# SWMA Specifications and Tolerances (S&T) Committee
# 2021 Annual Meeting Report

Mr. Alan Walker, Committee Chair
Florida

## INTRODUCTION

The Specifications and Tolerances (S&T) Committee (hereinafter referred to as "Committee") submits its Report to the Southern Weights and Measures Association (SWMA). The Report consists of the SWMA Agenda (NCWM Carryover and NEW items) and this Addendum. Page numbers in the tables below refer to pages in this Addendum. Suggested revisions to the handbook are shown in **bold face print** by ~~**striking out**~~ information to be deleted and **underlining** information to be added. Requirements that are proposed to be nonretroactive are printed in **bold-faced *italics.***

Presented below is a list of agenda items considered by the SWMA and its recommendations to the NCWM Specifications and Tolerances Committee.

**Subject Series List**

## Table A
## Table of Contents

## Table B
## Glossary of Acronyms and Terms

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

**Details of All Items**
*(In order by Reference Key)*

## GEN – GENERAL CODE

### GEN-19.1 A 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,

*NOTE: These proposals are a modification of the 2021 S&T Agenda Block 1 Item GEN-19.1. Since the S&T Committee has changed these items from "assigned" to "developing," the submitter has revised and expanded the original proposal to address discussions within the NCWM Field Standards Task Group and other comments received on the proposal. These items are related, so they are submitted as group*.

**Source:**
Seraphin Test Measure Company

**Purpose:**

(a) 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 use of the OIML R117 Reduced MPE formula when the uncertainty of the transfer standard exceeds the one-third requirement; and

(b) Add definitions for field standard and Type 1 and Type 2 transfer standards that identifies the critical characteristics for field and transfer standards regarding the Fundamental Considerations of Handbook 44.

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

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

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

Amend Handbook 44 Appendix A – Fundamental Considerations as follows:

**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.
**(Amended 202X)**

And add the following at the end of Section 3.2. of the Fundamental Considerations.

**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.**

**Both field standards and transfer standards must demonstrate metrological traceability to national or international standards. To demonstrate metrological traceability, (a) all measuring instruments used in the test system must be tested in a laboratory that is accredited or recognized at the time of calibration of these instruments, (b) the calibration service is included in the scope of measurements for the laboratory accreditation or recognition, and (c) adequate test data must exist and been collected using acceptable test methods to establish the uncertainty associated with the transfer standards.**

**A field standard is one that meets the one-third requirement mentioned earlier in this section. Additionally, the standard maintains its validity or stability as a standard over an extended period, typically at least one year, 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 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 tested 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 OIML Recommendation 117-2: 2019, Section 4.2.2, which states:**

**Reduced MPE = (4/3 x MPE – U)**

**Where:**

**MPE = the applicable tolerance**

**U = uncertainty associated with the Type 2 transfer standard at the 95% confidence level.**

**(Added 202X)**

And 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 (typically one year), (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.**
**(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.**
**(Added 202X.**

**Background and Discussion:**
This item has been assigned to the submitter for further development. 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

The submitter provided the following:

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

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

- The range of flow rates at which the commercial meters under test operate (from the minimum to maximum flow rates for the meters);
- The range of air temperatures over which meters are used (perhaps 10° F to 105° F);
- The range of product temperatures over which meters are used (perhaps 10° F to 105° F, especially applicable for above ground storage tanks);
- The range of temperature differences that may exist between the product, the standard and the air over which meters are used (perhaps up to 50° F, especially for cold fuel in underground tanks and hot air temperatures);
- The range of pressures at which the pumping systems operate at different times and locations;
- The different products measured by similar meters; and
- Tests of multiple “standards” of the same type when used in different test system configurations (and “standards” of different sizes) to verify that the results agree and are consistent.

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

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

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

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

The submitter also provided the following possible opposing arguments:

I. There are several proposals before the S&T Committee to recognize some meters as field standards and field standard reference meters. These proposals have not specified how the proposed field standards are to be tested to demonstrate compliance with the Fundamental Considerations requirements of Section. 3.2. It is possible that some companies will push for the recognition of meters as field standards without submitting data to support their claims of performance as field standards.

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

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

IV. Laboratory calibration procedures may not reflect the performance of the proposed field standard under field conditions.

V. Some companies may object to the cost of collecting data for transfer standards (meters) of different sizes and with different flow rate ranges to prove that the results for the different sized transfer standards (metering systems) will produce consistent test results on the same commercial meters.

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

VI. Establishing a reasonably good estimate of the standard deviation associated with a transfer standard (to be added to the basic tolerances for the devices under test) may require significant time, effort and cost.

VII. Some companies may want to modify the device under test to be able to test the commercial measuring device, rather than testing the device as used.

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

**Background and Discussion:**
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.

NCWM 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.

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

NCWM 2020 Interim Meeting: Field Standard TG Chair Jason 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.

NCWM 2021 Interim Meeting: NCWM Field Standard TG Chair, Jason 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. Ms. 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.

NCWM 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. 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.

**Regional Association Comments:**

WWMA 2020 Annual Meeting: At the 2020 WWMA Annual Meeting, the WWMA adhered to a condensed agenda due to the COVID pandemic and did not consider this item.

SWMA 2020 Annual Meeting: At the 2020 SWMA Annual Meeting, the SWMA adhered to a condensed agenda due to the COVID pandemic and did not consider this item.

NEWMA 2021 Annual Meeting: Comments were received on the entire block: Diane Lee (NIST OWM) commented that there is currently discussion for definitions of field standards and work for testing of master meters. Russ Vires (SMA) supports the development as it applies to items GEN-19.1, SCL-18.1, ABW-18.1, and AWS-18.1 and looks forward to further development. Tina Butcher (NIST OWM) gave an overview of the master meter project and the different types of testing to be performed. Bob Murnane (Seraphin) commented that the Field Standard Task Group is currently without a chairman and at a standstill on definitions until a new chairman is found. Ross Anderson (NY

retired) expressed concerns with testing versus calibrating and the associated uncertainties. He is concerned that calibrating will require additional uncertainty components that must be developed using control charts and proficiency tests. The cost and time of this to an inspector is not practical. Ms. Diane Lee (NIST OWM) is concerned that tolerances may be too small to encompass uncertainties in the field. The NEWMA S&T Committee recommends that this item remain with Assigned status.

CWMA 2021 Annual Meeting: Comments taken on the whole block. Diane Lee (NIST OWM) reported that testing with NIST master meters is underway. CNG meters are being tested in Colorado. The LPG master meter is to set to begin being used shortly. There are two separate task groups working on this project. The NCWM Field Standards Task Group is looking for a new chairman. Russ Vires (SMA) stated that the SMA supports continued efforts on this proposal. Doug Musick (KS) supports the items moving forward but more information is needed concerning their use. Bob Murnane (Seraphin Test Measures) stated that not much more can be done without data to show that meters can be used as a standard. Seraphin stated that there is a paper discussing direction for the task group. Tina Butcher (NIST OWM) stated that testing for the different types of the master meters would occur simultaneously to speed up the data collection and analysis of the data. Charlie Stutesman (KS) asked if there was a date for conclusion of the task group activities and expressed the need to stay on top of this item. He suggested that there may be a need to set a sunset date for the activities of the task group. Loren Minnich (KS) reported that NCWM set an original goal of July 2021 to complete the mission, but it is not a deadline. Tina Butcher reported on what the master meters group is trying to achieve. Tina reminded the group that the Fundamental Considerations allows States to use master meters. OWM is assisting states with determining that these "master meters" would be viable for use as a field standard Adding something to the Fundamental Considerations to clarify that states can use them may be helpful. NIST is currently focusing on the Coriolis meter but what will come out of the study will be protocols that States can apply to other meter technologies. The CWMA S&T Committee recommends that this item remain an assigned item.

**SWMA Report**

**Regional recommendation to NCWM on item status:**

- ☐ Recommend as a Voting Item on the NCWM agenda
- ☐ Recommend as an Information Item on the NCWM agenda
- ☒ Recommend as an Assigned Item on the NCWM agenda
  *(To be developed by an NCWM Task Group or Subcommittee)*
- ☐ Recommend as a Developing Item on the NCWM agenda
  *(To be developed by source of the proposal)*
- ☐ Recommend Withdrawal of the Item from the NCWM agenda
  *(In the case of new proposals, do not forward this item to NCWM)*
- ☐ No recommendation from the region to NCWM
  *(If this is a new proposal, it will not be forwarded to the national committee by this region)*

**Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)*

Mr. Henry Oppermann, representing 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, State of 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.

Russ Vires, Scale Manufacturers Association, stated that they have no position at this time.

Russ Vires, 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.

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

## BLOCK 6 ITEMS (B6) COMMERCIAL AND LAW ENFORCEMENT, AXLE AND AXLE GROUP WEIGHTS

**Source:**
NIST, Office of Weights and Measures

**Purpose:**
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.

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

**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:

(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**)

(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.

(**~~c~~d)** 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.)

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

**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]*

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

**Item Under Consideration:**
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.)

**Previous Action:**
New

**Original Justification:**
OWM has noted a number of inquiries submitted to our office for explanation on the many and various issues involved with the use of weighing or measuring devices as commercial devices when there is charge for doing so. Law enforcement devices may be regulated in a different manner than commercial devices (e.g., allows highway weight limit enforcement through multi-draft weighing) when commercial devices are not allowed to be used in that way.

The submitter pointed out that there seems to be a difference in opinions regarding this practice constitutes a commercial transaction.

The submitter requested voting status for these items in 2022.

**Arguments in Favor:**

**Regulatory:**
•

**Industry:**
•

**Advisory:**
•

**Arguments Against:**

**Regulatory:**
•

**Industry:**
•

**Advisory:**
•

**Neutral Comments:**

**Regulatory:**
•

**Industry:**
•

**Advisory:**
•

**Item Development:**
New

**Regional Associations' Comments:**
New

| SWMA Report |
|---|
| **Regional recommendation to NCWM on item status:**<br><br>☐ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda<br>☐ Recommend as an Assigned Item on the NCWM agenda<br>*(To be developed by an NCWM Task Group or Subcommittee)*<br>☒ Recommend as a Developing Item on the NCWM agenda<br>*(To be developed by source of the proposal)*<br>☐ Recommend Withdrawal of the Item from the NCWM agenda<br>*(In the case of new proposals, do not forward this item to NCWM)*<br>☐ No recommendation from the region to NCWM<br>*(If this is a new proposal, it will not be forwarded to the national committee by this region)* |
| **Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)* |
| 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.<br><br>This committee would like clarification on the purpose and use of axle weight scale values allowed by this proposal beyond law enforcement use.<br><br>This committee recommends that this item move forward with a Developing status. |

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

## BLOCK 2 ITEMS (B2) DEFINE TRUE VALUE FOR USE IN ERROR CALCULATIONS

*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:**
Ross Andersen (Retired)

**Purpose:**
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

## B2: SCL-20.3 A S.5.4. Relationship of Minimum Load Cell Verification Interval to the Scale Division

**Item Under Consideration:**
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)* $v_{min} \leq \frac{\text{~~d~~ e}}{\sqrt{N}}$ *for scales without lever systems; and*

*(b)* $v_{min} \leq \frac{\text{~~d~~ e}}{\sqrt{N} \times (\text{scale multiple})}$ *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.

**Item Under Consideration:**
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.

**Item Under Consideration:**
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.

**Item Under Consideration:**
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 7. Maintenance Tolerances

**Item Under Consideration:**
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

**Item Under Consideration:**
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 |
| 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)**

**Background/Discussion:**
These items have been assigned to the newly formed Verification Scale Division (e) Task Group for further development. For more information or to provide comment, please contact the task group chair:

Mr. Doug Musick
Kansas Department of Agriculture
785-564-6681, doug.musick@ks.gov

Most scales under the Scales Code are designated by the manufacturer to have a value of e that equals d. Where e and d are not equal, there has been confusion in interpreting the Scales Code since the Code was adopted in 1984 (taking effect in 1986). This confusion came to the forefront with the needs arising from the cannabis trade. I believe that there were errors in translating OIML R76 (the basis of the current Scales Code) to HB44 format, there were key issues that were lost in translation, and finally there is misunderstanding of the HB44 Code that contributed to this confusion. This proposal will seek to identify the sources of confusion and offer revisions to make correction.

In this discussion I will be using the OIML term instrument when referencing a complete scale or weighing system. This eliminated the dual meaning of the term "device." A device will only refer to functioning parts of an instrument. Finally, the term "scale" will not be a weighing instrument. Scale will refer only to the measurement scale, i.e., analog graduations or digital divisions.

**1. Determining Error in Verification**

GEN-20.1.
In 2017, item 3200-7, a proposal to revise the expression of tolerances in several codes, was considered and withdrawn by the S&T Committee. The proposal aimed to correct the missing reference in those codes to errors of overregistration and underregistration. It also included a change to the definition of overregistration and underregistration that was prompted in part to a lack of understanding of the process of verification. Many of the comments received indicated that it was better handled through training. Additionally, the NCWM is working on the issue of alternative test methods which directly impacts the subject of verification. In reviewing the 2017 proposal again, I believe the real problem is a misunderstanding of the process of verification itself, stemming from a missing definition for "True Value."

The new definition and changes to the General Code correct deficiencies in the code. The "true value" has never been clearly defined in code although it may be inferred from the definitions. The concept of true value is essential to understanding verification process as it is used throughout the Handbook. It is also a legal issue establishing the basis for tolerance decisions with the uncertain test procedure clearly stated. Our decisions are based on the true value derived from a traceable standard and not based on the standard itself. Once established, the true value is considered to have no error for purposes of legal verification. In our tests, the uncertainties in the test procedure are unquantified. If you have to defend your test in court and are asked about the uncertainty in your test, what will you answer? With the addition of the True Value definition, you have a traceable test report for your standard and the text of G-T.3. regarding the legality of the specified test procedure. The verification process formally addresses the risks in two ways. First the risks are kept small by the standard and procedure specified. Second, the risks are shared equally between buyers and sellers. The enhancements explain clearly how errors are computed and how they are interpreted.

The addition of a % error definition in G-T.3. corrects a deficiency that was identified in testing LMD's. The tolerances in the LMD codes are expressed using errors of overregistration /underregistration (device indication – true value). Yet we in the US traditionally calculate those errors as errors of excess/deficiency (true value – device indication). When calculating % error in these calculations, it seemed appropriate to put the device indication in the denominator, but this is incorrect. All error calculations must be in terms of the true value, especially % calculations.

