoke in support of further development of the two items in Block 6.

Mr. Lou Straub (Fairbanks Scale) reported that Fairbanks Scale had been manufacturing the multi-platform "CAT" vehicle scale system for over forty years and the systems had been installed in approximately 2,000 locations. He also reported that he fully supported the GEN-22.1 item that the Committee had earlier removed from Block 6. Referencing the proposal in SCL-22.1, Mr. Straub stated he agreed that the recorded representation of weights from individual axle or axle groups need to be clearly identified as "not-legal-for- trade" on the printed ticket unless the entire vehicle is positioned on live elements of the vehicle scale system and all axles/axle groups are weighed simultaneously. He voiced disagreement with the second sentence proposed in paragraph S.1.14. noting that when one considers a truck with six to eight axle groups that cannot fit onto the different independent platform and be weighed simultaneously, identifying which platform weighed each of these axle and axle groups becomes unnecessary.

The Committee, in consideration of the comments received during open hearings, agreed to replace the Block 6 SCL-22.1 proposal in its Interim Meeting agenda (2022 NCWM Publication 15) with the updated version provided by OWM just prior to the 2022 NCWM Interim Meeting and maintain a developing status on the two remaining items in Block 6. The following proposal represents the Block 6 SCL-22.1 item appearing in the 2022 version of NCWM Publication 15 that the Committee agreed to replace with the Item under Consideration now shown in SCL-22.1:

Item under Consideration:

Amend Handbook 44, Scales Code as follows:

S.1.14. Recorded Representation of Axle or Axle Group Weights. – The recorded representation of weights from individual axle or axle group weights shall clearly be identified as "not legal for trade" or "non-commercial" weight values unless the entire vehicle is positioned on live elements of a multiple-platform vehicle scale and where all axles/axle groups are weighed simultaneously. All recorded weights of axles/axle groups shall be identified as representing only a portion of the vehicle's total gross weight (e.g., by axle groupings such as: "axle group 1," "axle group 2," "axle group 3," or by individual axle description such as: "steering axle," "drive axles," "trailer axles").

Any total gross weight of the vehicle included in the recorded representations determined by summing axle weights shall be clearly identified as "not-legal-for trade" or "non-commercial" unless those axle weights were recorded when all parts of the vehicle rested simultaneously on live portions of the scale, or the individual components were uncoupled, positioned completely on the live elements, and weighed separately on the scale.

[subsequent requirements to be renumbered as appropriate]

On May 19, 2022, OWM provided S&T Committee Chair Mr. Bradford Bachelder an electronic file containing the following revised version of the B6: SCL-22.3 proposal as replacement for the current proposal in 2022 NCWM Publication 16. OWM requested he share it with the Committee to be considered as replacement for the current proposal in the Committee's agenda.

OWM's Revised Replacement Proposal for B6: SCL-22.3 UR.3.3. Single-Draft Vehicle Weighing, and UR.3.4. Axle and Axle Group Weight Values.

Amend NIST Handbook 44, Scales Code as follows:

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 highway-law-enforcement scales**,** ~~**and**~~ scales used for the collection of statistical data**, or scales used to charge a fee for the service of providing weights of the different axle-, axle-group loads, and total weight of vehicles and coupled-vehicle combinations when the only use of those values is to determine compliance with highway legal load limits and safe distribution of the load.**

(Added 1992)

UR.3.4. Weighing of Axle- and Axle-Group Loads – Establishing weight values for the different individual axle- and axle-group loads of a vehicle or coupled-vehicle combination is oftentimes necessary to verify compliance with state and federal highway load limits. When a fee is charged for the use of an axle-load scale or vehicle scale to determine such values, the transaction is considered "commercial" under the provisions of the General Code paragraph G-A.1. Commercial and Law Enforcement Equipment and the scale shall comply with all applicable NIST Handbook 44 requirements for commercial weighing systems.

When weight values for axle- and/or axle-group loads are obtained using multiple-independent platform vehicle scales systems where all parts of the vehicle or coupled-vehicle combination being weighed are simultaneously positioned on live elements of the scale, the values for the different axle- and axle-group loads may be summed to establish the commercial gross weight.

In no case, however, shall a summed result of the different axle- and axle-group loads of a vehicle or coupled vehicle combination weighed in multiple drafts be used for commercial purposes except as provided in subparts (a) and (b) of paragraph UR.3.3. Single-Draft Vehicle Weighing

Renumber existing paragraphs UR.3.4 through UR.3.12.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearing the following comments were heard:

Mr. Kurt Floren (Los Angeles County, California): he wants to offer that the last part of subsection A and breaking into bullet points. He wants to break out equipment that is commercial, then the other types. It's titled commercial and law enforcement then "other commercial" and it becomes confusing. Is it all commercial and subsect to our jurisdiction? rephrase GA-1 : apply "to commercial equipment as follows": ... explains that everything under is commercial. (strike "commercial" from A and B). Between apply and as in the first line, insert commercial equipment. Mr. Kurt Floren stated that he will submit a written statement to the Committee as presented during open hearings.

Mr. Ivan Hankins (Iowa): he wants clarification as to what is being changed to make it better. It looks like it's already there, and he wants more definition on why this is changing.

Ms. Cadence Matijevich (Nevada): agreed with Mr. Floren, but cautions that we consider how the heading reads if we add commercial to the opening statement then there might be some interpretation that what is

or is not commercial law enforcement equipment. (Is there a fine assessed?) does not want to narrow the subsection of law enforcement devices only to commercial purposes.

Mr. Kurt Floren (Los Angeles County, California): fix to Ms. Matijevich: restructure under GA-1: insert subsection under 1: commercial as follows, then insert A,B,C then 2 for law enforcement.

Ms. Cadence Matijevich (Nevada) - stated that Mr. Floren is much better at this, and his fix is good.

Mr. Lou Straub (Fairbanks Scales): agreed with Mr. Hankins, that the original language is satisfactory. Language needs to say that its NTEP approved and meet handbook requirements.

Mr. Eric Golden (Cardinal Scale): does a commercial transaction include just getting a weight: he says yes. Change the wording that that transaction is commercial. No suggestions at this time. Mr. Floren missed a typo: in B2: "Basis".

Mrs. Tina Butcher (NIST OWM): their office submitted this. Wanted to clarify commercial transactions. Agreed with previous testimony. They have submitted other proposals to amend method of sale reg. and uniform law. They have determined that HB 44 and 2 sections in HB 130 are slightly different. Uniform Reg. for service persons also needs to be aligned. Wants this to remain Developing so that they can continue to align the language and make it more uniform.

Mr. Russell Vires (Scale Manufactures Association): This is a new item, the SMA has not vetted this yet. They will do so at November meeting. This should remain Developing so that there's no unintended consequences.

Mrs. Tina Butcher (NIST OWM): In the agenda, this is blocked with two other "companions". She feels that the block should continue, however, if others think that other items in the block are ready (SCL-22.1 and SCL-22.3) those items can move forward.

Mr. Don Onwiler (NCWM): SCL-22.3 is the name of the next item.

Mr. Russell Vires (Scale Manufactures Association): he is looking at it as a block and is commenting as an entire block. Wants all 3 to remain Developing so that they can research.

Mr. Lou Straub (Fairbank Scales): SCL-22.1: concern about the second sentence: talking about the entire truck on the scale = not legal for trade: this is ok. Second part about axle identifications (axle groups) this gets difficult to identify group notifications. Wants the ticket that has already been marked as not legal for trade to not have to identify all axels. Wants this re-worded. They will put down axle weight and gross weight. Preprinted labels don't allow enough space.

Mr. Eric Golden (Cardinal Scales): agreed with Mrs. Butcher to split the items. "Blow the block apart." The second two items introduce additional items and topics. Wants to pull the second two items out.

The WWMA S&T Committee recommends that this be assigned a Developmental status. The Committee recommends following the submitter's request to remove GEN-22.1 from the Block. Based on testimony heard the Committee agreed to submit the following language for item GEN-22.1. The Committee notes that SCL-22.1 (UR.3.3.) item was reassigned as SCL-22.3.

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

(1) To commercial weighing and measuring equipment

(a) ~~**To commercial weighing and measuring equipment; that is, t**~~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 **and 20XX**)

(d) **To ~~other commercial~~ weighing and measuring equipment:**

i. when there is a fee assessed for the use of the equipment to determine a weight or measure;

ii. used to determine the bases of an award using count, weight, or measure; or

iii. used in computing any basic charge or payment for services rendered on the basis of weight or measure

(Added 20XX)

(**~~b~~c**)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 of the device.

~~(c~~(d)(2) To weighing and measuring equipment in official use for the enforcement of law or for the collection of statistical information by government agencies.

(These requirements should be used as a guide by the weights and measures official when, upon request, courtesy examinations of noncommercial equipment are made.)

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing Mr. Russ Vires (Mettler Toledo) stated that this item needs work on the wording and further review by stakeholders. Its current language could have unintended consequences, and recommended it continue with a Developing Status.

This Committee would like clarification on the purpose and use of axle weight scale values allowed by this proposal beyond law enforcement use.

This Committee recommends that this item move forward with a Developing status.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.

GEN-22.1
Mr. Rick Harshman (NIST OWM) commented that the language is in-need of some changes and NIST will be providing changes for the NCWM.

Mr. Eric Golden (Cardinal Scale) supports the intent of this item, but it may need some wordsmithing.

Mr. Lou Straub (SMA), Cheryl Ayer (New Hampshire), and John McGuire (New Jersey) all support this as a Developing item.

SCL 22.1
Mr. Eric Golden (Cardinal Scale) supports this item moving forward as Developing.

Mr. Lou Straub (Fairbanks Scale) agreed with language in general. But questions the benefit of including all the language on a scale ticket and the large amount of information would be difficult to fit on the ticket.

Mr. Eric Golden (Cardinal Scale) and Ms. Cheryl Ayer (New Hampshire) agreed with comments from Mr. Straub.

Mr. John McGuire (New Jersey) recommended keeping this item in Developing status.

SCL 22.3
Mr. Eric Golden (Cardinal Scale) suggested to strike "non-commercial" and additional wordsmithing to align with paragraph UR3.4.

Mr. John McGuire (New Jersey) supports keeping this item in Developing status.

The NEWMA Specifications and Tolerances Committee recommends that this item be given a Developing Status.

During NEWMA's 2022 Annual Meeting Open Hearings, the Committee heard the following comments:

Mr. Russ Vires (SMA) recommends Block 6 be broken into two separate items. Mr. Vires indicated his supports this item with the following language change: S.1.14.1. Axle and Axle Group Loads. - All recorded representations of the different axle and axle group loads of a vehicle when weighed in a single draft on a multi-independent platform vehicle scale system shall be identified by providing indication of either. Mrs. Tina Butcher (NIST OWM) commented that this item needs development.

After hearing comments from the floor, the Committee recognized the need to further develop this block and recommended the block retain Developing status.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the Committee heard comments from the floor. Mr. Loren Minnich (Kansas) suggested change he sent to the Committee (in green).

> **B6: GEN-22.1 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 **and 20XX**)

(d) To other commercial weighing and measuring equipment:

i. when there is a fee assessed for the use of the equipment to determine a weight or measure;

ii. ~~used to determine the bases of an award using count, weight, or measure~~ when using weight, measure, or count as the basis to determine an award; or

iii. used in computing any basic charge or payment for services rendered on the basis of weight or measure

(Added 20XX)

Mr. Loren Minnich (Kansas) also asked NIST for clarification on G-A.1. because different states already interrupt rule different ways. Ms. Diane Lee (NIST OWM) agreed with Mr. Minnich and suggested it be Developing. Mr. Eric Golden (Cardinal Scales) agreed with the spirit of the proposal; it is indeed a "commercial transaction" to charge a person a fee solely for the purpose of obtaining a weight of a vehicle – it is not required to have to undergo a sales transaction of weighed product in order for it to be considered a commercial transaction. Mr. Golden also recommended striking out the following (in red) stating the reasoning behind this is by leaving the "non-commercial" language in the proposal, it defeats the purpose of the proposal, which is to officially clarify what a non-commercial transaction is.

B6: SCL-22.1 S.1.14. Recorded Representation of Axle or Axle Group Weights

S.1.14. Recorded Representation of Axle or Axle Group Weights. – The recorded representation of weights from individual axle or axle group weights shall clearly be identified as "not legal for trade~~" or "non-commercial" weight values~~ unless the entire vehicle is positioned on live elements of a multiple-platform vehicle scale and where all axles/axle groups are weighed simultaneously. All recorded weights of axles/axle groups shall be identified as representing only a portion of the vehicle's total gross weight (e.g., by axle groupings such as: "axle group 1," "axle group 2," "axle group 3," or by individual axle description such as: "steering axle," "drive axles," "trailer axles").

Any total gross weight of the vehicle included in the recorded representations determined by summing axle weights shall be clearly identified as "not-legal-for trade" ~~or "non-commercial"~~ unless those axle weights were recorded when all parts of the vehicle rested simultaneously on live portions of the scale, or the individual components were uncoupled, positioned completely on the live elements, and weighed separately on the scale.

Mrs. Tina Butcher (NIST OWM) agreed G-A.1. needed more work and had no objection to Mr. Golden's suggestion of splitting SCL-22.1 and SCL-22.3. Mr. Lou Straub (Fairbanks) says current G-A.1. is already correct. He also agreed with Mr. Golden from Cardinal Scales on SCL 22.1. Mr. Doug Musick (Kansas) agreed with Mr. Straub. Says that item is not practical for all vehicles out there. Keep as Developing. Mr. Ivan Hankins (Iowa) feels G-A.1. is already correct. Mr. Charles Stutesman (Kansas) stated original language is good as written.

CWMA S&T Committee recommends that GEN 22.1 be withdrawn and SCL-22.1 and SCL 22.3 remain Developing.

During the 2022 CWMA Annual Meeting Open Hearing the Committee heard the following comments:

Mr. Russ Vires (SMA) - The SMA recommends that Block 6 be broken apart into two (2) individual items. Each of these items deals with a separate topic that needs to be discussed individually. Regarding SCL-22.1: The SMA supports this item with the following changes: "***S.1.14.1. Axle and Axle Group Loads. - All recorded representations of the different axle and axle group loads of a vehicle when weighed in a single draft on a multi-independent platform vehicle scale system shall be identified by providing indication of either:"***

Identifying the recorded weight values for the axle/axle groups as required in S.1.14.1.(a) is only necessary when the vehicle can be weighed in a single draft.

The CWMA agreed to recommend further development of this block of items.

Scale Manufacturers Association (SMA-Fall 2021 Meeting)

The SMA recommends that Block 6 be broken apart into three (3) individual items.

Rationale: Each of these items deals with a separate topic that needs to be discussed individually.

B6: GEN-22.1 G.A.1. COMMERCIAL AND LAW-ENFORCEMENT EQUIPMENT

Position: The SMA supports this item.

Rationale: The proposed item provides clarity to define what constitutes a "commercial transaction".

B6: SCL-22.1 S.1.14. RECORDED REPRESENTATION OF AXLE OR AXLE GROUP WEIGHTS

Position: The SMA supports this item with the following changes:

S.1.14. Recorded Representation of Axle or Axle Group Weights. – The recorded representation ~~of weights from individual axle or axle group weights~~ shall clearly be identified as "not legal for trade" ~~or "non-commercial" weight values~~ unless the entire vehicle is positioned on live elements of a multiple-platform vehicle scale and where all axles/axle groups are weighed simultaneously. ~~All recorded weights of axles/axle groups shall be identified as representing only a portion of the vehicle's total gross weight (e.g., by axle groupings such as: "axle group 1," "axle group 2," "axle group 3," or by individual axle description such as: "steering axle," "drive axles," "trailer axles").~~

Any total gross weight of the vehicle included in the recorded representations determined by summing axle weights shall be clearly identified as "not-legal-for trade" ~~or "non-commercial"~~ unless those axle weights were recorded when all parts of the vehicle rested simultaneously on live portions of the scale, or the individual components were uncoupled, positioned completely on the live elements, and weighed separately on the scale.

Rationale: The item attempts to define what constitutes a "commercial transaction", but the words "non-commercial" reduces its clarity. Secondly, it is not necessary to label each weight value of axle/axle group

weights as "not legal for trade"; putting the words "not legal for trade" on the recorded representation once is adequate.

B6: SCL-22.3 UR.3.3. SINGLE-DRAFT VEHICLE WEIGHING., AND UR.3.4. AXLE AND AXLE GROUP WEIGHT VALUES

Position: The SMA supports this item.

SMA-Spring 2022 Meeting

The SMA recommends that Block 6 be broken apart into three (3) individual items.

Rationale: Each of these items deals with a separate topic that needs to be discussed individually.

B6: SCL-22.1 D S.1.14. RECORDED REPRESENTATION OF AXLE OR AXLE GROUP WEIGHTS

Position: The SMA supports this item with the following changes:

S.1.14.1. Axle and Axle Group Loads. All recorded representations of the different axle and

axle group loads of a vehicle when weighed in a single draft on a multi-independent platform vehicle scale system shall be identified by providing indication of either:

Rationale: identifying the recorded weight values for the axle/axle groups as required in S.1.14.1.(a) is only necessary when the vehicle can be weighed in a single draft.