SCL-20.1
The addition of the Note addresses the issue of digital rounding. Parallel to R 76, the note requires errors to be determined to a resolution of at least 0.2 e. Remember that error = indication – true value, and the true value is normally the nominal value of the test weight. That means determining the indication to a resolution of 0.2 e or finer using error weights or other means when e >=2 d, or by directly reading the indications when e >= 5 d. This means if e = 5 d or e = 10 d, the indication is resolved fine enough to reduce the rounding error. In R76, the requirement is to "eliminate" rounding error, but this is not possible. You can only reduce it to 0.5 of whatever division size you resolve the indication. Hence, the proposal uses the term "reduce" instead of "eliminate." The waiver allows field inspectors to continue to use direct reading when e = d, with a resulting rounding error of 0.5 e. This accepts the additional risk of passing devices outside the tolerances. (See section 4 of the proposal)

The changes to the two Scales Code tolerance paragraphs create a specific reference to the type of error in G-T.3. In this case it formally states errors are errors of overregistration/underregistration. The other change in T.1.1. addresses the missing part about applying tolerances to net values as well as gross values for unmarked scales. I believe this was just an oversight in 1984, as applying tolerances to either gross or net loads had been the established practice long before the 1984 changes to the Scales Code.

**2. Correct Code references to ensure correct reference to either e or d, as appropriate.**

SCL-20.2
Section S.1.2.2. is not dealing with the verification scale division e as the title implies. Instead, it is dealing with special requirements for instruments designed such that e does not equal d.

Section S.1.2.2.2. is not a specification issue directed to the manufacturer, but rather a question of suitability. It should have been put into the User Requirements section 1. Selection Requirements. For a discussion of the option to delete this refer to part 4 of the proposal.

SCL-20.3
The correct value for the table is e. The use of d in the formulas only works when e = d. That is addressed in the note * below, which is not necessary when e is used in the formulas.

SCL-20.4

- The inclusion of references to d in the header to column 2 of the table is technically incorrect. The verification scale division must refer only to e.
- The change to Note 1 serves to eliminate the confusion about considering e to be the digit to the left of d, and ensures the e value comes from the markings on the device. It is the manufacturer who choses e for classification purposes.
- The changes to note 3 correctly references the verification scale division e and not the scale division d, and they clean up some grammatical errors.

SCL-20.5
The change clarifies that the verification scale division is equal to the marked d when no separate marking of e is provided. Note that nothing in Note 3 prevents marking d = 1 g e = 1 g, or capacity 10000 g x 1 g e =1 g. The change to the last sentence cleans up a nonsensical term "weight unit." The scale division must be in a unit of weight, e.g., g, kg, lb, etc. The intent was to have each range of a multi-range device include a capacity and division size n. Note R76 requires marking of Class, Max (capacity), and e, with a marking of d is only required when e <>d

SCL-20.6
The change to T.N.1.1.2. corrects the contradiction between the current code using d and the definition using e in determining accuracy class. The value of n in the definitions already correctly refers to e

The change to T.N.1.1.3. is an attempt to clarify (e) and (d) similar to R 76 in Table 2. Note that when e=d, under S.6.3. only one marking is required. It is only when e ≠ d that S.6.3. requires both to be marked. The addition of material for ungraduated analog devices is housekeeping since d has no meaning for these devices. The change also clarifies that some requirements are directed to d (functional requirements on the device) and some to e (relating to classification and tolerance values).

**3. Discuss issues of suitability of scales when e and d are not equal.**

SCL-20.7
It is the value of e that is used in specifying tolerances according to the definition of e, and all values in this table must be expressed in terms of e. The table is currently written in terms of the scale division d, which is technically incorrect.

SCL-20.8

The parenthetical (d or e) in the headers to columns 2 and 3 is confusing when the two are not equal. Which one do you use? The note may address Class I and II devices, but it does not help with weight classifiers in Classes III and IIII, where you certainly don't want to use d.

It is vital to note that for instruments under R76 the manufacturer is required to mark a minimum load (Min). The manufacturer calculates Min using e. However, the minimum load is marked in mass units matching the instrument display in divisions of d. There is no confusion since it is marked on the instrument. In HB44 the inspector must determine the minimum load from Table 8 and the scale markings. Most users don't even know this requirement exists, unless told by the inspector.

Table 8 is addressing the large significance of rounding error at small loads. The table must be clear to ensure the correct scale division is used in enforcement. The table at right shows the relative errors resulting from roundoff to the nearest scale division d at various loads in the table. In principle, we are trying to ensure loads weighed are sufficient to reduce the relative errors to the levels shown, i.e. for Class I – 0.5%, for Class II – 1.0%, Class IIIL – 1.0%, for Class III – 2.5%, and Class IIII – 5%. While these might seem large initially, there is a diminishing returns effect. A small percentage of a small number tends to be insignificant. Because the value of commodities goes up as the accuracy goes up, we have more stringent requirements on Classes I and II.

| Load d | Relative Error |
|---|---|
| 10 | 5.0% |
| 20 | 2.5% |
| 50 | 1.0% |
| 100 | 0.5% |

Scales fall into three categories, i.e. with e > d, e = d, and e < d.

- If e < d, e.g. weight classifiers, it seems clear the appropriate choice is e. The table in the second note specifies d, which is technically incorrect. For example, a Class III weight classifier with d = 50 g e = 1 g, the relative accuracy of 5% is reached at 10 e. At 10 d or (500 e) the relative error due to rounding is 0.1%.

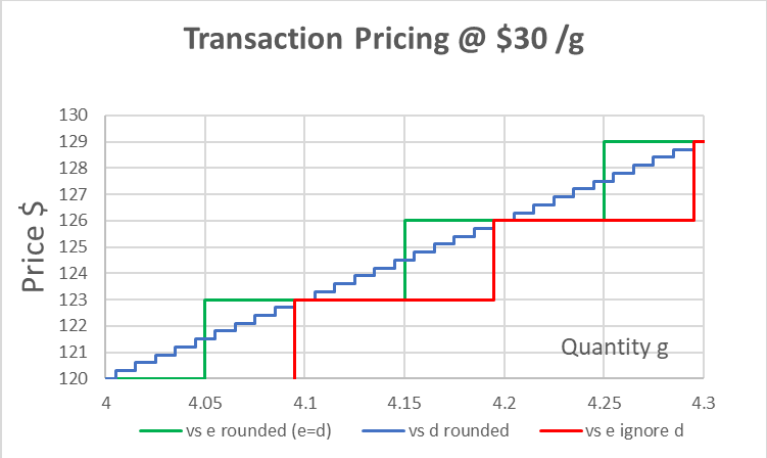
- If e = d, it doesn't matter.

- If e > d, on some Class I and II scales, you get the desired relative error when you use d. If you use e, the scale with e ≠ d will result in much smaller rounding error since the rounding is internally applied to d and not to e. Examples: If e = 0.1 g, then 50 e is 5 g and the rounding error is 0.5 e / 50 e = 1%, i.e. the desired level for Class II. If e = 0.1 g and d = 0.01 g, then 50 e is 5 g and the rounding is to 0.5 d or 0.05 e, thus the rounding error is 0.05 e / 50 e = 0.1%. This may be why the parenthetical (d or e) is used in the current language. Perhaps it was intended that we use the smaller value of the two if e and d are different. The proposal states e is used in cases where e < d and d is used in all other cases. This eliminates any confusion. We may consider adding a marking of Min as per R76 as a future idea.

The change to the * note performs a similar function to the change in Note 1 in Table 3, as it disconnects e from d and relies solely on the markings of d and e.

In 2017, the NCWM added S.1.2.2.2. to prohibit use of Class I and II scales with a differentiated scale division. One argument was that the differentiated digit would cause confusion. There were arguments in opposition to the proposal. I argued that the confusion rested mostly with the weights and measures community (see earlier discussion). Plus, the finer digit extended the usable range of the scale since you could reach the 1% limit to rounding error at 50 d. For a Class II scale with e = 0.1 g and d = 0.01 g, that means weighing small loads down to 0.5 g loads which is something that users need in the cannabis trade.

One issue involves the rounding errors addressed in Table 8. A more critical issue in my view is the pricing increments. At $30/g, 0.1 g e represents a pricing increment of $3. By displaying 0.01 g d, that 0.01 g d reduces the price increment to $0.30. This is displayed in the graph at right. The blue line shows the 30 cent steps if you use the differentiated d. If you use the digit to the left of the differentiated d, you see the counted divisions e discussed earlier. The gap between the blue and red lines show the losses to users if they are forced to round down. The green line shows pricing on a normally rounded scale with 0.1 g e. The normal rounding shares the risk equally between buyer and seller.



If the user must have a scale with e = d, then it forces them to go to 0.01 g e to service loads at the 1 g level. For that scale 50 e is 0.5 g, and the 1 g loads weighed are near 100 e. Precision scales rarely use 2 or 5 divisions, so capacities get reduced by a factor of 10 to move down to the next smaller division size. Blocking the use of e=10d may force many users to purchase two scales where a single scale would have been suitable if using a scale with a differentiated d were not blocked.

**4. Discussion regarding disconnecting e from d**

Sections in the current Scales Code are being incorrectly interpreted to imply there is a direct connection between e and d. Essentially there is a belief when inspecting Class II scales when e does not equal d that we are somehow verifying the first digit to the left of d. Even when e = d, there is a belief that we are verifying d. That fails to follow the principles incorporated in G-T.3. We are not verifying the division; we are verifying the entire instrument indication at an applied load.

The scale division d is defined as the smallest division of the instrument under test (IUT). The scale division is referred to extensively in the code and we find that requirements written around d regulate the operating characteristics of the instrument, e.g. discrimination. When reading analog indications, we round to the nearest graduation (See Appendix A. Section 10). Under General Code G-S.5.2.2. (d), there is an important requirement that the smallest division of any digital device round off. Unless specifically designated the instruments in HB44 are in "normal rounding" class of instruments. Even with normal rounding, it is critical to understand that the digits to the left of the least significant digits are not rounded. They are counted. For example, as you count the rounded-off d's, when you increment from 9 to 0 in the least significant digit, the next digit increments 1 digit. The break point between digits to left of the least significant digit always occurs at 9.5 d. If d is 1 g, then the tenth d is counted as 10 g and the 100$^{th}$ d is counted as 100 g, etc. Normal rounding of the tens place would normally occur at 5.0 d. If you attempt to apply tolerances to e and just ignore d, you are not rounding in conformance to G-S.5.2.2. (d). Instead, you are rounding down, which places the scale user at a disadvantage and disrupts equity.

UR.3.10. addresses dynamic monorail scales, which also have e ≠ d, and requires that the commercial transaction using these devices shall be based on e, interpreted to mean the digit to the left of the differentiated d. These transactions therefore must be based on a counting scale (rounding down) instead of a half-up/half-down system as required in G-S.5.2.2. (d). When applied to a high-priced commodity at $30 /g, the pricing errors add up because the scale user is forced to always round down. The table at right shows the impact, and this impact can be attributed to every transaction. At $30/g, the average loss to the user per transaction is $1.35. That is not equity!

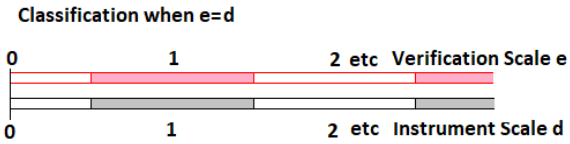
| Indication | $ Using d | $ Using e | $ gain/loss |
|---|---|---|---|
| 0.95 | $28.50 | $27.00 | -$1.50 |
| 0.96 | $28.80 | $27.00 | -$1.80 |
| 0.97 | $29.10 | $27.00 | -$2.10 |
| 0.98 | $29.40 | $27.00 | -$2.40 |
| 0.99 | $29.70 | $27.00 | -$2.70 |
| 1.00 | $30.00 | $30.00 | $0.00 |
| 1.01 | $30.30 | $30.00 | -$0.30 |
| 1.02 | $30.60 | $30.00 | -$0.60 |
| 1.03 | $30.90 | $30.00 | -$0.90 |
| 1.04 | $31.20 | $30.00 | -$1.20 |
| 1.05 | $31.50 | $30.00 | -$1.50 |

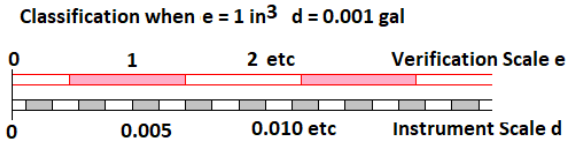
Verifying a scale division is virtually impossible. For a Class II device the accuracy requirement is approximately 0.01% of applied load. If the division is 0.1 g, then the required accuracy is ± 0.00001 g and we are trying to measure that with a resolution of 0.1 g. In addition, we don't have standards below 1 mg.

I contend that e is not the digit to the left of the differentiated d! Nor do we verify e. Careful reading of the definition of the verification scale division "e" in Appendix D will reveal no direct connection between e and the indications on the instrument being verified. The verification scale division is a mass (weight) value declared by the manufacturer in required markings that is used in classifying instruments and in specifying tolerances for the device. In the header to column 2 in Table 3., we find the expression "Verification Scale Divisions (d or e[1]). This is another chance to misunderstand the Code. The verification scale division must be e according to the definition. It can't be d, although it can have the same value as d. Similarly, reading Note 1 in Table 3, you might conclude that e is the value of the digit immediately to the left of d. The critical distinction is that e is a <u>value</u> of that digit and not the actual division of the display. To avoid confusion, I propose amending Table 3. to simply direct you to the scale markings to find e and remove any reference to the digit in the display.

The e value is also used in classifying instruments in the Scales Code. Classes refer to relative error ranges. This comes from the ratio MTol / e. At the second step in the tolerance structure in Table 6. Under HB44 a Class III instrument is ~0.1% accurate. This is 2 e tolerance for a load of 2,000 e. A Class II instrument is accurate to ~0.01 %, or 2 e error for a load of 20,000 e. However, the tolerances within a class are stepped, such that the % error varies through the operating range. For Class II the relative errors are 0.02% at 5,000 e, 0.01% at 20,000 e and 0.0033% at 100,000 e. The manufacturer decides what class and relative accuracy he needs to serve (based on capacity and n) and designs accordingly.