B6: SCL-22.3 D UR.3.3. SINGLE-DRAFT VEHICLE WEIGHING., AND UR.3.4. AXLE AND AXLE GROUP WEIGHT VALUES

Position: The SMA supports the intent of this item and believes that additional work is necessary.

ITEM BLOCK 7 (B7) D TOLERANCES ON TESTS USING TRANSFER STANDARDS

Note: The Item under Consideration was revised by the submitter based on comments from the 2022 Interim Meeting.

Source: Seraphin Test Measure Company, A Division of Pemberton Fabricators, Inc.

Purpose and Justification:
The purpose of these proposals is to change the language in the tolerance paragraphs to provide consistency with the changes in the combined amended proposals of 2022 S&T Agenda Item Block 8 (GEN-19.1. and OTH-22.1). In the codes mentioned below, the current language of Handbook 44 states 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). The proposed language simply states that the formula given in the General Code (the proposed G-T.5.) be used, rather than repeat the formula in each of the specific codes listed below.

OWM Executive Summary for Item Block 7 (B7) – Tolerances on Tests Using Transfer Standards

OWM Recommendation: When the S&T Committee presents Block 8 for a vote, OWM agrees that Block 7 should also go forward for a vote.

- Block 7 Items are proposed changes to NIST HB 44 Codes that have transfer standard tolerance requirements.
- Because of the larger uncertainties associate with the use of transfer standards, the current Code requirement increases the tolerance to account for the uncertainties in the tolerance.
- The proposal is to revise the transfer standard tolerance requirements with an equation to calculate the tolerances for Type 2 Transfer standards and to clarify that these standards are considered Type 2 standards.
- The equation places an upper limit on how large the uncertainty associated with the transfer standard can be.

Table 3. Summary of Recommendations

Block 7 Items (B7) Tolerances on Tests Using Transfer Standards

	V	D	W	A	I	Notes*	Comments
Submitter							• Updated Proposal from Seraphin Test Measure Co requesting Block 7 be designated as a Voting item when Block 8 is designated as Voting. • (01-06-2022)
OWM	✓						• When Block 8 is voting
WWMA		✓					
SWMA		✓					
NEWMA		✓					
CWMA	✓						
NCWM		✓					

	Letters of Support	Letters of Opposition	Notes
Industry	Comments from Emerson-Micro Motion (09-27-21)		
Manufacturers			
Retailers and Consumers			

Table 3. Summary of Recommendations							
Block 7 Items (B7) Tolerances on Tests Using Transfer Standards							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**

***Notes Key:**
1 – Submitted modified language
2 – Item not discussed
3 – No meeting held
4 – Not submitted on agenda
5 – No recommendation or not considered

B7: CLM-22.1 D T.3. On Tests Using Type 2 Transfer Standards.

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

T.3. On Tests Using Type 2 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.~~ **When commercial meters are tested using a Type 2 transfer standard, the tolerance applied to the meter under test shall be calculated using the formula specified in the General Code Tolerance section.**

(Amended 202X)

B7: CDL-22.1 D T.3. On Tests Using Type 2 Transfer Standards.

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

T.3. On Tests Using Type 2 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.~~ **When commercial meters are tested using a Type 2 transfer standard, the tolerance applied to the meter under test shall be calculated using the formula specified in the General Code Tolerance section.**

(Amended 202X)

B7: HGM-22.1 D T.4. Tolerance Application on Tests Using Type 2 Transfer Standard Test Method.

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

T.4. Tolerance Application on Tests Using Type 2 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.~~ **When commercial meters are tested using a Type 2 transfer standard, the tolerance applied to the meter under test shall be calculated using the formula specified in the General Code Tolerance section.**

(Amended 202X)

NIST OWM Detailed Technical Analysis:

Seraphin proposed Block 7 Items to address the changes that are proposed in Block 8 concerning transfer standards. Block 7 items in the Interim Meeting Report were revised based on comments heard during the 2022 Interim Meeting.

Transfer standards are address in the Cryogenic Liquid-Measuring Devices Code, the Carbon Dioxide Liquid-Measuring Devices Code and the Hydrogen Gas-Measuring Devices Code. These codes already specify that a larger tolerance be used when transfer standards are used to account for the higher uncertainty associated with these types of standards and the fact that they will not likely meet the fundamental considerations paragraph 3.2 tolerances for Standards.

The proposed changes in Block 8 define the different types of standards (Field Standard, Type 1 Transfer Standard and Type 2 Transfer Standard). Block 8 also proposes to add a General code requirement with an equation that should be used to determine the tolerance for type 2 transfer standards because Type 2 transfer standards will not likely meet the fundamental considerations concerning the error and uncertainty. The equation places an upper limit on how large the uncertainty associated with the transfer standard can be.

Block 7 makes changes to the aforementioned codes to reference the General Code requirement with the equation that will be used to calculate the tolerance when using type 2 transfer standards in these codes.

When the S&T Committee presents the combined item GEN-19.1 and OTH-22.1, Block 8 item for a vote, then this item, Block 7 may also go forward for a vote.

Summary of Discussions and Actions:

At the 2022 Interim Meeting the Committee recommended that this item be given a Developing status for further development by the submitter based on comments heard during the 2022 Interim Meeting. Since the 2022 Interim Meeting, the submitter made additional changes to the items under consideration which are currently reflected in Block 7 above. These changes add "Type 2" to clarify the type of transfer standard and references the revised equation in the proposed Block 8 item of this report.

Regional Association Reporting:

Western Weights and Measures Association

During the 2021 Annual Meeting Open Hearings the following comments were heard:

Mr. Bob Murnane (Seraphin): submitter: this needs to go with the GEN-19.

Mr. Marc Buttler (Emerson Micro Motion): wants to re-state: earlier comment on GEN item would also apply to calculation on this. He will adjust the calculation to increasing tolerance from decreasing.

Mr. Bob Murnane (Seraphin): they have looked at original comments in GEN 19: they will have info for us shortly.

A letter was submitted to the Committee by Mr. Marc Buttler (Emerson Micro Motion) and will be posted to the WWMA website.

The WWMA S&T Committee recommends that this Block be assigned a Developmental status. The Committee recommends that item GEN-19.1 be inserted into Block 7.

Southern Weights and Measures Association

During the 2021 Annual Meeting Open Hearing Mr. Oppermann (Seraphin) stated that this item is related to Gen 19.1. and should not move forward unless Gen 19.1 moves forward as well.

This Committee recommends this item be assigned Developing status.

Northeastern Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the following comments were heard.

Mr. Henry Opperman (Seraphin) commented with clarification from Mr. Bob Murnane (Seraphin) that this item is in conjunction with Gen 19 and with the changes outlined in Gen 19 (see comments). He recommends this item to be forwarded as a Developing item.

The NEWMA Specifications and Tolerances Committee recommends that this item be given a Developing Status.

During the 2022 Annual Meeting Open Hearing no comments were heard from the body on this item, however, the Committee recognizes the need to further develop this block.

Central Weights and Measures Association

During the 2021 Interim Meeting Open Hearing the Committee heard comments from the floor. Mr. Henry Opperman (Weights and Measures Consultants) stated that if GEN 19.1 were to pass then CLM 22.1 and CDL 22.1 would need to be voted on as well. Mrs. Tina Butcher (NIST OWM) thinks original formula is correct, whereas modified formula would not put a limit. Believes it needs more work. Mr. Robert Murnane (Seraphin) recommended that the item stay as Developing and be combined with GEN 19.1.

CWMA S&T Committee recommends that the item be Developing.

During 2022 Annual Meeting Open Hearing, Mr. Bob Murnane (Seraphin) commented that it should remain Developing, can't move to Voting item unless OTH-22.1 does move to Voting.

The CWMA S&T Committee recommends this moves forward as a Voting item, with the understanding that Block 8 must first pass.

ITEM BLOCK 8 (B8) D G-T.5. TOLERANCES ON TESTS WHEN TRANSFER STANDARDS ARE USED., APPENDIX A, SECTION 3.2. TOLERANCES FOR STANDARDS., AND APPENDIX D – DEFINITIONS: STANDADS, FIELD., ~~TRANSFER STANDARD.~~ AND STANDARD, TRANSFER. APPENDIX A: FUNDAMENTAL CONSIDERATIONS, 3. TESTING APPARATUS

B8: GEN-19.1 DG-T.5. Tolerances on Tests When Transfer Standards are Used., Appendix A, Section 3.2. Tolerances for Standards., and Appendix D – Definitions: standards, field., ~~transfer standard.~~ and standard, transfer.

B8: OTH-22.1 D Appendix A: Fundamental Considerations, 3. Testing_Apparatus

(**Note:** These proposals are a combined modification of the 2021 S&T Agenda Block 1 Items GEN-19.1 and OTH-22.1. Since the S&T Committee has changed item GEN-19.1 from "assigned" to "developing," the submitter has worked with NIST OWM to revise and combine the original proposals of GEN-19.1 and OTH-22.1 to address discussions within the NCWM Field Standards Task Group and other comments received at the regional weights and measures meetings on the proposals. These items are related, so they are presented together. These OWM and Seraphin proposals were submitted to the S&T Committee just before the 2022 Interim Meeting.

Note: The joint OWM and Seraphin proposals submitted to the S&T Committee just before the 2022 Interim Meeting were updated with two changes at the request of the Submitters following the 2022 Interim Meeting. The first change is in the definition of "Standard, Field." The words "(typically one year)" were replaced with "(as determined by the Director)". The second change was to add the words "to the International System of Units (SI)" in the section 3.1.3. of the Fundamental Considerations. These two changes are reflected in the items below.)

Source: The NIST Office of Weights and Measures and Seraphin Test Measure Company have combined their previously separate proposals into a single proposal.

Purpose and Justification:

(a) Add a tolerance statement to the General Code that applies whenever a Type 2 transfer standard is used;

(b) Clarify in the Fundamental Considerations (Appendix A of Handbook 44) that the authority to approve field test standards rests with the regulatory official and that specific types of field test standards need not be identified in the body of a Handbook 44 Code in order to be approved by the weights and measures director;

(c) Add text to Section 3.2. Tolerances for Standards of the Fundamental Considerations (Appendix A of Handbook 44) to recognize the wide range of transfer standards already recognized in Handbook 44, explain the critical differences between field standards and transfer standards, and to specify the formula to be used to calculate the device tolerance when the uncertainty of the transfer standard exceeds the one-third requirement; and

(d) Add definitions to Appendix D of Handbook 44 for field standard and Type 1 and Type 2 transfer standards that identify the critical characteristics for field and transfer standards.

Footnote 2 in the Fundamental Consideration of NIST Handbook 44 already provides a statement regarding the authority of the Director to approve field test standards or equipment, OWM believes including additional information regarding the essential elements of traceability and a reference to specific measurement practices would be helpful to both emphasize that authority and provide guidance to Directors and industry regarding the selection of appropriate field test standards.

NIST OWM recommends the guidance originally included in Footnote 2 along with the additional references to the "Essential Elements" described above are best included in the body of Section 3 for clarity and ease of use. Consequently, OWM recommends deleting the existing Footnote 2 and incorporating its contents into the body of Section 3.

OWM also believes that some may erroneously believe that field test standards must be specifically listed within a NIST Handbook 44 code in order to be used in the inspection and testing of devices covered by that code. Providing a clear statement that this is not the case along with a reference to the required criteria may help alleviate this misunderstanding.

A tolerance statement is added to the general code that addresses uncertainties of Type 2 Transfer standards since they do not meet the NIST Handbook 44 Fundamental Consideration that state "When the standard is used without correction, its combined error and uncertainty must be less than one-third of the applicable device tolerance". Several equations were considered to included an OIML equation. After discussion an alternative equation was agreed upon. An assessment of the two equations, the 2/3 Formula: Increased MPE = (2/3 x MPE + U) with an upper limit of U_{MAX} = 2/3 MPE and the OIML Formula: Reduced MPE = (4/3 × MPE – *U*) are provided below:

The OIML formula and the 2/3 formula are similar, but they take different approaches to establish the tolerances for the device under test. The 2/3 formula is more logical, more technically consistent with the Handbook 44 concept of Type 2 transfer standards, and it is easier to understand. The 2/3 formula combines the tolerance that remains to be used by the commercial device with the growing uncertainty of the T2TS into one total tolerance value, whereas the OIML Reduced MPE calculates only the tolerance applied to test of the commercial meter under test. When Type 2 transfer standards are used in the field, the uncertainties associated with the T2TS should be recorded on the report form or a copy of the calibration certificate should be left with the test report, so the uncertainty values are available on site and can be used in an analysis should the tests with another T2TS generate different results.

The most accurate reference standard that is available should always be used for any field test. However, when the only practical option for a field test that is available is a Type 2 transfer standard, the 2/3 formula will err in favor of the commercial device to avoid failing a device that should have passed. Conversely, the OIML Reduced MPE might result in failing a commercial device that would have passed had a more accurate (e.g., Type 1 transfer or field) reference standard been available to use for the test.

Field standards are intended to have an error and uncertainty less than or equal to 1/3 of the tolerance applied to the commercial device under test. When a Type 2 transfer standard has an uncertainty slightly greater than 1/3 of the tolerance, then, using the 2/3 formula, the total tolerance applied to the device under test increases above the H44 tolerance by the amount that the uncertainty associated with the Type 2 transfer standard exceeds the 1/3 limit, thereby establishing a total tolerance slightly greater than the NIST Handbook 44 tolerances specified in the applicable codes and keeping the portion of the tolerance that remains allocated to the device under test at a constant level equal to 2/3 of the NIST Handbook 44 tolerance.

Type 2 Transfer Standards: Uncertainty is Added to the Tolerance

When the uncertainty associated with a T2TS exceeds 1/3 of the tolerance applied to the device under test, the uncertainty of the T2TS is recognized in the field test result by increasing the tolerance that is applied to the device under test. The OIML formula and the 2/3 formula take different approaches to increasing the tolerance for the device under test.

	Field Standard	Field Standard	OIML Formula	OIML Formula	2/3 Formula	2/3 Formula
Uncertainty of Standard (as % of Tolerance)	% of MPE (Tolerance) Applied to the Device	% MPE (Tolerance) Allocated to Device	% of MPE Applied to the Difference in the Test Results Using a T2TS	OIML Reduced MPE and Uncertainty of T2TS (%)	% of Combined Tolerance and Uncertainty Applied to the Device	% of Combined Tolerance and Uncertainty Allocated to the Device
0%	100	100				
10%	100	90				
20%	100	80				
30%	100	70				
33%	100	67				
34%			99	133	101	67
40%			93	133	107	67
50%			83	133	117	67
60%			73	133	127	67
67%			67	133	133	67
70%			63	133	137	67
80%			53	133	147	67
90%			43	133	157	67
100%			33	133	167	67

OWM Executive Summary for Item Block 8 (B8) G-T.5. Tolerances on Tests When Transfer Standards Are Used, Appendix A, Section 3.2. Tolerances for Standards., and Appendix D – Definitions: Standards, Field., and Standard, Transfer. Appendix A: Fundamental Considerations, 3. Testing Apparatus

OWM Recommendation: The submitters agree that these items, GEN-19.1 and OTH-22.1 are fully developed and requested that this S&T committee consider that Block 8 item be a Voting Item in 2023.

- State and industry have a need to use various types of test standards to evaluate commercial devices installed in the marketplace. NIST OWM recognizes the need to use various standards to test commercial devices and support the use of these standards when test data supports its use.

- Block 8 clarifies the use and definition of three types of standards to be included in NIST HB 44: (1) Fields Standards, (2) Type 1 Transfer Standards and (3) Type 2 Transfer Standards; it provides an equation that should be used to calculate the tolerances when Type 2 transfer standards are used; provides definitions for Field Standards, Type 1 Transfer Standards and Type 2 Transfer Standards, and provides clarification that the State Director has the authority to approve the use of standard and that specific requirements in NIST HB 44 code are not necessary to approve a standard for use.

- Two items, LPG-15.1 and MFM-15.1 in the Interim Meeting Report (Publication 16), include a purpose statement that the proposals are added to allow field standard meters to be used to test and

place into service dispensers and delivery system flow meters. Block 8 items clarify what has always been recognized in NIST HB 44 concerning the responsibility for acceptance of a standard and notes that specific code changes are not necessary for a field standard to be adequate for use.

- In addition to the changes in Block 8, a new form 15 for the 2023 cycle, which is not included in the 2022 Publication 16 and has not been addressed separately in the 2022 NIST OWM Technical Analysis, has been circulated to the Spring 2022 Regional Associations (NEWMA and CWMA)

- This new Form 15 adds a General Code requirement so that rather than revising a specific code in Handbook 44 every time a new field or transfer standard is proposed or developed, an overall statement in the General Code recognizes the use of other field and transfer standards that meet the requirements for use as field or transfer standards. The proposal is as follows:

  G-N.3. Test Methods. – <u>Permissible test methods for verifying compliance of weighing and measuring systems with the provisions of the General Code and Specific Codes include, but are not limited to, test methods and apparatus that have been approved by the State Director of weights and measures as outlined in Appendix A - Fundamental Considerations, Section 3. Testing Apparatus.</u>

- NIST OWM also observed that the definitions in Block 8 should include appropriate references to the NIST HB 44 codes.