If e is not a division on the instrument, what is it? In R76, the basis of our current Scales Code, the term "scale" is not used to refer to a weighing instrument, but rather the graduations or divisions, i.e., the "scale" of indication. Thus, a scale division is not limited to weighing devices. A register on an LMD has a "scale division," e.g., a RMFD typically indicates in 0.001 gal divisions of scale. It should be easy to see the 0.001 gal increments correspond to d in the Scales Code. When we verify the RMFD, we use a test measure with an independent scale, either 1 $in^3$ for older measures and 0.5 $in^3$ for newer measures. The "verification scale" for the RMFD is therefore the "scale" on the test measure used to determine the true value. The instrument scale and the verification scale connect at only one point, at ZERO! Error arises when the two scale diverge as you move along the measurement scale due to linearity errors, influence factors, random variations, etc., within the instrument. The Verification Scale is considered to have no error.

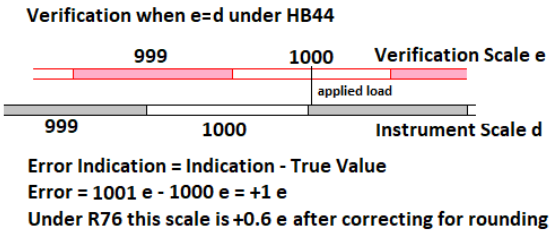


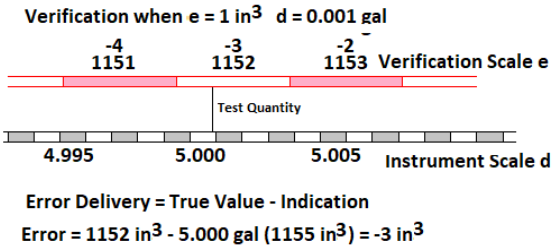




Above at left, the graphic shows a case where e = d. Notice how the divisions d and e both begin at center zero and the divisions align perfectly because at this magnification it is impossible to see small differences. The test evaluates the sum of many divisions in order to see any deviation. Above at right, the graphic shows how the 1$in^3$ e for the RMFD verification aligns with the 0.001 gal d of the instrument. Now imagine what happens when a test is performed.

Classification is based on relative error. This allows the verification scale division to differ from the instrument scale division, sometimes larger and sometimes smaller. With the RMFD above right, d is significantly smaller than e. In fact, the 6 e maintenance tolerance is 25 d. The two scales are independent. Would anyone suggest that the d smaller than e is inappropriate for commercial use. We verify the RMFD to e just like the weighing instrument with e = 10 d. The confusion comes from the requirement to differentiate d on these instruments.

Why does the Code require d to be differentiated when d is smaller than e? That is the critical question. It is not because d is somehow inaccurate or unreliable. It is not because d is smaller than the e of the tolerances. I believe it is because the code wanted to ensure that the serviceperson or official did not use d for tolerance calculations. It had nothing to do with users or customers.




In the above graphics, the instrument scale diverges from the verification scale. They both started at the same zero reference. Notice that the RMFD at right calculates delivery error vs indication error at left. The key is to understand that the verification scale has no error and we are measuring the deviation of the instrument scale from the verification scale.

This pattern holds true for other verification tests, from tests of packaged goods with a reference scale to tests of taximeters on a road course. Circling back to the proposed definition of true value, in addition to its use in classifying scales, **the verification scale is that "scale" used to measure the true value. The division of that "true value" measurement scale is "e."** With the new G-T.3. that true value is the legal basis of our tests and is known without uncertainty. A table of a variety of verifications and their d and e scales are provided below.

| Instrument & quantity | Instrument scale division d | Verification scale division e | Maintenance Tolerance | Ratio MT/e |
|---|---|---|---|---|
| RMFD @ 5 gal | 0.001 gal | 1 $in^3$<br>0.5 $in^3$ | 6 $in^3$ | 6<br>12 |
| VTM @ 100 gal | 0.1 gal | 5 $in^3$ | ~70 $in^3$ | 14 |
| Rack @ 1,000gal | 1 gal | 0.1 gal | 3 gal | 30 |
| Mass Flow Class 0.3 | <= 0.2% MMQ | <= 0.02% | 0.3% | 15 |
| Taximeter @ 1 mi | 0.2 mi | ~0.001 mi (!5 ft) | +0.01/-0.04 mi | 10/40 |
| Package Checking @ 1 lb<br>@ 4 oz | N/A<br>N/A | <= 0.005 lb<br><= 0.002 lb | 0.044 lb<br>0.016 lb | 8.8<br>8 |
| IIII scale e = d @ 200 d | 1 d | 1 e = 1 d | 2 e | 2 |
| III scale e = d @ 2,000 d | 1 d | 1 e = 1 d | 2 e | 2 |
| II scale e = d @ 20,000 d | 1 d | 1 e = 1 d | 2 e | 2 |
| II scale e = 10 d @ 20,000 e | 1 d | 1 e = 10 d | 2 e | 2 |

The last column of the table is the real focus of verification. We want to have sufficient resolution in determining errors. Although the issue is a bit more complicated, this ratio is a measure of the effectiveness of the verification. Special notes:

- For the RMFD, VTM, and Rack instruments the ratio is limited by HB105-3 and the specified minimum division of the prover scale. This becomes part of the code when you specify the prover must meet that specification.

- For the mass flow instruments the Notes provide no guidance on the verification scale division. I submit the value of resolution in error should be in HB44 Notes for all Codes, similar to R76 for weighing instruments. This is something I hope the work group on alternative test methods addresses. The EPO does specify the reference scale division be no larger than 1/10 of the smallest tolerance applied. This means the Mass Flow code requires a minimum ratio of 15:1 for maintenance tolerance which I believe is overkill and very costly. Compare to 5:1 elsewhere.

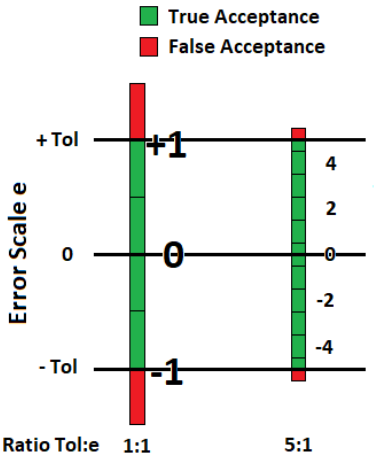
- For scales the ratio is only 2:1 as currently written in Handbook 44. There is no mention of error weights in the Code. In R76, the ratio is specified in that it requires errors to be determined to at least 0.2 e. This produces a ratio of 5:1 in the first step, 10:1 in step two and 15:1 in step three. If you determine errors to 0.1 e, as we do normally with error weights, it allows you to double those ratios and provide 10:1 in the first step. Reading the errors in d when e = 5 d or e = 10d, allows you to meet the minimum without using error weights (or expanded resolution).

Why use maintenance tolerance in computing this ratio? In verification, there is a shift in emphasis relative to calibration. In verification, your primary concern is with the population. You want all the devices in the same commercial field to have performance that is similar enough to promote equity. Even if you are little sloppy in applying acceptance tolerance, the instrument is highly likely to perform within maintenance tolerances. In calibration, the focus is always on a single artifact or instrument.

Why is this resolution in determining errors important? The short answer is to reduce the incidence of false acceptance/rejection. The Range of False Acceptance (RFA) can be defined as the portion of the compliant measured

error that reaches outside the tolerance limits due to rounding in the error calculation. Limiting the RFA is the objective in specifying the resolution of errors.

When we use direct reading in testing weighing instruments the ratio of Tol:e in the first tolerance step is 1:1 and we have an RFA of ½ e in proportion to the 1 e tolerance. The RFA is 50% of the tolerance, meaning we can accept instruments in error up to 1.5 times the tolerance. When we add the R76 requirement to measure errors to 0.2 e we increase the ratio of Tol:e to 5:1 and thereby reduce the RFA to 0.1 e in proportion to the 1 e maintenance tolerance (see graphic at right). This RFA is only 10% of the tolerance. Statistically, it can be shown that the RFA contributes to the population variability based on the Root Sum Square. At ½ e RFA when Tol:e is 1:1, the population variability gets increased by 22%. When we increase the Tol:e ratio to 5:1 the population variation is only increased by 1%, which is not considered significant.




A better way to express this in is terms of compliance rate. Imagine your test data shows compliance of a class of devices as 95% at 1 e tolerance, but you are testing using direct reading. Due to rounding in measuring the error that you are not addressing, 95 % of the instruments are actually within 1.22 e and not the 1.00 e indicated in the compliance data. By increasing the Tol:e ratio to 5:1, 95% of the instruments are accurate within 1.01 e.

2020 NCWM Interim Meeting: The Committee acknowledged written comments from the submitter and heard comments during the open hearing session on this item. Mr. Constantine Cotsoradis (Flint Hills Resources) and Mr. Russ Vires (SMA) representing interests from an industry perspective questioned the need for the changes being proposed in this block of items. Additional comments from regulatory officials indicated that the changes included in this proposal were not successful in clarifying HB44 requirements and possibly added to any confusion that exists. Mr. Steve Cook (CA, retired) pointed out that the changes ignored weighing devices that did not fall under Accuracy Class I or II and stated his willingness to work with the submitter to further develop the proposal.

Several other comments heard during open hearings indicated that it is questionable to include all of the individual items that are shown as part of Block 2. Comments from SMA, and some regulatory officials recommended that this Block of items be separated since not all items now grouped under Block 2 seem to be closely related. Mr. Kurt Floren (Los Angeles Co., CA) also pointed out that some of the proposed amended language is not clear and will add to confusion in interpretation of requirements and that there are some editorial corrections and proper formatting needed in this proposal as well.

NIST OWM commented that while most of the proposed changes seem to be fundamentally sound, the urgent need to implement some of those proposed changes is not clear. OWM also agreed with other comments that recommend separating the items under Block 2 into individual items or grouped together where items are more clearly related. OWM notes that item SCL-20.2 now included in Block 2 is clearly related to two other items individually listed on the S&T Committee's agenda: SCL-20.10 and SCL-20.11. Additionally, OWM believes that the determination if individual Scales Code requirements are meant to apply to either "e" or "d" should be carefully considered on a case-by-case basis. Also recommended was that additional input be solicited from stakeholders (industry officials and device manufacturers in particular) prior to adopting any changes based on this proposal.

During the Committee's work session, they agreed that some of the items combined under Block 2 should be separated. The Committee agreed that items GEN-20.1, SCL-20.1, and SCL-20.2 should be removed from Block 2 and given individual consideration. Considering items individually, the Committee agreed to the following:

- Item GEN-20.1: The Committee acknowledged the receipt of comments from some of the regional associations concerning the use of the term "True Value" in the formulas included in parts (a) & (b) and how it is defined in the proposal. The Committee agreed that there may be value in further defining the application of tolerance and that the item should be given a Developing status adding that consideration should be given to amending the use of the term "True Value."

- Item SCL-20.1: There were no direct comments regarding this item during open hearings. The Committee reviewed NIST OWM's analysis on this item and agreed it should be withdrawn noting this proposed change is unnecessary.

- Item SCL-20.2: During open hearings this item was discussed relative to items SCL-20.10 and SCL-20.11 which address the same issue. Most comments received were in favor of option 2 in this proposal which was effectively the same as SCL-20.10. The Committee agreed this item should also be withdrawn.

- Items SCL-20.3: The Committee agreed items SCL-20.4, SCL-20.5, SCL-20.6, SCL-20.7, and SCL-20.8 should be grouped together as Block 2 and given an Assigned status.

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.

NCWM 2021 Interim Meeting: The Committee heard comments on this item during the open hearing session including the following.

Mr. John Barton (NIST OWM) stated that as a member of the Task Group assigned to this item, that group met on several occasions over the past 4 months to deliberate on the issues involved in this proposal. While the Task Group came to conclusions that are included in the final report, there had been other individuals and groups that came to different conclusions on those issues. Those other individuals and groups included subject matter experts, NTEP evaluators, scale manufacturers, and the NTEP Weighing Sector. Mr. Barton further stated that given the impact of changes proposed in this item, it may be wise to include additional sources of input prior to adopting the recommended changes.

It was also noted that the Committee set a date of November 15, 2023 for the Task Group to return its conclusions and that the Task Group finalized its work in a matter of 4 months rather than using the 3 years granted. It is also significant to note that the Task Group requested an Informational status for this item as opposed to a Voting status. This suggests that the Task Group is open to the notion that the proposal could be vetted further even when they have generated a "final" report on their work.

Mr. Henry Opperman (Weights and Measures Consulting) referred to the written comments he submitted to the Committee prior to this meeting and stated that all individual items in this Block should be withdrawn. Mr. Opperman stated that the proposals in this Block are based on false premises and therefore should not be adopted. Mr. Alan Walker (FL) agreed with Mr. Opperman and stated this proposal should be withdrawn also.

During the committee's work session, the Committee considered updating the charge to the TG to direct that group to specifically identify each change recommended in the final report to actual changes proposed as amendments in HB 44. The Committee also recommends this remains as an assigned item.

NCWM 2021 Annual Meeting: At the request of the Task Group Chair, the Committee elevated the status of this item from Assigned to the task group to Informational.

**Regional Association Comments:**

2020 Regional Meetings of the WWMA and SWMA: These regions adhered to a condensed agenda due to the COVID pandemic and did not consider this item.

CWMA 2021 Annual Meeting: Charlie Stutesman gave an update on the item and asked for info from the task group. Doug Musick KS provided updates from the task group and will be providing changes to the item to NCWM S&T Committee before the July Annual meeting. John Barton like the direction of the task group and reported that comments have been received. Russ Vires, SMA, stated that SMA met April 22 and supports work of the task group. The group supports continued efforts on the verification interval for "e" and scale division for "d". Loren Minnich (KS) suggested that the Block be renamed to "Verification Scale Division (e)" as the existing title is for an item that has been withdrawn. The CWMA S&T Committee recommends that this item remain an assigned item.