Table 3. Summary of Recommendations

BLOCK 8 (B8) ITEM GEN-19.1 – G-T.5. Tolerances on Tests When Transfer Standards are Used., <u>Appendix A, Section 3.2. Tolerances for Standards</u>., and Appendix D – Definitions: <u>standards, field</u>., ~~transfer standard~~. <u>and standard, transfer</u>

	V	D	W	A	I	Notes*	Comments
Submitter Seraphin & OWM	✓					1	
WWMA		✓					
SWMA				✓			
NEWMA		✓					
CWMA	✓						
NCWM		✓					

	Letters of Support	Letters of Opposition	Notes

Table 3. Summary of Recommendations			
BLOCK 8 (B8) ITEM GEN-19.1 – G-T.5. Tolerances on Tests When Transfer Standards are Used., Appendix A, Section 3.2. Tolerances for Standards., and Appendix D – Definitions: standards, field., ~~transfer standard~~. and standard, transfer			
Industry	Supporting Information from Seraphin Test Measure Co. (04-03-2020) Comments from Emerson-Micro Motion (09-27-2021) Updated Proposal from Seraphin Test Measure Co. (01-06-2022) Formula Explanation – Seraphin Test Measure (06-17-2022)		
Manufacturers			
Retailers and Consumers			
***Notes Key:** 1 – Submitted modified language 2 – Item not discussed 3 – No meeting held 4 – Not submitted on agenda 5 – No recommendation or not considered			

Table 3. Summary of Recommendations							
BLOCK 8 ITEM (B8) OTH-22.1 Appendix A: Fundamental Considerations, 3. Testing Apparatus							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**
Submitter							
OWM	✓						
WWMA		✓					
SWMA		✓					
NEWMA		✓					
CWMA	✓						
NCWM		✓					
		Letters of Support			**Letters of Opposition**		**Notes**

Table 3. Summary of Recommendations							
BLOCK 8 ITEM (B8) OTH-22.1 Appendix A: Fundamental Considerations, 3. Testing Apparatus							
	V	**D**	**W**	**A**	**I**	**Notes***	**Comments**
Industry		Updated Proposal from Seraphine Test Measure Co. (01-06-2022)					
Manufacturers							
Retailers and Consumers							

***Notes Key:**
1 – Submitted modified language
2 – Item not discussed
3 – No meeting held
4 – Not submitted on agenda
5 – No recommendation or not considered

B8: GEN-19.1 D G-T.5. Tolerances on Tests When Transfer Standards are Used., Appendix A, Section 3.2. Tolerances for Standards., and Appendix D – Definitions: standards, field., ~~transfer standard.~~ and standard, transfer.

Amend Handbook 44, General Code as follows**:**

G-T.5. Tolerances on Tests When Type 2 Transfer Standards Are Used. – When Type 2 transfer standards are used, the following formula shall be used to compute the tolerance applicable to the device under test:

Increased MPE = (2/3 x MPE + U)

with an upper limit of U_{MAX} = 2/3 MPE

Where MPE is the basic tolerance that applies when using a basic reference standard; and

U = uncertainty associated with the Type 2 transfer standard.

The increase in the applied tolerance when using a Type 2 transfer standard applies only to the basic tolerances for devices as defined in Handbook 44; that is acceptance, maintenance and minimum tolerances. Note that the repeatability tolerance and the special test tolerances are NOT increased.

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 Code is also exempt because relative and absolute tolerances are included in the code.

Amend Handbook 44 Appendix D – Definitions as follows.

Standard, Field. – A physical artifact, static or dynamic measurement device or a reference material that (a) meets the requirements of the Fundamental Considerations, Section 3.2., (b) is stable (accurate and repeatable) over an extended period of time (as determined by the Director), (c) is valid (corrections that may be used) over the range of environmental and operational parameters in which the commercial measuring devices are used, and (d) is traceable to the reference or working standards through comparisons, using acceptable laboratory procedures. [3.34, 3.38, 3.39, x.xx, x.xx…]

(Added 202X)

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

Standard, Transfer, Type 1 and Type 2. − A physical artifact, static or dynamic measurement device or a reference material that is proven to be stable (accurate and repeatable) for a short time under the limited environmental and operational conditions during which the transfer standard is used. A Type 1 transfer standard is a transfer standard that meets the one-third accuracy requirement for a short time over a limited range of environmental conditions and/or a limited range of operating conditions in which it is used. A Type 2 transfer standard is one that does not meet the one-third requirement and may not be stable or valid over an extended time period or over wide ranges of environmental or operating conditions. (3.34, 3.38, 3.39, x.xx, x.xx…]

(Added 202X)

B8: OTH-22.1 D Appendix A: Fundamental Considerations, 3. Testing Apparatus

Amend Handbook 44, Appendix A: Fundamental Considerations as shown below. Delete Footnote 2 referenced in Section 3. Testing Apparatus of NIST Handbook 44 Appendix A, Fundamental Considerations, moving portions of the footnote into Section 3.1 as part of the proposed changes to Section 3.1 shown above. Note that no changes are proposed to Footnote 1.

~~**[2] Recommendations regarding the specifications and tolerances for suitable field standards may be obtained from the Office of Weights and Measures of the National Institute of Standards and Technology. Standards will meet the specifications of the National Institute of Standards and Technology Handbook 105-Series standards (or other suitable and designated standards). This section shall not preclude the use of additional field standards and/or equipment, as approved by the Director, for uniform evaluation of device performance.**~~

3.1. Adequacy.[2] **–** Tests can be made properly only if, among other things, adequate testing apparatus is available. Testing apparatus may be considered adequate only when it is properly designed for its intended use, when it is so constructed that it will retain its characteristics for a reasonable period under conditions of normal use, when it is available in denominations appropriate for a proper determination of the value or performance of the commercial equipment under test, and when it is accurately calibrated.

3.1.1. Essential Elements of Traceability. To ensure that field test standards and test methods provide for measurements that are traceable to the International System of Units (SI), through NIST or other National Metrology Institutes, they must satisfy the "Essential Elements of Traceability." As explained in NIST IR6969 GMP-13 Good Measurement Practice for Ensuring Metrological Traceability, these elements include the following.

- **Realization of SI Units**
- **Unbroken Chain of Comparisons**
- **Documented Calibration Program**
- **Documented Measurement Uncertainty**
- **Documented Measurement Procedure**
- **Accredited Technical Competence**
- **Measurement Assurance**

3.1.2. Specifications for Standards. Standards will meet the specifications of the National Institute of Standards and Technology Handbook 105-Series standards or other appropriate designated documentary standards (e.g., ASTM, ASME, etc.). Recommendations regarding the specifications and tolerances for suitable field standards may be obtained from the Office of Weights and Measures of the National Institute of Standards and Technology.

3.1.3. Authority for Approving Field Test Standards and/or Equipment. This section shall not preclude the use of additional field standards and/or equipment, as approved by the Director, for uniform evaluation of device performance. Specific types of field test standards are not required to be identified in a NIST Handbook 44 code in order to be considered suitable. Provided the standards meet the "Essential Elements of Traceability" (described in Section 3.1.1. above) that help ensure the standards are suitable and capable of supporting measurements traceable to the International System of Units (SI) through NIST or other National Metrology Institutes, they need only be approved by the Director.

3.2. Tolerances for Standards. – Except for work of relatively high precision, it is recommended that the accuracy of **field** standards used in testing commercial weighing and measuring equipment be established and maintained so that the use of corrections is not necessary. When the **field** 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.

Whenever possible and practical, field standards should be used to test commercial devices. However, where it is impractical or unduly cumbersome to use field standards, transfer standards may be used. There are two categories of transfer standards. The critical criteria that distinguish between these standards are: (1) the accuracy and uncertainty of the standard; (2) the stability as a standard over an extended period; and (3) proven validity or performance of the standard over the range of environmental and operational conditions in which the standard may be used.

A "field standard" is one that meets the one-third requirement mentioned earlier in this section. Additionally, the field standard maintains its validity or stability as a standard over an extended

period (defined based on data of the standard's stability by an authorized metrology lab or as specified by the Director) and is known to maintain its value as a standard over the full range of environmental conditions and the range of operating conditions in which the standard may be used to test commercial weighing and measuring devices. Corrections, as documented by an authorized metrology laboratory, may be used.

Transfer standards do not meet one or more of these critical criteria. One category of transfer standards, which is referred to here as a "Type 1 transfer standard," is a transfer standard that meets the one-third accuracy requirement for a short time, under a limited range of environmental conditions and/or a limited range of operating conditions. The accuracy of a Type 1 transfer standard may have to be verified through testing each time it is used to verify that the desired accuracy and performance can be achieved when the Type 1 transfer standard is used under the limited environmental and operating conditions. When a Type 1 transfer standard is used, the basic tolerances specified for the commercial measuring devices are applied as specified in the applicable codes.

The second category of transfer standard, which is referred to here as a "Type 2 transfer standard," is one that does not meet the one-third requirement. The Type 2 transfer standard must be stable and valid under the environmental or operating conditions in which it is used. The performance characteristics must be confirmed with sufficient data to properly characterize the uncertainty associated with the Type 2 transfer standard. When a Type 2 transfer standard is used, the tolerances applicable to the commercial weighing and measuring device must be increased to recognize the large uncertainty or corrections associated with the Type 2 transfer standard. When commercial meters are tested using a Type 2 transfer standard, the tolerance applied to the meter under test shall be determined as specified in the General Code.

(Added 202X)

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.

NIST OWM Detailed Technical Analysis:

State and industry have a need to use various types of test standards to evaluate commercial devices installed in the marketplace. NIST OWM recognizes the need to use various standards to test commercial devices and support the use of these standards when test data supports its use. Several proposals for changes to

NIST HB 44 have been considered to address the use of these standards. Some were to address terminology for various types of standards in NIST HB 44. Other proposals were to provide specific requirements for some codes in NIST HB 44 for the purpose of recognizing these standards in the handbook, but the responsibility for recognition of standards is already address in the fundamental consideration section in NIST HB 44. These proposals also included varying terms used to describe these standards and were subsequently all combined as a Block item and assigned to a task group. With limited success as a block item, it was decided to separate these items into their original block and individual items for consideration, some of the items were withdrawn. Block 8 items are a combined modification of the 2021 S&T Agenda Block 1 Item GEN-19.1 and OTH-22.1. With the S&T Committee changes to the status of item GEN-19.1 from "assigned" to "developing," the submitter, Seraphin and NIST OWM seeing the need to add clarification to NIST HB 44 for the different terms used to address standards that are used to test commercial devices and the need to provide clarification as to what is needed for States to accept various types of standards, worked together to develop Item Block 8. These proposals were revised to address discussions within the NCWM Field Standards Task Group and other comments received at the regional weights and measures associations meetings and the 2022 Interim Meeting. There is also a companion item Block 7 that helps to clarify the use of the term transfer standards in NIST HB 44.

Block 8 clarifies the use and definition of three types of standards to be included in NIST HB 44: (1) Fields Standards, (2) Type 1 Transfer Standards and (3) Type 2 Transfer Standards; it provides an equation that should be used to calculate the tolerances when Type 2 transfer standards are used; provides definitions for Field Standards, Type 1 Transfer Standards and Type 2 Transfer Standards, and provides clarification that the State Director has the authority to approve the use of standard and that specific requirements in NIST HB 44 code are not necessary to approve a standard for use.

Although 3 types of standards are to be specified in NIST HB 44, language has been added in Block 8 such that whenever possible and practical, field standards should be used to test commercial devices. Definitions are provided for the three different types of standards. Separating the standards into 3 types helps to determine what specifications should be used for the standards combined error and uncertainty or whether the tolerances should be increased to account for the error in the standard. Both Field Standards and Type 1 Transfer standards must comply with the current Fundamental Considerations in NIST HB 44 that state "When a Standard is used without correction, its combined error and uncertainty must be less than one-third of the applicable device tolerance". This allows the device under test to have more than 2/3 of the tolerance associated with the test. Type 2 Transfer Standards do not meet the one-third requirement and may not be stable or valid over an extended time-period or over wide ranges of environmental or operating conditions. With the inability to meet the one-third requirements for the uncertainty in the standard that Field Standards and Type 1 Transfer Standard are required to meet, an equation was added to the general code for all Type 2 Transfer Standards in NIST HB 44 to multiply the basic tolerance (the applicable tolerance, maintenance, acceptance, or special test tolerances by 2/3 and adding the uncertainty of the standard. This increases the total tolerance when using a Type 2 transfer standard to account for the uncertainty of the standard.

Although a larger tolerance is used to account for the uncertainty in Type 2 standards, allowing an unlimited amount of uncertainty to be added to the tolerance adds an open-ended amount of uncertainty to the tolerance and the larger the tolerance that is allowed the more lead way is given to the device under test and the more disadvantage to the customer. As such a stipulation was added that the maximum limit for the uncertainty of type 2 standards must be 2/3 of the MPE. The proposed equation provides a uniform method for considering the uncertainties associated with Type 2 Standards. An example of calculating the equation is provided below.

Increased MPE = (2/3 x MPE + U)

with an upper limit of U_{MAX} = 2/3 MPE

Example Calculation

Increased MPE = (2/3 x 0.01 + 0.005)
= 0.01166

In this example the U_{MAX} does not exceed 2/3 MPE which = 0.007

Mr. Henry Oppermann of Seraphin provided an analysis of the equation which is provided in the Justification of this Technical Analysis.

This Block also helps to clarify that the Director has the authority to approve Standards for use within a jurisdiction. This information is already included in a footnote in the Fundamental Considerations but has been moved to Section 3 in the Fundamental Considerations. Language was also added to clarify that specific language is not needed in various NIST HB Codes in order that these standards be accepted. Two items, LPG-15.1 and MFM-15.1 in the Interim Meeting Report (Publication 16), include a purpose statement that the proposals are added to allow field standard meters to be used to test and place into service dispensers and delivery system flow meters. Block 8 items clarify what has always been recognized in NIST HB 44 concerning the responsibility for acceptance of a standard and notes that specific code changes are not necessary for a standard to be adequate for use. Please see additional NIST OWM concerns with items LPG-15.1 and MFM-15.1 in the NIST OWM Technical Analysis for these items.

In addition to the changes in Block 8, a new Form 15 for the 2023 cycle which is not included in the 2022 Publication 16 and has not been addressed separately in the 2022 NIST OWM Technical Analysis, has been circulated to the Spring 2022 Regional Associations (NEWMA and CWMA) that will also impact LPG-15.1 and MFM-15.1 and Block 7 items. This proposal adds a General Code requirement so that rather than revising a specific code in Handbook 44 every time a new field or transfer standard is proposed or developed, an overall statement in the General Code recognizes the use of other field and transfer standards that meet the requirements for use as field or transfer standards is proposed as follows:

G-N.3. Test Methods. – <u>Permissible test methods for verifying compliance of weighing and measuring systems with the provisions of the General Code and Specific Codes include, but are not limited to, test methods and apparatus that have been approved by the State Director of weights and measures as outlined in Appendix A - Fundamental Considerations, Section 3. Testing Apparatus.</u>

For those who believe a specific statement in Handbook 44 is needed to recognize additional field and transfer standards, the proposed addition of G-N.3. will provide the reference they want without the need to change individual codes on a regular basis to recognize each particular field or transfer standard.

The submitters agree that these items, GEN-19.1 and OTH-22.1 are fully developed and requested that this S&T Committee consider that this combined item be a Voting Item in 2023.

Summary of Discussions and Actions:

At the 2022 Interim Meeting there was discussion concerning specifying a 1-year length of time for the stability of a field standard. The concern was whether or not this was an appropriate length of time and

how a specific length of time for a standards stability could change due to many factors. Some expressed concerns with more time needed to review the latest edition of the proposal. NIST and Seraphin agreed to further develop the item and NIST OWM requested that both GEN-19.1 and the OTH-22.1 be combined. During their work session, the Committee agreed to combine both GEN-19.1 and OTH-22.1 and agreed to a developing status for this item. For more information or to provide comment, please contact:

Mr. Robert Murnane
Seraphin Test Measure Company
A Division of Pemberton Fabricators, Inc.
(609) 267-0922, **rmurnane@pemfb.com**

or

Ms. G. Diane Lee
NIST Office of Weights and Measures
diane.lee@nist.gov

Regional Association Reporting:

Western Weights and Measures Association

(B8: GEN-19.1)
At the 2021 WWMA Open Hearings the following comments were heard:

Mr. Marc Buttler (Emerson Micro Motion): Regards to the fine work of the work group and authors of form 15, he finds it useful and helpful by augmenting the existing wording to add clarity as we work forward to more practical testing. He wanted to comment on whether the underlying principle of affording additional tolerance not capable of meeting the 1/3rd. In the language there is an equation (lower down in the proposal) reduced MPE. This is intended to penalize the tolerance of the device and not give additional leeway. Further into the justification it references an established principle that says that additional tolerance is afforded when complex. A better equation would be to take the MPE x 2/3 PLUS and not minus. This avoids jurisdictions having different uncertainty testing to different tolerances. He can prepare a written summary of his comments and will send to us.

Mr. Bob Murnane (Seraphin): Seraphin proposed this. There is a lack of definitions. This comes into play in block 5. This was put in to clarify and give definite definitions to field and transfer standards. He hopes this clarifies multiple items on the agenda.