NEWMA 2021Annual Meeting: Comments were received on the entire block. Updates were received from John Barton (NIST OWM) on the progress of the Task Group. Work is currently being performed by the task group and changes will be presented at the NCWM Annual meeting. The SMA (Russ Vires representative) supports the future development of this item. Comments were heard from Ross Anderson (NY retired) that there are additional pieces of this item that have been removed from the block but are no less important. The NEWMA S&T Committee recommends that this item remain with Assigned status.

| **SWMA Report** |
|---|
| **Regional recommendation to NCWM on item status:**<br><br>☐ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda<br>☒ Recommend as an Assigned Item on the NCWM agenda<br>*(To be developed by an NCWM Task Group or Subcommittee)*<br>☐ Recommend as a Developing Item on the NCWM agenda<br>*(To be developed by source of the proposal)*<br>☐ Recommend Withdrawal of the Item from the NCWM agenda<br>*(In the case of new proposals, do not forward this item to NCWM)*<br>☐ No recommendation from the region to NCWM<br>*(If this is a new proposal, it will not be forwarded to the national committee by this region)* |
| **Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)* |
| Russ Vires, SMA, supports further development of this item, and recommended the descriptive name changes for "e" and "d" as posted on the NCWM website.<br><br>This committee recommends this item move forward with an Assigned status. |

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

## SCL – SCALES

### SCL-20.9 D 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:**
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.

**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]

**Background/Discussion:**
This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Mr. Doug Musick
Kansas Department of Agriculture
785-564-6681, 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.

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.

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.

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.

**Regional Association Comments:**

2020 Regional Meetings of the WWMA and SWMA: These regions adhered to a condensed agenda due to the COVID pandemic and did not consider this item.

CWMA 2021 Annual Meeting: Loren Minnich (KS) continues to work with NIST on this item and noted that limited work has been completed since January. Work will continue prior to the annual. If any question or suggestion can send to Loren. Russ Vires, SMA opposes this item as it may be an application issue and not a specification issue. Some members of SMA willing to participate in further development of this item. John Barton (NIST OWM) believes this item needs additional work and willing to work with Loren. The CWMA S&T Committee recommends that this item remain a developing item.

NEWMA 2021Annual Meeting: A comment was heard from John Barton (NIST OWM) outlining the NIST analysis. He believes this item needs more work and is willing to assist the submitter in the development. Russ Vires (SMA) is in opposition of this item and believes it may be an application issue and not a specification issue. The NEWMA S&T Committee recommends that this item remain with Developing status.

**SWMA Report**

**Regional recommendation to NCWM on item status:**

- ☐ Recommend as a Voting Item on the NCWM agenda
- ☐ Recommend as an Information Item on the NCWM agenda
- ☐ Recommend as an Assigned Item on the NCWM agenda
  *(To be developed by an NCWM Task Group or Subcommittee)*
- ☒ Recommend as a Developing Item on the NCWM agenda
  *(To be developed by source of the proposal)*
- ☐ Recommend Withdrawal of the Item from the NCWM agenda
  *(In the case of new proposals, do not forward this item to NCWM)*
- ☐ No recommendation from the region to NCWM
  *(If this is a new proposal, it will not be forwarded to the national committee by this region)*

**Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)*

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 committee recommends this item remain a Developing status.

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

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

**Source:**
NCWM Cannabis Task Group

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

**Item Under Consideration:**
Amend 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.[4]

**…**

**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)**

**Previous Action:**
New

**Original Justification:**
As states legalize sales of cannabis in its various forms, the need has arisen for uniform standards for scale suitability. Uniform requirements from one state to the next, will strengthen each jurisdiction's ability to effectively regulate the industry in a fair and equitable manner. Uniform standards also provide industry with expectations regardless of the jurisdiction, reducing potential conflict or confusion.

Some states may already have scale suitability requirements differing for those proposed here. The task group is hopeful that differences can be resolved so that the standards are the same in every jurisdiction:

The proposed suitability requirements are based on existing standards as set forth by the California Division of Standards, Division of Measurement Standards.

The submitter requested that this item be a Developing Item.

**Arguments in Favor:**

**Regulatory:**
•

**Industry:**
•

**Advisory:**
•

**Arguments Against:**

**Regulatory:**
•

**Industry:**
•

**Advisory:**
•

**Neutral Comments:**

**Regulatory:**
•

**Industry:**
•

**Advisory:**
•

**Item Development:**
New

**Regional Associations' Comments:**
New

**SWMA Report**

**Regional recommendation to NCWM on item status:**

☒ Recommend as a Voting Item on the NCWM agenda
☐ Recommend as an Information Item on the NCWM agenda
☐ Recommend as an Assigned Item on the NCWM agenda
*(To be developed by an NCWM Task Group or Subcommittee)*
☐ Recommend as a Developing Item on the NCWM agenda
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*(In the case of new proposals, do not forward this item to NCWM)*
☐ No recommendation from the region to NCWM
*(If this is a new proposal, it will not be forwarded to the national committee by this region)*

**Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)*

Russ Vires, SMA, stated that they have no position on this item at this time.

Matt Curran, State of Florida, stated that he supports this as a Voting item. He also provided comments in support of this item from 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) 0.01g for net weighments ~~up to capacity~~ up to 10g,**
**(b) 0.1g for net weighments greater than 10g, up to 100g, ~~capacity, and~~**
**(c) 1g for net weighments greater than 100g, up to capacity.**
**(Added 20XX)**

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.

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

## BLOCK 4 ITEMS (B4) 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.*

**Source:**
Kansas Department of Agriculture, Division of Weights and Measures

**Purpose:**
Allow recorded values to be captured electronically as an alternative to a printed ticket or receipt.

### B4: GEN-21.2 D G-S.5.6. Recorded Representations.

**Item Under Consideration:**
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.

**Item Under Consideration:**
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 Provide**d**.** – 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

**Item Under Consideration:**
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

**Item Under Consideration:**
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~~2~~) (Amended 1994**, and 20XX**)

**…**

**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**~~ **recorded representation** 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) **(Amended 20XX)**

**B4: CLM-21.1 D S.1.4.1. ~~Printed Ticket~~Recorded Representation., UR.2.6.3. ~~Printed Ticket~~Recorded Representation.**

**Item Under Consideration:**
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-XX.X D S.1.4.2. ~~Printed Ticket~~ Recorded Representation., UR.2.6.3. ~~Printed Ticket~~Recorded Representation.**

**Item Under Consideration:**
Amend NIST 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.**

**Item Under Consideration:**
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-21.1 D S.1.4.1. ~~Printed Ticket~~Recorded Representations., UR.2.4.2. ~~Tickets or Invoices.~~ Recorded Representation.

**Item Under Consideration:**
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.

**Item Under Consideration:**
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.

**Item Under Consideration:**
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**]

**Previous Action:**
- 2021: Developing Item

**Original Justification:**
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.

**Comments in Favor:**

**Regulatory:**
- 2021 Interim: 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.
- 2021 Annual: Mr. Charles Stutesman looks forward to maintaining developing status between now and Interim. When electronic receipt provision was put in GC, it works well but specific codes supersede. All the sections in this block have printer requirements. The goal was not to remove printers but to add

the option for electronic receipts if customer wants it. He would appreciate comments on how to clean up the proposal.

**Industry:**

- 2021 Interim: 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.

**Advisory:**

- 2021 Interim: 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.

**Comments Against:**

**Regulatory:**

- 

**Industry:**

- 

**Advisory:**

- 

**Neutral Comments:**

**Regulatory:**

- 

**Industry:**

- 

**Advisory:**

- 

**Item Development:**
This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Mr. Charles Stutesman
Kansas Department of Agriculture
785-564-6683 charles.stutesman@ks.gov

**NOTE: The proposal as it appeared in the 2021 Interim Meeting agenda is available at https://www.ncwm.com/interim-archive.**

**Regional Association Comments:**

WWMA 2020 Annual Meeting: No comments were received during open hearings. However, the submitter did provide additional changes and continues to develop the item. The Committee recommends this block be given Developing status.

SWMA 2020 Annual Meeting: During the Open Hearings, the Committee heard from Ms. Dianne Lee (NIST OWM) who stated that the purpose of this item is to allow an option for an electronic ticket by revising the language of the Recording Requirements in Handbook 44. She also stated that NIST OWM supports this block. The Committee also heard from Mr. Hal Prince (FL) that electronic tickets are already allowed, and that this revision would allow electronic only tickets. The Committee also heard from Tina Butcher (OWM) who stated that she had the same concerns as Hal but was assured the intent was only to allow an electronic option for customers. The Committee also heard from Ken Ramsburg (MD) who stated that he agreed with Mr. Prince, and that the General Code already covered this. The Committee also heard from Mr. Tory Brewer (WV) who stated that he was concerned that this item would make it difficult for customers to receive a printed ticket if it was not set as a default, and how the customer would choose a printed ticket instead of an electronic one. Ms. Tina Butcher (NIST OWM) also stated that Specific Code superseded the General Code, so that is why a change is likely needed to allow electronic tickets. After considering this item the Committee recommends that it be given Developing Status.

CWMA 2021 Annual Meeting: Charlie Stutesman (KS), the developer of this item gave a brief update and requested that this item remains developing. Diane Lee (NIST OWM) supports continuing development of this item. Russ Vires (SMA) supports continuing development of this item. Loren Minnich (KS) submitted suggested changes to developer. Included in Appendix at the end of this report. He thought G-S.5.6. is getting too wordy and should be simplified to allow specific codes to speak for themselves. The CWMA S&T Committee recommends that this Item Block remain a Developing.

NEWMA 2021Annual Meeting: Comments were received on the entire block. Diane Lee (NIST OWM) commented on the desire by many to add the ability for electronic recorded representations and that she expects continued development from the submitter. Russ Vires (SMA) supports this item and recognizes the importance for options to the consumer. Comments were given in support by Jim Willis (NY) and John McGuire (NJ). The NEWMA S&T Committee recommends that this item remain with Developing status.

**SWMA Report**

**Regional recommendation to NCWM on item status:**

- ☐ Recommend as a Voting Item on the NCWM agenda
- ☐ Recommend as an Information Item on the NCWM agenda
- ☐ Recommend as an Assigned Item on the NCWM agenda
  *(To be developed by an NCWM Task Group or Subcommittee)*
- ☒ Recommend as a Developing Item on the NCWM agenda
  *(To be developed by source of the proposal)*
- ☐ Recommend Withdrawal of the Item from the NCWM agenda
  *(In the case of new proposals, do not forward this item to NCWM)*
- ☐ No recommendation from the region to NCWM
  *(If this is a new proposal, it will not be forwarded to the national committee by this region)*

**Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)*

Russ Vires, SMA, stated that he supports this item.

Tim Chesser, State of 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.

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

# ITEM BLOCK 1 (B1) D TERMINOLOGY FOR TESTING STANDARDS

**(original B1 items)**

| | | |
|---|---|---|
| B1: SCL-18.1 | D | N.2. Verification (Testing) Standards |
| B1: ABW-18.1 | D | N.2. Verification (Testing) Standards |
| B1: AWS-18.1 | D | N.1.3. Verification (Testing) Standards, N.3.1. Official Tests, UR.4. Testing Standards |
| B1: CLM-18.1 | D | N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards |
| B1: CDL-18.1 | D | N.3.2. Transfer Standard Test, T.3. On Tests Using Transfer Standards |
| B1: HGM-18.1 | D | N.4.1. Master Meter (Transfer) Standard Test, T.4. Tolerance Application on Test Using Transfer Standard Test Method |
| B1: GMM-18.1 | D | 5.56(a): N.1.1. Air Oven Reference Method Transfer Standards, N.1.3. Meter to Like-Type Meter Method Transfer Standards and 5.56(b): N.1.1. Transfer Standards, T. Tolerances[1] |
| B1: LVS-18.1 | D | N.2. Testing Standards |
| B1: OTH-18.1 | D | Appendix A: Fundamental Considerations, 3.2. Tolerances for Standards, 3.3. Accuracy of Standards |
| B1: OTH-18.2 | D | 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:**
To remove the current limited definition and use of the term "Transfer Standard" and eliminate terms "Testing Standards", "Verification (Testing) Standards", and instead use the term Field Standard, consistent with its reference in Handbook 44, Appendix A, Fundamental Considerations and its use in several sections of Handbook 44. To correct the broad use of the term Transfer Standard and instead replace its use with the term Field Standard. To update all use of the term "standard" to use the term "Field Standard". To remove the current limited definition of Transfer Standard and instead use the term Field Standard.

## B1: SCL-18.1 D N.2. Verification (Testing) Standards

**Item Under Consideration:**
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 D N.2. Verification (Testing) Standards

**Item Under Consideration:**
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 D N.1.3. Verification (Testing) Standards, N.3.1. Official Tests, UR.4. Testing Standards

**Item Under Consideration:**
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 D N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards

**Item Under Consideration:**
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-18.1 D N.3.2. Transfer Standard Test, T.3. On Tests Using Transfer Standards

**Item Under Consideration:**
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 D N.4.1. Master Meter (Transfer) Standard Test, T.4. Tolerance Application on Test Using Transfer Standard Test Method

**Item Under Consideration:**
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 2021XX)**

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

**Item Under Consideration:**
Amend 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 D N.2. Testing Standards

**Item Under Consideration:**
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 D Appendix A: Fundamental Considerations, 3.2. Tolerances for Standards, 3.3. Accuracy of Standards

**Item Under Consideration:**
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 D Appendix D – Definitions: fifth-wheel, official grain samples, transfer standard and Standard, Field

**Item Under Consideration:**
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]**~~

**<u>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</u>**

**through comparisons, using acceptable laboratory procedures, and used in conjunction with commercial weighing and measuring equipment.**

**(Added 20XX)**

**Background and Discussion:**

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.

NCWM 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.

NCWM 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

NCWM 2020 Interim Meeting: Field Standard TG Chair Jason 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.

2021 NCWM Interim Meeting: NCWM Field Standard TG Chair, Jason 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 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.

NCWM 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. 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.

**Regional Association Comments:**

WWMA 2020 Annual Meeting: At the 2020 WWMA Annual Meeting, the WWMA adhered to a condensed agenda due to the COVID pandemic and did not consider this item.

SWMA 2020 Annual Meeting: At the 2020 SWMA Annual Meeting, the SWMA adhered to a condensed agenda due to the COVID pandemic and did not consider this item.