Mr. Russell Vires (Scale Manufactures Association): this item has been around for a while and was part of block 1. It has been pulled out and changed. The SMA has made comments in the past to support this item, but at this point they will meet in November and review; they have not been able to review the substantial changes yet. They have no position as of now. This needs to remain developing to allow stakeholders the opportunity to review.

Ms. Diane Lee (NIST OWM): wants to expand on Mr. Vires' comments. This was included in a block with terminology for standards, (master meter, transfer standard or field standard). She questioned whether the transfer standards could meet the 1/3 standard. NIST has an analysis from the Annual Meeting that will address some of the issues; however, they have not met as a group yet. We can look online on NCWM and look forward to them providing additional info. (Previous analysis is available on the NCWM website).

Mr. Kurt Floren (Los Angeles County, California): he commented on the proposed definition of field standard (S&T 7). He thinks it is better, but raises an issue that there is a distinction between volumetric and gravimetric. The existing language spoke to the calibration and certification in the lab. Field standards are tested under all environmental conditions and range of operating conditions. In a lab setting, there are conditions that need to be very strict. He's concerned that it says that it's known to maintain. Question: are we thinking more from a volumetric standpoint (temperature changes, etc.) that's not really a concern with a mass standard. Thinks that there will be challenges in the future on pass/fail, and question all of the environmental criterial that the standards were tested to. Requesting (please) take into consideration the environmental factors (lab or/vs. field) and how this would relate to an enforcement action.

The WWMA S&T Committee recommends that this item should remain Developmental in status. The Committee recommends that the submitter works with NIST OWM and commentators above to resolve issues presented. A letter was submitted to the Committee by Mr. Marc Buttler (Emerson Micro Motion) and will be posted to the NCWM website. The Committee also recommends that consideration be made that this item be included in Block 7.

(B8: OTH-22.1)
During the 2021 Annual Meeting Open Hearing the following comments were heard:

Mr. Michael Keilty (Endress + Hauser): 3.1.1 on pg. S&T 112, line 2: unnecessary language: "likely through NIST" is not appropriate. In 3.1.2 : "standards will meet the… or other appropriate…. ASTM ASME" NIST HB105 is not consensus standards and we should not be referring to that. Traceability is not solely owned by NIST. Speaks about international traceability (Switzerland, Canada, etc..). Recommends Developing.

Mrs. Tina Butcher (NIST OWM): Submitter: NIST is not the only one for traceability - key here is making sure that due diligence that essential elements of traceability have been addressed. Authority rests with W/M director. Item 3.12: question ab. HB105: this requirement is simply taking the already existing language and moving it up into the main body. This is to clarify where authority rests (W/M directors). Clarifies what is needed to be looked at.

Mr. Matt Douglas (California - DMS): They support this item.

Mr. Randy Jennings (Retired, Tennessee, Rep's himself): supports comments made by Mr. Keilty. Wants to be careful about bringing forward anything that can take away options.

Ms. Cadence Matijevich (Nevada): seeking clarification from Mrs. Butcher: clarification on traceability/distinction, SI vs NIST, in 3.1.1: we say traceable to international system, in 3.1.3: says traceable to NIST. Why is there a discrepancy in traceability verbiage? Is there a specific reason to limit to NIST in 3.1.3?

Mrs. Butcher (NIST OWM): they tried to preserve the language already in footnote 2 and just bring it up into the body. Trying to emphasize that the director has the authority. Tried to provide a link between 3.1.1 and 3.1.3. Could say traceable to SI likely through NIST.

Mr. Michael Keilty (Endress + Hauser): they say traceability is through national standards and they feel that that covers it all.

The WWMA S&T Committee recommends that this be assigned a Developmental status.

Southern Weights and Measures Association

(B8: GEN-19.1)

During the 2021 Annual Meeting Open Hearing, Mr. Henry Oppermann (Seraphin) explained the differences between Field Standards, Type 1 and Type 2 Transfer Standards, and expressed support for a proposed change that originated in the Western.

Mr. Tim Chesser (Arkansas) questioned what "sufficient data" would be once a device is placed into service as a Standard, and how often it would need to be reverified.

Mr. Oppermann responded to Mr. Chesser stating that the Master Meter Task Group must evaluate the performance of these devices and create calibration and performance requirements in the future.

Mr. Russ Vires (speaking on behalf of the Scale Manufacturers Association) stated that they have no position at this time.

Mr. Russ Vires (speaking on behalf of Mettler Toledo) stated that he believes this is in conflict with Block 1, and would recommend it continue with a Developing status.

Mr. Michael Keilty (Endress + Hauser) assured Mr. Chesser that any devices used as a Field Standard would have a traceable chain of metrology.

This Committee recommends that this item remain Assigned pending the Workgroup finding a new Chairperson.

(B8: OTH-22.1)

During the 2021 Annual Meeting Open Hearing, Mr. Keilty (Endress+Hauser) stated that this item is a proposal by NIST to change some language in Appendix A of Handbook 44. The changes suggested are to strike "likely through NIST," in section 3.1.1., "the National Institute of Standards and Technology Handbook 105-Series standards or other" in section 3.1.2., as well as to strike "NIST" in section 3.1.3. and replace it with "International System of Units (SI)". He does not feel that Handbook 105 is a consensus document.

Mr. Oppermann (Seraphin) stated that he would like to work with NIST to combine this item with GEN 19.1, and recommended moving it forward with a Developing status.

This Committee agrees that this item should be reworded or possibly combined with Gen 19.1 and recommends this item be assigned a Developing status.

Northeastern Weights and Measures Association

(B8: GEN-19.1)

During the 2021 Interim Meeting Open Hearings, the following comments were heard: Henry Opperman (W&M Consulting/Seraphin) Commented that they are updating the formula in the proposal due to the feedback received from the Western Weights and Measures Association and recommended a Developing Status. Updates can be found on the NCWM website.

Lou Straub representing the SMA agreed with a Developing Status and reminded us that SMA positions have been posted on the NCWM website.

The NEWMA Specifications and Tolerances Committee recommends that this item be given a Developing Status.

(B8: OTH-22.1)

During the 2021 Interim Meeting Open Hearing the following comments were heard.

Ms. Juana Williams (NIST OWM) commented:

- NIST OWM submitted this item to:
    - Further emphasize the statement currently in the Fundamental Considerations that authority rests with the Director to approve standards.
    - Provide additional details to assist in the assessment and approval of a standard for use in testing commercial weighing and measuring systems.
        - This includes recognizing the need to verify that certain essential elements of traceability have been met and a listing of those elements.

  Based on comments heard at the WWMA, NIST would like to modify the language in the proposed 3.1.3. Authority for Approving Field Test Standards and/or Equipment to align the language with that in the proposed 3.1.1. Essential Elements of Traceability; the proposed change will mirror the statement in 3.1.1. that that traceability to the SI can be establish through entities other than NIST.

  3.1.3. Authority for Approving Field Test Standards and/or Equipment. This section shall not preclude the use of additional field standards and/or equipment, as approved by the Director, for uniform evaluation of device performance. Specific types of field test standards are not required to be identified in a NIST Handbook 44 code in order to be considered suitable. Provided the standards meet the "Essential Elements of Traceability" (described in Section 3.1.1. above) that help ensure the standards are suitable and capable of supporting measurements traceable to the SI, likely through NIST, they need only be approved by the Director.

- OWM notes that work underway in the NIST USNWG on Field Reference Meters may result in additional input to this section of the Handbook and possibly, though not necessarily, other sections. In the meantime, the proposed changes to this section will clarify that test standards need not be specified by name in specific codes, unless there is language that would otherwise impact their use.

Mr. Michael Keilty (Endress + Hauser Flowtec) comments below: he is suggesting the removal of yellow highlighted portions that are referencing NIST and the change reflected in 3.1.3.(blue highlighted) He believes that NIST is relevant, but not the only avenue for traceability.

3.1.1. Essential Elements of Traceability. To ensure that field test standards and test methods provide for measurements that are traceable to the International System of Units (SI), ~~likely through NIST~~, they must satisfy the "Essential Elements of Traceability." As

explained in NIST IR6969 GMP-13 Good Measurement Practice for Ensuring Metrological Traceability, these elements include the following.

- **Realization of SI Units**
- **Unbroken Chain of Comparisons**
- **Documented Calibration Program**
- **Documented Measurement Uncertainty**
- **Documented Measurement Procedure**
- **Accredited Technical Competence**
- **Measurement Assurance**

3.1.2. Specifications for Standards. Standards will meet the specifications of ~~the National Institute of Standards and Technology Handbook 105-Series standards or other~~ appropriate designated documentary standards (e.g., ASTM, ASME, etc.). Recommendations regarding the specifications and tolerances for suitable field standards may be obtained from the Office of Weights and Measures of the National Institute of Standards and Technology.