NEWMA 2021 Annual Meeting: Comments were received on the entire block: Diane Lee (NIST OWM) commented that there is currently discussion for definitions of field standards and work for testing of master meters. Russ Vires (SMA) supports the development as it applies to items GEN-19.1, SCL-18.1, ABW-18.1, and AWS-18.1 and looks forward to further development. Tina Butcher (NIST OWM) gave an overview of the master meter project and the different types of testing to be performed. Bob Murnane (Seraphin) commented that the Field Standard Task Group is currently without a chairman and at a standstill on definitions until a new chairman is found. Ross Anderson (NY retired) expressed concerns with testing versus calibrating and the associated uncertainties. He is concerned that calibrating will require additional uncertainty components that must be developed using control charts and proficiency tests. The cost and time of this to an inspector is not practical. Diane Lee (NIST OWM) is concerned that tolerances may be too small to encompass uncertainties in the field. The NEWMA S&T Committee recommends that this item remain with Assigned status.

CWMA 2021 Annual Meeting: Comments taken on the whole block. Diane Lee (NIST OWM) reported that testing with NIST master meters is underway. CNG meters are being tested in Colorado. The LPG master meter is to set to begin being used shortly. There are two separate task groups working on this project. The NCWM Field Standards Task Group is looking for a new chairman. Russ Vires (SMA) stated that the SMA supports continued efforts on this proposal. Doug Musick (KS) supports the items moving forward but more information is needed concerning their use. Bob Murnane (Seraphin Test Measures) stated that not much more can be done without data to show that meters can be used as a standard. Seraphin stated that there is a paper discussing direction for the task group. Tina Butcher (NIST OWM) stated that testing for the different types of the master meters would occur simultaneously to speed up the data collection and analysis of the data. Charlie Stutesman (KS) asked if there was a date for conclusion of the task group activities and expressed the need to stay on top of this item. He suggested that there may be a need to set a sunset date for the activities of the task group. Loren Minnich (KS) reported that NCWM set an original goal of July 2021 to complete the mission, but it is not a deadline. Tina Butcher reported on what the master meters group is trying to achieve. Tina reminded the group that the Fundamental Considerations allows States to use master meters. OWM is assisting states with determining that these "master meters" would be viable for use as a field standard Adding something to the Fundamental Considerations to clarify that states can use them may be helpful. NIST is currently focusing on the Coriolis meter but what will come out of the study will be protocols that States can apply to other meter technologies. The CWMA S&T Committee recommends that this item remain an assigned item.

| **SWMA Report** |
|---|
| **Regional recommendation to NCWM on item status:**<br><br>☐ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda<br>☐ Recommend as an Assigned Item on the NCWM agenda<br>*(To be developed by an NCWM Task Group or Subcommittee)*<br>☒ Recommend as a Developing Item on the NCWM agenda<br>*(To be developed by source of the proposal)* |

☐ Recommend Withdrawal of the Item from the NCWM agenda
*(In the case of new proposals, do not forward this item to NCWM)*
☐ No recommendation from the region to NCWM
*(If this is a new proposal, it will not be forwarded to the national committee by this region)*

**Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)*

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.

Russ Vires, SMA, stated they support SCL/ABW/AWS because it is important to use consistent terminology across Handbook 44.

Russ Vires, 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.

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

## ITEM BLOCK 5 (B5) 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 D N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards
B5: CDL-18.2 D N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards
B5: HGM-18.2 D N.4.1. Master Meter (Transfer) Standard Test and T.4. Tolerance Application on Test Using Transfer Standard Test Method
B5: OTH-18.3 A Appendix D – Definitions: field reference standard meter ~~and transfer standard~~

**Source:**
Endress + Hauser Flowtec AG USA (2018)

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

### B5: CLM-18.2 W N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards

**Item Under Consideration:**
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-18.2 W N.3.2. Transfer Standard Test and T.3. On Tests Using Transfer Standards

**Item Under Consideration:**
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**.

## 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

**Item Under Consideration:**
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~~

**Item Under Consideration:**
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.~~**

**Background/Discussion:**
These items have been assigned to the submitter for further development. For more information or to provide comment, please contact:

Mr. Michael Keilty
Endress + Hauser Flowtec AG USA
970-586-2122, michael.keilty@us.endress.com

During S&T open hearings discussion in July 2017 it was pointed out that the term transfer standard which is used in the proposal to amend HB44 3.37 N.3 and 3.32 N.3 Test Drafts is incorrect. The statement made also suggested that the use of transfer standard is incorrectly used in HB44 code sections 3.34, 3.38 and 3.39. It was suggested that a more appropriate term to use is field reference standard or field reference standard meter. There is no definition in OIML G18 which supports the use of the term transfer standard. There is suggestive basis to support reference standard as it is used textually in OIML G18.

NIST has no procedural documents in place to justify the revision with a definition. The definition of transfer standard is used in code sections 3.34, 3.38 and 3.39 and that those sections do not need to change.

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.

NCWM 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.

NCWM 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

NCWM 2020 Interim Meeting: Field Standard TG Chair Jason 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.

NCWM 2021 Interim Meeting: NCWM Field Standard TG Chair, Jason 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.

NCWM 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. 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.

**Regional Association Comments:**

WWMA 2020 Annual Meeting: At the 2020 WWMA Annual Meeting, the WWMA adhered to a condensed agenda due to the COVID pandemic and did not consider this item.

SWMA 2020 Annual Meeting: At the 2020 SWMA Annual Meeting, the SWMA adhered to a condensed agenda due to the COVID pandemic and did not consider this item.

CWMA 2021 Annual Meeting: Comments taken on the whole block. Diane Lee (NIST OWM) reported that testing with NIST master meters is underway. CNG meters are being tested in Colorado. The LPG master meter is to set to begin being used shortly. There are two separate task groups working on this project. The NCWM Field Standards Task Group is looking for a new chairman. Russ Vires (SMA) stated that the SMA supports continued efforts on this proposal. Doug Musick (KS) supports the items moving forward but more information is needed concerning their use. Bob Murnane (Seraphin Test Measures) stated that not much more can be done without data to show that meters can be used as a standard. Seraphin stated that there is a paper discussing direction for the task group. Tina Butcher (NIST OWM) stated that testing for the different types of the master meters would occur simultaneously to speed up the data collection and analysis of the data. Charlie Stutesman (KS) asked if there was a date for conclusion of the task group activities and expressed the need to stay on top of this item. He suggested that there may be a need to set a sunset date for the activities of the task group. Loren Minnich (KS) reported that NCWM set an original goal of July 2021 to complete the mission but it is not a deadline. Tina Butcher reported on what the master meters group is trying to achieve. Tina reminded the group that the Fundamental Considerations allows States to use master meters. OWM is assisting states with determining that these "master meters" would be viable for use as a field standard Adding something to the Fundamental Considerations to clarify that states can use them may be helpful. NIST is currently focusing on the Coriolis meter but what will come out of the study will be protocols that States can apply to other meter technologies. The CWMA S&T Committee recommends that this item remain an assigned item.

NEWMA 2021 Annual Meeting: Comments were received on the entire block: Diane Lee (NIST OWM) commented that there is currently discussion for definitions of field standards and work for testing of master meters. Russ Vires (SMA) supports the development as it applies to items GEN-19.1, SCL-18.1, ABW-18.1, and AWS-18.1 and looks forward to further development. Tina Butcher (NIST OWM) gave an overview of the master meter project and the different types of testing to be performed. Bob Murnane (Seraphin) commented that the Field Standard Task Group is currently without a chairman and at a standstill on definitions until a new chairman is found. Ross Anderson (NY retired) expressed concerns with testing versus calibrating and the associated uncertainties. He is concerned that calibrating will require additional uncertainty components that must be developed using control charts and proficiency tests. The cost and time of this to an inspector is not practical. Diane Lee (NIST OWM) is concerned that tolerances may be too small to encompass uncertainties in the field. The NEWMA S&T Committee recommends that this item remain with Assigned status.

| **SWMA Report** |
|---|
| **Regional recommendation to NCWM on item status:**<br><br>☐ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda<br>☐ Recommend as an Assigned Item on the NCWM agenda<br>*(To be developed by an NCWM Task Group or Subcommittee)*<br>☐ Recommend as a Developing Item on the NCWM agenda<br>*(To be developed by source of the proposal)*<br>☒ Recommend Withdrawal of the Item from the NCWM agenda<br>*(In the case of new proposals, do not forward this item to NCWM)*<br>☐ No recommendation from the region to NCWM<br>*(If this is a new proposal, it will not be forwarded to the national committee by this region)* |
| **Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)* |

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.

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.

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

## LMD – LIQUID MEASURING DEVICES

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

**Source:**
Gilbarco, Inc.

**Purpose:**
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.

**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.*<br><br>*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.]** <br><br> *[*Nonretroactive as of January 1, 1996]* |
| ***Category 3:*** *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* <br><br> *[Nonretroactive as of January 1, 1995]* <br><br> *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.* <br><br> *[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)

**Previous Action:**

- 2021: Developing Item

**Original Justification:**
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.

**Comments in Favor:**

**Regulatory:**
•

**Industry:**
- 2021 Interim: Randy Moses (Wayne Fueling Systems LLC), the submitter of Item LMD-20.1, agreed to withdraw his proposal in favor of this item and will work with the submitter of this item to further develop it. Both companies support electronic logs for Category 3 sealing requirements.

**Advisory:**
- 2021 Interim and Annual: Ms. Diane Lee (NIST OWM) noted that there is a similar proposal on the S&T agenda, Item EVF-21.4 that the committee may want to consider when discussing this item and that OWM agrees with a developing status for this item.

**Comments Against:**

**Regulatory:**
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**Industry:**
•

**Advisory:**
•

**Neutral Comments:**

**Regulatory:**
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**Industry:**
•

**Advisory:**
•

**Item Development:**
The Committee agreed at the 2021 Interim Meeting to withdraw LMD-20.1. The Committee agreed on a Developing status for LMD-21.1

This item has been 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

**Regional Association Comments:**

WWMA 2020 Annual Meeting: Mr. Brent Price (Gilbarco) commented this is a little different than other proposals. Gas pumps have limited printing capabilities on receipts so they would like the option for electronic printing. Suggests combining into one proposal with Wayne Pump. Steven Harrington (OR) commented he was concerned about how this will affect device testing efficiency by adding additional testing steps in the field. He is also concerned about time

and structure of how this information is received in the field. Committee recommends this to be assigned developing status. The Committee recommends that the submitter work with other stakeholders and vets this through the other regions for further development.

SWMA 2020 Annual Meeting: During Open Hearings, the Committee heard from Mr. Brent Price (Gilbarco), the submitter, who stated that he wants to have the option of an Electronic Event Log, and for the item to be considered as fully developed. The Committee also heard from Ms. Tina Butcher (OWM) who stated she would like to have consistent language in the Handbook for LMD, EVSE, and Taximeters. The Committee notes that it prefers the language in this item rather than a similar item submitted by Wayne last year. After considering this item the Committee recommends the item given Voting status.

CWMA 2021 Annual Meeting: Diane Lee (NIST OWM) provided background and technical information on this item. OWM believes this should move forward as a developing item. The CWMA S&T Committee recommends that Item B5: LMD-21.1 remain Developing.

NEWMA 2021Annual Meeting: No comments received on Withdrawn items. A comment was heard from Diane Lee (NIST OWM) that Gilbarco is working with Wayne on the continued development of this item and that NIST supports its development. The NEWMA S&T Committee recommends that this item remain with Developing status.

| **SWMA Report** |
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| **Regional recommendation to NCWM on item status:**<br><br>☒ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda<br>☐ Recommend as an Assigned Item on the NCWM agenda<br>*(To be developed by an NCWM Task Group or Subcommittee)*<br>☐ Recommend as a Developing Item on the NCWM agenda<br>*(To be developed by source of the proposal)*<br>☐ Recommend Withdrawal of the Item from the NCWM agenda<br>*(In the case of new proposals, do not forward this item to NCWM)*<br>☐ No recommendation from the region to NCWM<br>*(If this is a new proposal, it will not be forwarded to the national committee by this region)* |
| **Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)* |
| 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.<br><br>Tim Chesser, Arkansas, supports moving this forward as a Voting Item.<br><br>This committee recommends moving this item forward as a Voting Item. |

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

## VTM – VEHICLE TANK METERS

### VTM-18.1 D 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.**

*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:**
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.

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

(Added 2018)

**Background/Discussion:**
This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Mr. Jim Willis
New York Department of Agriculture and Markets
518-485-8377, james.willis@agriculture.ny.gov

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.

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.

NCWM 2018 Annual Meeting: The Committee heard comments from OWM that this item needed additional work to address concerns that had been identified in OWM's 2018 Interim Meeting (and earlier) analyses. While there are clear benefits to improving safety when flushing hoses, OWM and others have noted these systems can facilitate fraud without appropriate safeguards in place. OWM noted the language in the Item Under Consideration in the Committee's 2018 Interim Report would:

1. provide an (unintentional) exemption to the provisions for "diversion of product" for ***all*** single meter, multiple product, multiple compartment systems;

2. would (unintentionally) require all such systems to be equipped with a manifold flush system;

3. fail to include requirements for the system to clearly indicate (on both display and recorded representations) when the flush system is in operation; and

4. fail to include limitations on how the user is permitted to appropriately use these systems.

In discussing the changes OWM felt were needed prior to the Annual Meeting, the submitter and OWM agreed that some of OWM's proposed changes would be considered editorial and others technical in nature. Since other than editorial changes could affect the Voting status of the item, OWM offered the following two courses of action for the Committee to consider:

1. Downgrade the item to Informational to allow time to address all the changes that are needed; or

2. Split the item into two parts to allow the portion of the item needing only editorial changes to move forward for vote; and carryover the remaining portion to allow time for it to be further developed and considered during the next NCWM cycle.

Rather than hold up the entire item to be considered in the next Conference cycle, the submitter requested the item be split into two parts to allow the completed portion, including the editorial changes, to move forward for vote.

NCWM 2019 Interim Meeting: The Committee heard comments to Agenda Item VTM-1 as well as position statements from MMA that they objected to manifold flush systems. NIST OWM provided an analysis to the Committee prior to the Interim Meeting. The comments heard during the open hearing and/or received prior to the Interim meeting are summarized below:

Mr. Hal Prince (FL) stated that it was missing any inclusion for limitation of use, such as when delivering multiple products. He suggested that the Committee consider language forwarded by the SWMA in its 2018 Annual Report. Mr. Prince also suggested that the item be kept developmental. Mr. Dan Murray, (Murray Equipment, Total Controls System) stated that Manifold Flush Systems were a big problem in Europe where they are permitted. Mr. Murray suggested these systems could facilitate fraud and NTEP should carefully consider this before granting approval. These systems should also be sealed. Mr. Murray's opinion was that the item should be withdrawn. Mr. Dmitri Karimov speaking on behalf of Meter Manufacturers Association, stated that MMA objected to manifold flush systems.