3.1.3. Authority for Approving Field Test Standards and/or Equipment. This section shall not preclude the use of additional field standards and/or equipment, as approved by the Director, for uniform evaluation of device performance. Specific types of field test standards are not required to be identified in a NIST Handbook 44 code in order to be considered suitable. Provided the standards meet the "Essential Elements of Traceability" (described in Section 3.1.1. above) that help ensure the standards are suitable and capable of supporting measurements traceable to ~~NIST~~ the International System of Units (SI), they need only be approved by the Director.

Mr. Lou Sakin (Hopkinton/Northbridge, Massachusetts) commented that he believes NIST OWM has a responsibility that is authorized by the Federal Dept. of Commerce.

Mr. Bob Murnane (Seraphin) recommends Developing status, Mr. Henry Opperman (Weights and Measures Consulting) stated that NIST is relevant to this portion and Ms. Juana Williams (NIST OWM) commented that NIST is indeed charged with responsibility from the Dept. of Commerce.

The NEWMA Specifications and Tolerances Committee recommends that this item be given Developing Status with consideration given to the new language above.

(B8: GEN-19.1)

During the 2022 Annual Meeting Open Hearing, Mr. Bob Murnane (Seraphin) commented that the purpose of this proposal was to define Type 1 and Type 2 Transfer Standards. Originally the proposal had the OIML formula, but the formula only calculates the meter-to-meter tolerance and as the uncertainty associated with the transfer standard increases, the tolerance allocated to the commercial device gradually decreases. The submitter is now proposing a "2/3 Formula" where the calculation includes all the uncertainty associated

with the transfer standard and the tolerance allocated to the commercial meter never drops below 2/3 of the normal tolerance. Mr. Murnane requested that this proposal be given a voting status.

After hearing comments from the floor, the Committee recognized the need to further develop this block and recommended the block retain Developing status.

(B8: OTH-22.1)

Mr. Russ Vires (SMA) commented the SMA supports this item as Developing. He urged stakeholders to review the item and make comments available to submitter.

After hearing comments from the floor, the Committee recognized the need to further develop this block and recommended the block retain Developing status.

Central Weights and Measures Association

(B8: GEN-19.1)

During the 2021 Interim Meeting Open Hearing the Committee heard comments from the floor. Mrs. Tina Butcher (NIST OWM) about working together with Seraphin to develop more. Mr. Robert Murnane (Seraphin Test Measure) agreed with Mrs. Butcher and looked forward to working together. Should stay as developing. Mr. Lou Straub (SMA) has not had the chance to review but would be meeting in two weeks.

CWMA S&T Committee recommends item move forward as a Developing item.

(B8: OTH-22.1)

During the 2021 Interim Meeting Open Hearing the Committee heard comments from the floor. Mrs. Tina Butcher (NIST OWM) says item is ready to move forward as a voting item, but proposed a slight modification to the language based on comments heard at the WWMA. Mrs. Butcher requested the last sentence in the proposed 3.1.3. Authority for Approving Field Test Standards and/or Equipment be modified to add the statement "to the International System of Units (SI), likely through" immediately before the term "NIST." This would align section 3.1.3. with the reference in proposed section 3.1.1. Essential Elements of Traceability and maintain the reference to NIST as is currently referenced by many jurisdictions' weights and measures jurisdictions' laws and regulations. The revised sentence in 3.1.3. would read as follows:

<u>Provided the standards meet the "Essential Elements of Traceability" (described in Section 3.1.1. above) that help ensure the standards are suitable and capable of supporting measurements traceable to the International System of Units (SI), likely through NIST, they need only be approved by the Director.</u>

Mr. Michael Keilty (Endress+Hauser) would like to see the comment Section 3.1.1. in the first sentence, strike "likely through NIST. Section 3.1.2. in the first sentence, strike "the National Institute of Standards and Technology Handbook 105-Series standards or other. Section 3.1.3. in the last sentence strike "NIST" and insert "International System of Units (SI)". He recommends that this agenda item be revised as recommended and moved forward as a Voting item.

CWMA S&T Committee recommends that this item move forward as a Voting item with Mr. Michael Keilty's (Endress+Hauser) recommendations.

(B8: GEN-19.1)

During the 2022 Annual Meeting Open Hearing, Mr. Bob Murnane (Seraphin) - transfer standard is already included in HB 44 but it isn't defined.

This doesn't preclude the ability for The Director to approve transfer standards.

HB 44 doesn't specify the frequency of testing intervals; cast iron vs stainless steel weights as an example. G.UR.4.1 already states the owner or operator must maintain the equipment, which includes the accuracy. States have different interval requirements. Recommends moving to a Voting item.

Mr. Jan Konijnenburg (NIST OWM) - State and industry have a need to use various types of test standards to evaluate commercial devices installed in the marketplace. NIST OWM recognizes the need to use various standards to test commercial devices and support the use of these standards when test data supports its use.

Block 8 clarifies the use and definition of three types of standards to be included in NIST HB 44: (1) Fields Standards, (2) Type 1 Transfer Standards and (3) Type 2 Transfer Standards; it provides an equation that should be used to calculate the tolerances when Type 2 transfer standards are used; provides definitions for Field Standards, Type 1 Transfer Standards and Type 2 Transfer Standards, and provides clarification that the State Director has the authority to approve the use of standard and that specific requirements in NIST HB 44 code are not necessary to approve a standard for use.

Two items, LPG-15.1 and MFM-15.1 in the Interim Meeting Report (Publication 16), include a purpose statement that the proposals are added to allow field standard meters to be used to test and place into service dispensers and delivery system flow meters. Block 8 items clarify what has always been recognized in NIST HB 44 concerning the responsibility for acceptance of a standard and notes that specific code changes are not necessary for a field standard to be adequate for use.

In addition to the changes in Block 8, a new form 15 for the 2023 cycle which is not included in the 2022 Publication 16 and has not been addressed separately in the 2022 NIST OWM Technical Analysis but has been circulated to the Spring 2022 Regional Associations (NEWMA and CWMA).

This new Form 15 adds a General Code requirement so that rather than revising a specific code in Handbook 44 every time a new field or transfer standard is proposed or developed, an overall statement in the General Code recognizes the use of other field and transfer standards that meet the requirements for use as field or transfer standards. The proposal is as follows:

G-N.3. Test Methods. – Permissible test methods for verifying compliance of weighing and measuring systems with the provisions of the General Code and Specific Codes include, but are not limited to, test methods and apparatus that have been approved by the State Director of weights and measures as outlined in Appendix A - Fundamental Considerations, Section 3. Testing Apparatus.
NIST OWM also observed that the definitions in Block 8 should include appropriate references to the NIST HB 44 codes.

OWM Recommendation: The submitters agree that these items, GEN-19.1 and OTH-22.1 are fully developed and requested that this S&T Committee consider that Block 8 item be a Voting Item in 2023.

Mr. Charlie Stutesman (Kansas) – GEN-19.1 line 29 – strike "as determined by the Director" "short term" and "extended term" are ambiguous phrases.

Mr. Loren Minich (Kansas) – Page 277 line 41 regarding a Type 2 transfer standard not being stable or valid over extended time, but OTH-22.1 page 279 line 28 says the Type 2 standard must be stable and valid. Mr. Minich would like to keep as Developing.

Mr. Doug Musick (Kansas) - Page 277 definitions: having the 1/3 rule in the code (and not in an appendix) is helpful. Suggested that Type 2 should go away and just have a single "transfer standard" definition.

Mr. Michael Keilty (Endress+Hauser) – "Short term", "extended period of time", "short period of time", "stable", "valid" are arbitrary; who defines this? Who is going to establish this time period and qualifications of devices? Are we establishing a program for that? API chapter 4.8 dictates 5 year calibration intervals for small volume provers, for example.

The CWMA S&T Committee recommends this moves forward as a voting item.

(B8: OTH-22.1)

During the 2022 Annual Meeting Open Hearing Mr. Russ Vires (SMA) - Supports OTH-22.1 as Developing. Stakeholders need to review and provide input to the submitter.

The CWMA S&T Committee recommends this moves forward as a Voting item.

References:

[1] 2022 - NIST OWM Analysis and Final reports **https://www.nist.gov/pml/weights-and-measures/publications/owm-technical-analysis**
[2] 1905-2021 NCWM Annual Conference reports **www.nist.gov/pml/weights-and-measures/publications/ncwm-annual-reports**
[3] National Conference on Weights and Measures (2022) Publication 15 and 16. **https://www.ncwm.com**

Appendix A: Supplemental Documents