NIST OWM agreed with the WWMA and the CWMA that this item is fully developed and agreed with assigning it a voting status. OWM provided the following review of the operation of the equipment, proposed changes, and additional points to consider:

- At the 2018 NCWM Annual Meeting the Conference voted to allow an exemption to S.3.1. for Manifold Flush Systems, which is currently in the 2019 HB 44 VTM code.

- S.3.1. states "no means" shall be provided to divert liquid from the measuring chamber of the meter or the discharge line.

- A manifold flush system allows liquid to be diverted from the discharge line on single hose multi-compartment VTMs so that liquid of one product is not mixed with liquid of another in the discharge line.

- Without a manifold flush system, the operator must manually return the product to the correct compartment to clear the discharge line before using another product.

- There are safety hazards with manually returning the product to storage (operator climbing on top of tank and lifting hose to return the product. There are also safety concerns when not properly clearing the discharge lines prior to delivering a different product and because of these safety concerns it was reported that more of these systems will likely be installed on single hose multicompartment trucks.

- Although safety is a high priority, the "means" used to return product back to storage is not as visible and makes facilitation of fraud a high possibility.

- The additional changes proposed are intended to ensure such systems are designed such that they do not facilitate fraud; help ensure owners understand their responsibilities when installing such a system; and ensure uniformity in enforcement though out the country.

- The changes reflect the suggested language from OWM's previous analysis and incorporate comments received from the MMA and others during the 2018 Annual meeting.

Non-retroactive dates may need to be added to allow time for manufacturers of flush systems to incorporate the safeguards into their systems. During the committee's work session, the Committee considered the comments received during the Interim Meeting open hearings and recommended a voting status for this item.

NCWM 2019 Annual Meeting: The Committee supported amendments proposed to subparts (f) and (g) based upon statements from the submitter (NY) indicating that manufacturers of manifold flush systems will need additional time to incorporate the safeguards into their systems. The Committee also agreed to place the item on the voting consent calendar as amended, and as shown in the Item Under Consideration.

During the open hearing sessions, the Committee heard comments from NIST OWM's Mrs. Tina Butcher offering a revision of S.3.1.1.(f). suggesting this portion be split into separate bullet points. Also heard were comments from Mr. Jim Willis (NY) in support of NIST OWM's suggestion and his recommendation for making this a nonretroactive requirement to allow manufacturers time to accommodate the necessary changes.

During the voting session, it was requested this item be removed from the voting consent calendar and voted on separately. The item failed to receive enough votes for adoption and was therefore returned to the Committee.

NCWM 2020 Interim Meeting: The Committee heard from Ms. Butcher (NIST OWM) who recommended that VTM-18.1 and VTM-20.1 be combined because both items address manifold flush systems, but VTM 18-1 does not restrict the use of the system to certain products and VTM 20-1 restricts the use of the system to home heating fuel. Mrs. Butcher recommended that the combined item be given a developing status to address the design and use of these systems adequately. Mrs. Butcher also recommended improvements to VTM 18-1 and VTM 20-1.

Mr. Dmitri Karimov (MMA) agreed with the language proposed in VTM 18-1 and acknowledged that there is value in the alternative proposal VTM-20.1 and supports combining both proposals into one. Mr. Hal Prince (FL) also agreed that Item VTM-18.1 and VTM-20.1 be combined and given a developing status. Mr. Prince expressed a willingness to work with submitters to further develop the items and noted that he has concerns with cross-contamination caused by these systems. Mr. Jim Willis agreed with Mrs. Butcher's statements. Mr. Karimov recommended including more categories for types of fuels in the proposal is important such as flammable, explosive, etc. Mr. John Hathaway (Murray Equipment) submitter of VTM-20.1 expressed interest in working together with the submitters of VTM-18.1.

During the Committee's work session, the committee agreed that this item, VTM-18.1 should be combined with VTM-20.1 and be given a developing status to allow the submitters of both items to work together towards resolving the conflicts in these two items.

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.

NCWM 2021 Interim Meeting: The Committee heard from Mr. Mike Smith (NY) who supports VTM 18.1 as a Developing item and he agreed to work with the other submitters of this item on paragraphs S.3.1.1. (f) and (g) and to address contamination. Mr. Hal Prince (FL) supports a Developing status for VTM-18.1 and noted that with VTM-18.1 there will be issues with fuel contamination. The concern raised in previous discussions was that if these manifold systems are used with multi-product, single discharge hose dispensers for the delivery of both motor fuels and home heating fuels, a small amount of home heating fuel mixed with a motor fuel could be problematic. It was also noted that these fuels could get contaminated repeatedly whenever there is a change from one fuel to another and that there is also the safety issue of flashing when mixing a gasoline with diesel or kerosene. Ms. Diane Lee report that VTM-18.1 and VTM-20.1 conflict. VTM-20.1 restricts the use of these systems to be used with only home heating fuels. Dmitri Karimov (MMA) noted if VTM-18.1 is adopted then VTM-20.1 would not be required. Mr. Charles Stutesman, (KS) was not sure if VTM-18-1 and VTM-20-1 were being discussed together and it was pointed out that it was agreed that they be combined at the 2020 interim meeting. Mr. John Hathaway (Total Control Systems) agreed with a Developing status for this item and noted that the changes to Paragraphs (f) and (g) would help to address some of the issues that were raised. The committee agreed to a Developing status for VTM-18.1 and to Withdraw VTM-20.1. The committee also stated that any concerns with contamination and safety should also be addressed.

NCWM 2021 Annual Meeting: Mr. Jim Willis of New York and submitter of this item reported that there are no updates due to the pandemic and requested that it remain under Developing status. NIST OWM included written comments in its analysis.

**Regional Association Comments:**

2020 Regional Meetings of the WWMA and SWMA: These regions adhered to a condensed agenda due to the Covid pandemic and did not consider this item.

CWMA 2021 Annual Meeting: No comments heard on this item. The CWMA S&T Committee recommends this item remain Developing.

NEWMA 2021Annual Meeting: Mr. Jim Willis (NY, submitter) commented that he is working with NIST and Murray Control Systems and expects to finalize the development of this item. Ms. Tina Butcher (NIST OWM) echoed Jim's comments and supported the efforts made to find language that is more widely supported. The NEWMA S&T Committee recommends that this item remain with Developing status.

| **SWMA Report** |
|---|
| **Regional recommendation to NCWM on item status:**<br><br>☐ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda |

☐ Recommend as an Assigned Item on the NCWM agenda
*(To be developed by an NCWM Task Group or Subcommittee)*
☒ Recommend as a Developing Item on the NCWM agenda
*(To be developed by source of the proposal)*
☐ Recommend Withdrawal of the Item from the NCWM agenda
*(In the case of new proposals, do not forward this item to NCWM)*
☐ No recommendation from the region to NCWM
*(If this is a new proposal, it will not be forwarded to the national committee by this region)*

**Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)*

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

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

## VTM-20.2 D 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:**
Change tolerances to accommodate more efficient milk-metering systems.

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

**Table 2.**
**Tolerances for Vehicle-Mounted Milk Meters**

| ~~**Indication (gallons)**~~ | **Maintenance Tolerance ~~(gallons)~~** | **Acceptance Tolerance ~~(gallons)~~** |
|---|---|---|
| ~~**100**~~ **Complete Measuring System** | ~~**0.5**~~ **0.5%** | ~~**0.3**~~ **0.5%** |
| ~~**200**~~ **Meter Only** | ~~**0.7**~~ **0.3%** | ~~**0.4**~~ **0.3%** |
| ~~**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**, Amended 20XX**)

**Background/Discussion:**
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

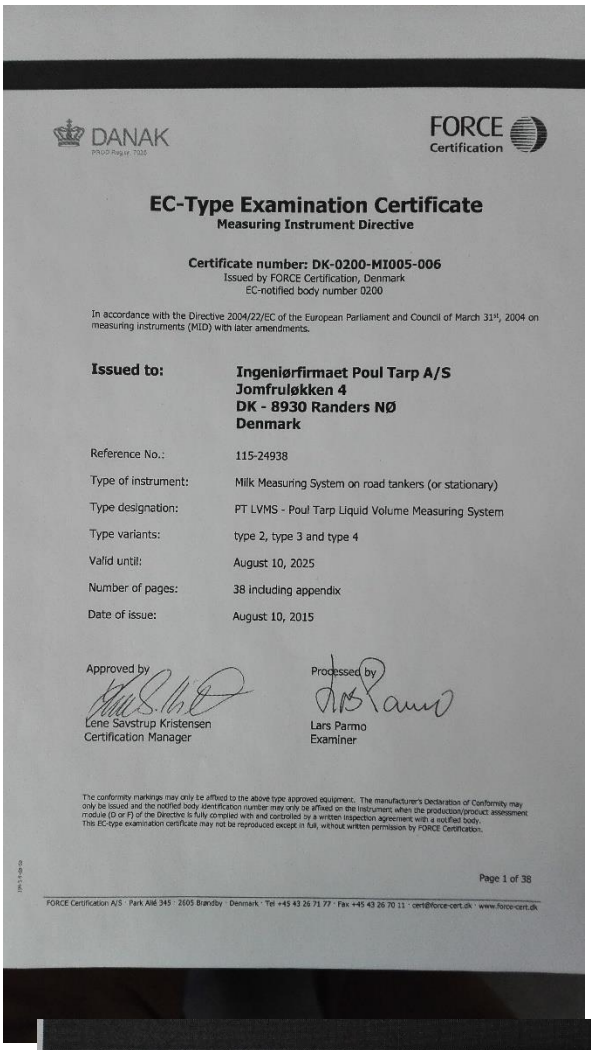
Existing tolerances are based on the accuracy of the Flow meter itself. The proposed Tolerances are based on Milk Metering Systems where the magnetic flow meter is a part of the Milk Metering system handling milk containing air.

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**



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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**<br>**Jomfruløkken 4**<br>**DK - 8930 Randers NØ**<br>**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
Lene Savstrup Kristensen
Certification Manager

Processed by
Lars Parmo
Examiner

The conformity markings may only be affixed to the above type approved equipment. The manufacturer's Declaration of Conformity may only be issued and the notified body identification number may only be affixed on the instrument when the production/product assessment module (D or F) of the Directive is fully complied with and controlled by a written inspection agreement with a notified body. This EC-type examination certificate may not be reproduced except in full, without written permission by FORCE Certification.

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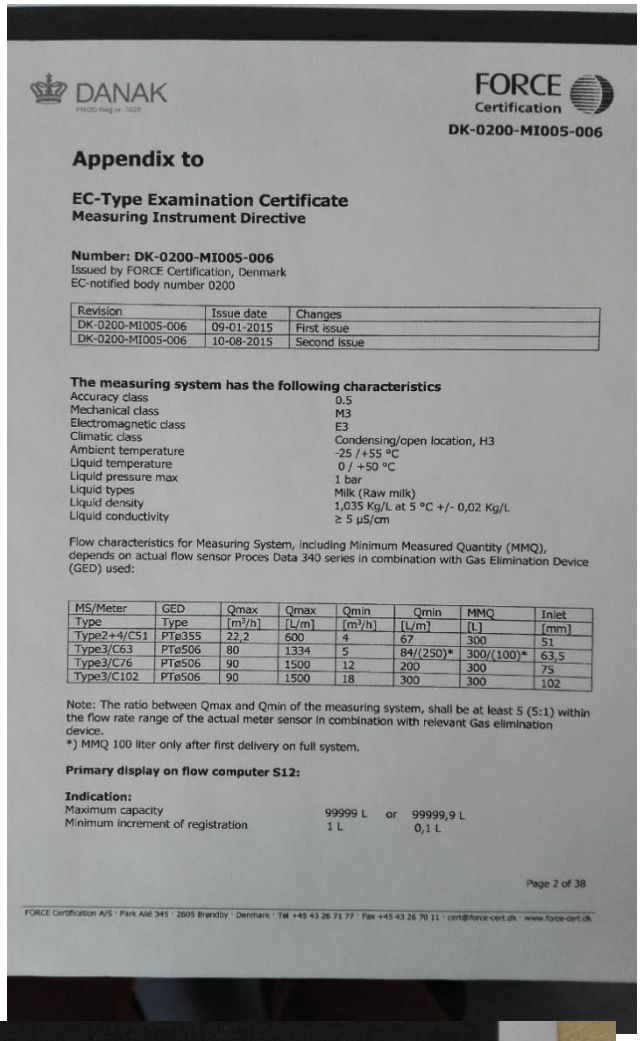

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FORCE Certification
**DK-0200-MI005-006**

## 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 | 102 |

Note: The ratio between Qmax and Qmin of the measuring system, shall be at least 5 (5:1) within the flow rate range of the actual meter sensor in combination with relevant Gas elimination device.
*) MMQ 100 liter only after first delivery on full system.

**Primary display on flow computer S12:**

**Indication:**

| | | | |
|---|---|---|---|
| Maximum capacity | 99999 L | or | 99999,9 L |
| Minimum increment of registration | 1 L | | 0,1 L |

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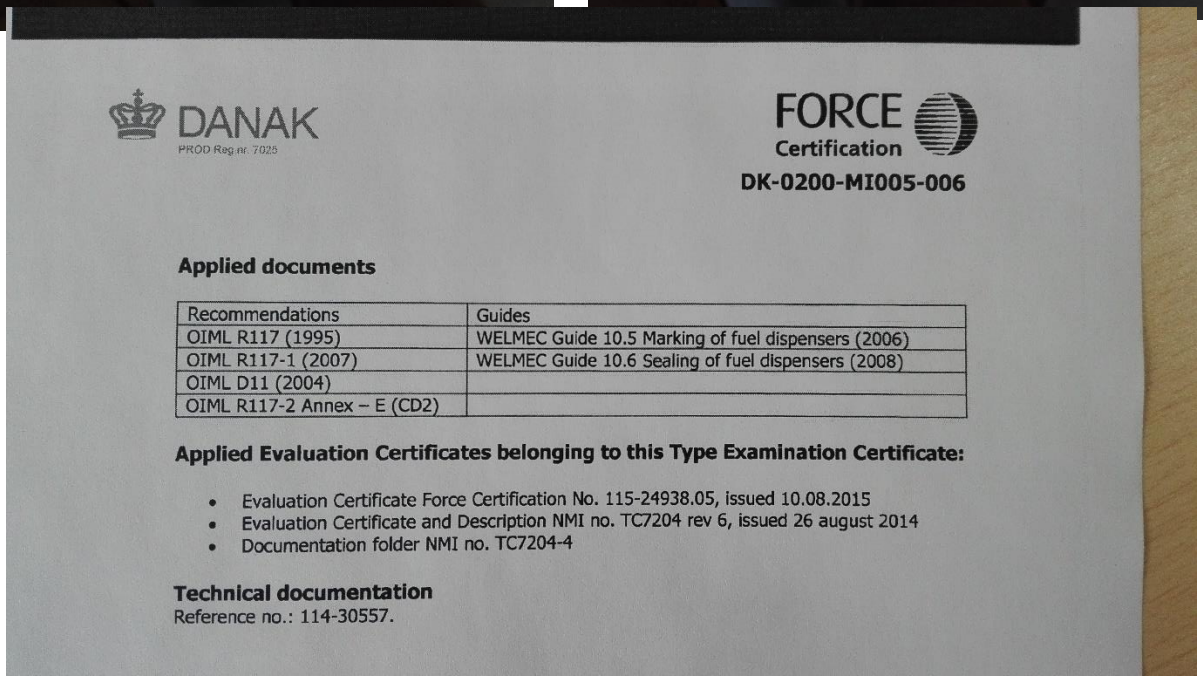

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### Applied documents

| 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) | |

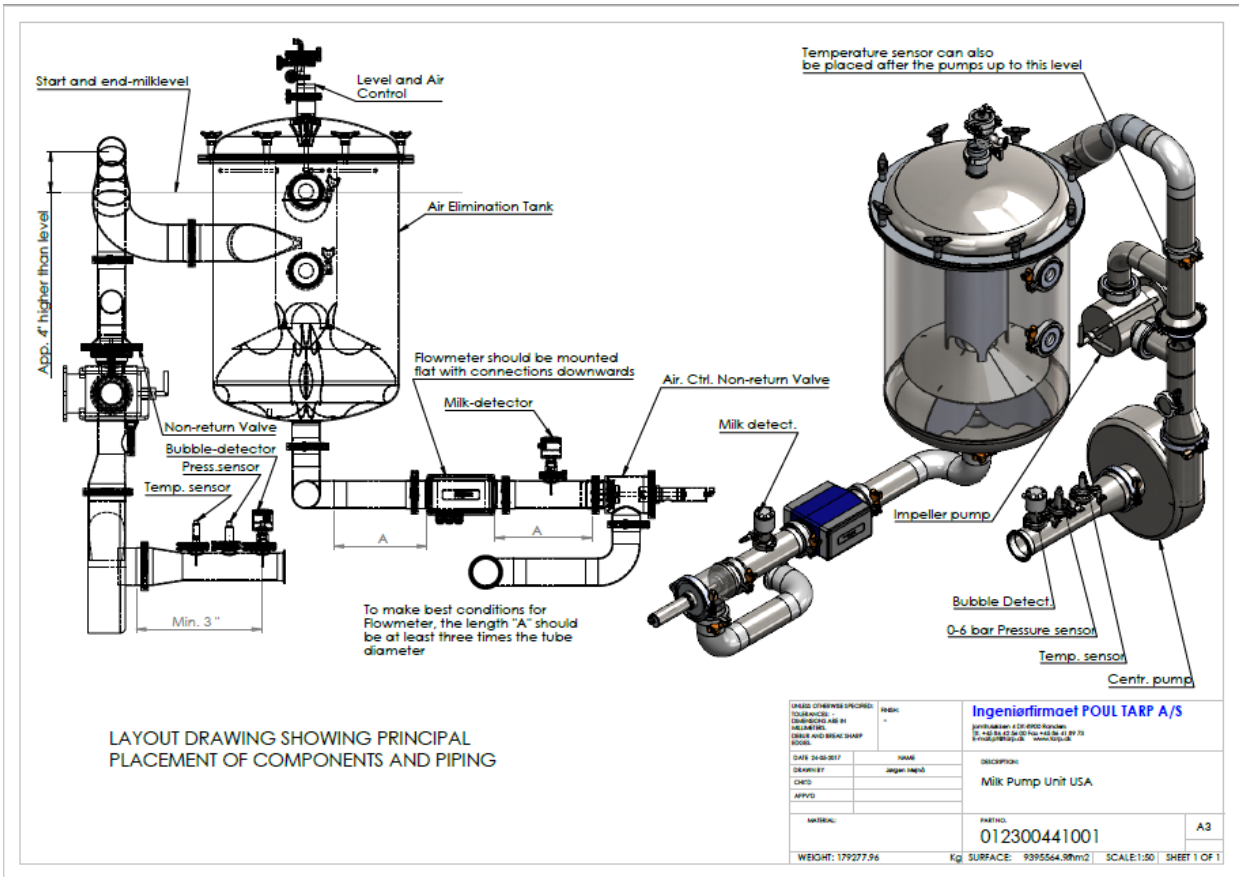
### Applied Evaluation Certificates belonging to this Type Examination Certificate:

- 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.

**FLOW COMPUTERS REGULATION IN THE US:**

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




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 (KS) 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 (KS) 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 (KS) 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 (KS) 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 (MD) 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 (AR) 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 (NY) recommended a developing status for this item. Mr. Kevin Schnepp (CA) 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.

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.

NCWM 2021 Interim Meeting: The Committee heard from Mr. Charles Stutesman (KS, Char 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 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 committees 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 groups 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.

NCWM 2021 Annual Meeting: Mr. Charlie 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 committees 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. Charlie 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** |
| Over 500 | Add ~~**0.002**~~ **0.006** gallons per indicated gallon over 500 | Add ~~**0.001**~~ **0.005** gallons per indicated gallon over 500 |

**Regional Association Comments:**

2020 Regional Meetings of the WWMA and SWMA: These regions adhered to a condensed agenda due to the COVID pandemic and did not consider this item.

CWMA 2021 Annual Meeting: Chair of the S&T Committee reported that this item appeared in CWMA Pub 16 as an assigned item incorrectly and should have been presented as a voting item. NCWM has verified that this is the case. Mr. Charlie Stutesman (KS), Chair of the Milk Meter Tolerance Task Group reported that the task group is moving forward with a proposal to align NIST Handbook 44 tolerances with OIML tolerances. The task group has made a formal request to the Chairman of the NCWM S&T Committee to expand the scope of the task group and is awaiting final decision on that request. Charlie reported that the current HB44 tolerances may be beyond the manufacturer's ability and may be in conflict with Fundamental Considerations.

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

NEWMA 2021Annual Meeting: Multiple comments were received in support of this item with a Voting status. Diane Lee (NIST OWM) is a member of the milk meter task group, and the task group recommends tolerances used in OIML. Jim Willis (NY), also member of the task group, asks to expand the scope of the task group to assess all three codes in the handbook where milk meters are found. The NEWMA S&T Committee recommends that this item move forward with Voting status.

| **SWMA Report** |
|---|
| **Regional recommendation to NCWM on item status:**<br><br>☐ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda<br>☐ Recommend as an Assigned Item on the NCWM agenda<br>*(To be developed by an NCWM Task Group or Subcommittee)*<br>☒ Recommend as a Developing Item on the NCWM agenda<br>*(To be developed by source of the proposal)*<br>☐ Recommend Withdrawal of the Item from the NCWM agenda<br>*(In the case of new proposals, do not forward this item to NCWM)*<br>☐ No recommendation from the region to NCWM<br>*(If this is a new proposal, it will not be forwarded to the national committee by this region)* |
| **Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)*<br>No comments were received on this item.<br><br>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.<br><br>This committee recommends the item remain Developing so that the submitters can gather more evidence about the accuracy of these devices. |

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

## LPG – LIQUIFIED PETROLEUM GAS AND ANHYDROUS AMMONIA LIQUID-MEASURING DEVICES

### LPG-22.1 V A.1. General., and Appendix D – Definitions. Liquefied Petroleum Gas Retail Motor Fuel Device.

**Source:**
North Carolina Department of Agriculture and Consumer Services

**Purpose:**
Provide a clearer definition of retail motor fuel device, in relation to LP-Gas, is needed to allow for the continued use of much of the existing dispenser equipment in the field. Those that are for delivery into a vehicle should comply with the appropriate HB 44 requirements, while those that dispense into a portable container, even if later used as a "motor fuel", can used a non-RMFD dispenser.

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

A.1. General. – This code applies to devices used for the measurement of liquefied petroleum gas and anhydrous ammonia in the liquid state, whether such devices are installed in a permanent location or mounted on a vehicle. **For retail motor fuel devices, see Appendix D, definition of liquefied petroleum gas retail motor fuel device.**

And amend Handbook 44, Appendix D – Definitions as follows:

**Liquefied Petroleum Gas Retail Motor Fuel Device. – A device designed for the measurement and delivery of liquefied petroleum gas used as a fuel for internal combustion engines in licensed vehicles. The term means the same as "retail motor fuel dispenser" and "retail motor fuel device" as it appears in section 3.32 LPG and Anhydrous Ammonia Liquid-Measuring Devices [3.32]**

motor-fuel device or motor-fuel dispenser or retail motor-fuel device. – A device designed for the measurement and delivery of liquids used as fuel for internal-combustion engines. The term "motor-fuel dispenser" means the same as "motor-fuel device"; the term "retail motor-fuel device" applies to a unique category of device. (Also see ~~**definition**~~ **definitions of "retail device." and "liquefied petroleum gas retail motor fuel dispenser")** [3.30, ~~**3.32,**~~ 3.37]

**Previous Action:**
New

**Original Justification:**
By definition in HB 44, LP-Gas (propane) is a motor fuel, however the majority of propane that is sold is not for motor fuel use. Most dispensers in the field are to fill bottles/cylinders/containers, and should be able to continue in that purpose, even if that container may end up fueling a motor, such as a forklift, mower or generator. I think the intent of a "retail motor fuel device" is that the majority of that product is going into vehicles. So, I have purposely chosen to use "licensed vehicles" to help define the appropriate device as "highway" and "non-highway" is a separate road tax issue. I think it is too much to ask locations, such as campground, with a dispenser to primarily fill grill cylinders, to add a retail motor fuel device because they occasionally fill a container that may be used on propane lawn mower, or similar equipment.

I suggest an addition to section A.1. to draw attention to this definition and the applicability of the code in that context. The alternative would be to change all instances of "retail motor fuel dispenser" and "retail motor fuel device" in section 3.32 to "liquefied petroleum gas retail motor fuel device".

The problem encountered by our staff is that existing, container filling dispensers later had a "T" installed and another hose was added, which had a K15 nozzle on it, currently required by the *LP-Gas Code* for filling vehicles. At that time, it was determined the equipment was being used., in part, as a retail motor fuel device and the appropriate HB 44 sections applied, which they could not meet (they were installed after the 2017 requirements took effect). I will note the existence of the nozzle alone does not make it and RFMD, as containers can be retrofitted to accept that nozzle, but it is an indication that questions on equipment usage need to be asked.

There are currently several NTEP approved LPG retail motor fuel dispensers in the marketplace and are defined by those manufacturers as such. This would maintain the level playing field for both the manufacturers and the businesses that have already installed LP-Gas RMFDs for the purpose of fueling vehicles.

The submitter acknowledged that This will effectively define devices for use with "vehicles" and "equipment". Some would suggest that current HB 44 requirements should apply to all dispensers that may result in usage as a "motor fuel", but this is not practical in terms of cost of equipment given the fraction of that type sale many locations may have. This is not how we typically consider items, but as LP-Gas, a long existing product and corresponding devices, is moving more into the alternative fuel market, there should be some consideration given to better determine where a RMFD is required. The alternative is to not enforce the requirements at all or selectively enforce them at some locations and not others, which is not equitable to the industry or the customers.

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

**Arguments in Favor:**

**Regulatory:**
- 

**Industry:**
- 

**Advisory:**
- 

**Arguments Against:**

**Regulatory:**
- 

**Industry:**
- 

**Advisory:**
- 

**Neutral Comments:**

**Regulatory:**
- 

**Industry:**
- 

**Advisory:**
- 

**Item Development:**
New

**Regional Associations' Comments:**
New

| **SWMA Report** |
|---|
| **Regional recommendation to NCWM on item status:**<br><br>☒ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda<br>☐ Recommend as an Assigned Item on the NCWM agenda<br>*(To be developed by an NCWM Task Group or Subcommittee)*<br>☐ Recommend as a Developing Item on the NCWM agenda<br>*(To be developed by source of the proposal)*<br>☐ Recommend Withdrawal of the Item from the NCWM agenda<br>*(In the case of new proposals, do not forward this item to NCWM)*<br>☐ No recommendation from the region to NCWM<br>*(If this is a new proposal, it will not be forwarded to the national committee by this region)* |

| **Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)* |
|---|
| Steven Benjamin, North Carolina, stated that he is seeing businesses add hoses to existing devices, essentially creating a RMFD. He recommended moving this forward as a Voting Item.<br><br>Mr. Keilty, Endress+Hauser, stated that we could explore adding a RMFD component to LPG to deal with this issue.<br><br>This committee feels this item is fully developed and recommends moving this item forward as a Voting Item. |

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

## LPG-15.1 V 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:**
Amend Handbook 44 to allow field reference standard meters to be used to test and place into service dispensers and delivery system flow meters.

**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)**

**Background and Discussion:**
This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Mr. Michael Keilty
Endress + Hauser Flowtec AG
970-586-2122, michael.keilty@us.endress.com

The use of transfer standards is recognized in Code sections 3.34 Cryogenic Liquid-Measuring Devices Code and 3.38 Carbon Dioxide Liquid-Measuring Devices Code and 3.39 Hydrogen Gas-Measuring Devices – Tentative Code. Transfer standard is only defined for testing cryogenic liquid measuring devices. It has been pointed out that the term transfer standard is not correct and that field reference standard meters may be more appropriate. See new the item under consideration, updated on September 8, 2017.

Field evaluation of LPG meters and CNG dispensers and LNG dispensers is very difficult using volumetric and gravimetric field standards and methods. The tolerances for these applications are such that using field reference standard meters are more efficient and safer. With CNG and LNG and LPG applications, the field reference standard meters are placed in-line with the delivery system as it is used to fill tanks and vehicles. The use of field reference standard meters eliminates return to storage issues. The use of field reference standard meters is easier and faster compared to the use of traditional field standards. The cost of using field reference standard meters and transporting them is much less than the cost of traditional field provers and standards.

Recognition in Handbook 44 will enable States to allow field reference standard meters to place systems into service and for field enforcement.

Volumetric field provers and gravimetric field proving are susceptible to environmental influences. The State of Colorado uses a field reference standard meter to test propane delivery truck meters. The State of Nebraska has used a field reference standard meter to test agricultural chemical meters. Other States have asked that there be recognition in HB44 in order for their State to allow the use of field reference standard meters.

In some applications, field reference standard meters are not more accurate than the meters used in the application. For that reason, longer test drafts and possibly more tests may need to be run.

The State of California is purported to have conducted a short study of field reference standard meters in the past. The conclusion did not lead to wide adoption of the practice.

Section 3.37 Mass Flow Meters user requirement U.R.3.8. Return of Product to Storage, Retail Compressed Natural Gas Dispensers requires that the natural gas which is delivered into the test container must be returned to storage. This is difficult and most often not complied with when the test vessel contents are released to atmosphere. States often have difficulties in remote locations finding suitable field reference equipment.

The Committee initially considered a proposal to modify paragraph N.3. Test Drafts and to add a new paragraph N.3.2. Transfer Standard Test as shown below. Note that, in Fall 2016, Mr. Keilty provided an update to this proposal as shown in the Item Under Consideration above.

**N.3. Test Drafts. –**

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

**N.3.2. Transfer Standard Test. – When comparing a meter with a calibrated transfer standard, the test draft shall be equal to at least the amount delivered by the device in 2 minutes at its maximum discharge rate.**

The submitter recommended that NIST update EPO 28 for CNG dispensers and EPO 26 for LPG Liquid Measuring Systems to include transfer standard meter tests. NIST Handbook 105-4 should also be revised to specifically address the transfer standard meter and the requirements for use.

The S&T Committee might also consider amending Sections 3.30 Liquid-Measuring Devices Code and 3.31 Vehicle-Tank Meters Code to allow transfer standard meters.

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.

NCWM 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.

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

NCWM 2020 Interim Meeting: Field Standard TG Chair Jason 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.

NCWM 2021 Interim Meeting: NCWM Field Standard TG Chair, Jason 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. Ms. 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.

NCWM 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. 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.

**Regional Association Comments:**

WWMA 2020 Annual Meeting: At the 2020 WWMA Annual Meeting, the WWMA adhered to a condensed agenda due to the COVID pandemic and did not consider this item.

SWMA 2020 Annual Meeting: At the 2020 SWMA Annual Meeting, the SWMA adhered to a condensed agenda due to the COVID pandemic and did not consider this item.

NEWMA 2021 Annual Meeting: Comments were received on the entire block: Diane Lee (NIST OWM) commented that there is currently discussion for definitions of field standards and work for testing of master meters. Russ Vires (SMA) supports the development as it applies to items GEN-19.1, SCL-18.1, ABW-18.1, and AWS-18.1 and looks forward to further development. Tina Butcher (NIST OWM) gave an overview of the master meter project and the different types of testing to be performed. Bob Murnane (Seraphin) commented that the Field Standard Task Group is currently without a chairman and at a standstill on definitions until a new chairman is found. Ross Anderson (NY retired) expressed concerns with testing versus calibrating and the associated uncertainties. He is concerned that calibrating will require additional uncertainty components that must be developed using control charts and proficiency tests. The cost and time of this to an inspector is not practical. Diane Lee (NIST OWM) is concerned that tolerances

may be too small to encompass uncertainties in the field. The NEWMA S&T Committee recommends that this item remain with Assigned status.

CWMA 2021 Annual Meeting: Comments taken on the whole block. Diane Lee (NIST OWM) reported that testing with NIST master meters is underway. CNG meters are being tested in Colorado. The LPG master meter is to set to begin being used shortly. There are two separate task groups working on this project. The NCWM Field Standards Task Group is looking for a new chairman. Russ Vires (SMA) stated that the SMA supports continued efforts on this proposal. Doug Musick (KS) supports the items moving forward but more information is needed concerning their use. Bob Murnane (Seraphin Test Measures) stated that not much more can be done without data to show that meters can be used as a standard. Seraphin stated that there is a paper discussing direction for the task group. Tina Butcher (NIST OWM) stated that testing for the different types of the master meters would occur simultaneously to speed up the data collection and analysis of the data. Charlie Stutesman (KS) asked if there was a date for conclusion of the task group activities and expressed the need to stay on top of this item. He suggested that there may be a need to set a sunset date for the activities of the task group. Loren Minnich (KS) reported that NCWM set an original goal of July 2021 to complete the mission, but it is not a deadline. Tina Butcher reported on what the master meters group is trying to achieve. Tina reminded the group that the Fundamental Considerations allows States to use master meters. OWM is assisting states with determining that these "master meters" would be viable for use as a field standard Adding something to the Fundamental Considerations to clarify that states can use them may be helpful. NIST is currently focusing on the Coriolis meter but what will come out of the study will be protocols that States can apply to other meter technologies. The CWMA S&T Committee recommends that this item remain an assigned item.

**SWMA Report**

**Regional recommendation to NCWM on item status:**

- ☒ Recommend as a Voting Item on the NCWM agenda
- ☐ Recommend as an Information Item on the NCWM agenda
- ☐ Recommend as an Assigned Item on the NCWM agenda
  *(To be developed by an NCWM Task Group or Subcommittee)*
- ☐ Recommend as a Developing Item on the NCWM agenda
  *(To be developed by source of the proposal)*
- ☐ Recommend Withdrawal of the Item from the NCWM agenda
  *(In the case of new proposals, do not forward this item to NCWM)*
- ☐ No recommendation from the region to NCWM
  *(If this is a new proposal, it will not be forwarded to the national committee by this region)*

**Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)*

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.

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

## 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:**
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.

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

**S.2.6 Zero-Set-Back Interlock for Stationary Customer-Operated Retail Motor-Fuel Devices, Electronic -** 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 as of** January 1, 2017]
(Added 2016, **Amended 2022**)

**Previous Action:**
New

**Original Justification:**
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.

**Arguments in Favor:**

**Regulatory:**
- 

**Industry:**
- 

**Advisory:**
- 

**Arguments Against:**

**Regulatory:**
- 

**Industry:**
- 

**Advisory:**
- 

**Neutral Comments:**

**Regulatory:**
- 

**Industry:**
- 

**Advisory:**
- 

**Item Development:**
New

**Regional Associations' Comments:**
New

| SWMA Report |
|---|
| **Regional recommendation to NCWM on item status:**<br><br>☐ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda<br>☐ Recommend as an Assigned Item on the NCWM agenda<br>*(To be developed by an NCWM Task Group or Subcommittee)*<br>☐ Recommend as a Developing Item on the NCWM agenda<br>*(To be developed by source of the proposal)*<br>☒ Recommend Withdrawal of the Item from the NCWM agenda<br>*(In the case of new proposals, do not forward this item to NCWM)*<br>☐ No recommendation from the region to NCWM<br>*(If this is a new proposal, it will not be forwarded to the national committee by this region)* |
| **Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)*<br>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.<br><br>Tim Chesser, Arkansas, opposes this item. He stated that it was a bad item, seemed incomplete, and recommended it be withdrawn.<br><br>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. |

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

## LPG-22.3 V 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.

**Source:**
National Propane Gas Association

**Purpose:**
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.

**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, Stationary ~~and Vehicle Mounted~~ Meters, Electronic.** - 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 two minutes the transaction must be completed before additional product flow is allowed. The 2-minute timeout shall be a sealable feature on an indicator.

**S.2.6. Zero-Set-Back Interlock, Vehicle Mounted Meters, Electronic.** - 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.

**S.2.~~6~~7. Zero-Set-Back Interlock for Stationary Self-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.

[Nonretroactive as of January 1, ~~**2017**~~ 2023]
(Added 2016, modified 2022

**Previous Action:**
New

**Original Justification:**
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.

**Arguments in Favor:**

**Regulatory:**
- 

**Industry:**
- 

**Advisory:**
- 

**Arguments Against:**

**Regulatory:**
- 

**Industry:**
- 

**Advisory:**
- 

**Neutral Comments:**

**Regulatory:**
- 

**Industry:**
- 

**Advisory:**
- 

**Item Development:**
New

**Regional Associations' Comments:**
New

| SWMA Report |
|---|
| **Regional recommendation to NCWM on item status:**<br><br>☒ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda<br>☐ Recommend as an Assigned Item on the NCWM agenda<br>*(To be developed by an NCWM Task Group or Subcommittee)*<br>☐ Recommend as a Developing Item on the NCWM agenda<br>*(To be developed by source of the proposal)*<br>☐ Recommend Withdrawal of the Item from the NCWM agenda<br>*(In the case of new proposals, do not forward this item to NCWM)*<br>☐ No recommendation from the region to NCWM<br>*(If this is a new proposal, it will not be forwarded to the national committee by this region)* |
| **Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)* |
| Steve Benjamin, North Carolina, supports this item.<br><br>This committee recommends this item move forward as a Voting item. |

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

## MFM – MASS FLOW METERS

### MFM-15.1 V 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

**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)**

**Background/Discussion:**
This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Mr. Michael Keilty
Endress + Hauser Flowtec AG USA
970-586-2122, michael.keilty@us.endress.com

The use of transfer standards is recognized in Code sections 3.34 Cryogenic Liquid-Measuring Devices Code and 3.38 Carbon Dioxide Liquid-Measuring Devices Code and 3.39 Hydrogen Gas-Measuring Devices – Tentative Code. Transfer standard is only defined for testing cryogenic liquid measuring devices. It has been pointed out that the term transfer standard is not correct and that field reference standard meters may be more appropriate. See new the item under consideration, updated on September 8, 2017.

Field evaluation of LPG meters and CNG dispensers and LNG dispensers is very difficult using volumetric and gravimetric field standards and methods. The tolerances for these applications are such that using field reference standard meters are more efficient and safer. With CNG and LNG and LPG applications, the field reference standard meters are placed in-line with the delivery system as it is used to fill tanks and vehicles. The use of field reference standard meters eliminates return to storage issues. The use of field reference standard meters is easier and faster compared to the use of traditional field standards. The cost of using field reference standard meters and transporting them is much less than the cost of traditional field provers and standards.

Recognition in Handbook 44 will enable States to allow field reference standard meters to place systems into service and for field enforcement.

Volumetric field provers and gravimetric field proving are susceptible to environmental influences. The State of Colorado uses a field reference standard meter to test propane delivery truck meters. The State of Nebraska has used a field reference standard meter to test agricultural chemical meters. Other States have asked that there be recognition in HB44 in order for their State to allow the use of field reference standard meters.

In some applications, field reference standard meters are not more accurate than the meters used in the application. For that reason, longer test drafts and possibly more tests may need to be run.

The State of California is purported to have conducted a short study of field reference standard meters in the past. The conclusion did not lead to wide adoption of the practice.

Section 3.37 Mass Flow Meters user requirement U.R.3.8. Return of Product to Storage, Retail Compressed Natural Gas Dispensers requires that the natural gas which is delivered into the test container must be returned to storage. This is difficult and most often not complied with when the test vessel contents are released to atmosphere. States often have difficulties in remote locations finding suitable field reference equipment.

In the fall of 2016, Mr. Keilty provided an update to the Item under Consideration. That update appears in the agenda. The previous proposed Item under Consideration was as follows:

**N.3. Test Drafts. –**

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

**N.3.2. Transfer Standard Test. – When comparing a meter with a calibrated transfer standard, the test draft shall be equal to at least the amount delivered by the device in 2 minutes at its maximum discharge rate.**

The submitter recommends that NIST update EPO 28 for CNG dispensers and EPO 26 for LPG Liquid Measuring Systems to include transfer standard meter tests. NIST Publication R 105-4 should also be revised to specifically address the transfer standard meter and the requirements for use.
The S&T Committee might also consider amending Sections 3.30 Liquid-Measuring Devices Code and 3.31 Vehicle-Tank Meters Code to allow transfer standard meters.

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.

NCWM 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.

NCWM 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

NCWM 2020 Interim Meeting: Field Standard TG Chair, Jason 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.

NCWM 2021 Interim Meeting: NCWM Field Standard TG Chair, Jason 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 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.

NCWM 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. 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.

**Regional Association Comments:**

WWMA 2020 Annual Meeting: At the 2020 WWMA Annual Meeting, the WWMA adhered to a condensed agenda due to the COVID pandemic and did not consider this item.

SWMA 2020 Annual Meeting: At the 2020 SWMA Annual Meeting, the SWMA adhered to a condensed agenda due to the COVID pandemic and did not consider this item.

NEWMA 2021 Annual Meeting: Comments were received on the entire block: Diane Lee (NIST OWM) commented that there is currently discussion for definitions of field standards and work for testing of master meters. Russ Vires (SMA) supports the development as it applies to items GEN-19.1, SCL-18.1, ABW-18.1, and AWS-18.1 and looks forward to further development. Tina Butcher (NIST OWM) gave an overview of the master meter project and the different types of testing to be performed. Bob Murnane (Seraphin) commented that the Field Standard Task Group is currently without a chairman and at a standstill on definitions until a new chairman is found. Ross Anderson (NY retired) expressed concerns with testing versus calibrating and the associated uncertainties. He is concerned that calibrating will require additional uncertainty components that must be developed using control charts and proficiency tests. The cost and time of this to an inspector is not practical. Diane Lee (NIST OWM) is concerned that tolerances may be too small to encompass uncertainties in the field. The NEWMA S&T Committee recommends that this item remain with Assigned status.

CWMA 2021 Annual Meeting: Comments taken on the whole block. Diane Lee (NIST OWM) reported that testing with NIST master meters is underway. CNG meters are being tested in Colorado. The LPG master meter is to set to begin being used shortly. There are two separate task groups working on this project. The NCWM Field Standards Task Group is looking for a new chairman. Russ Vires (SMA) stated that the SMA supports continued efforts on this proposal. Doug Musick (KS) supports the items moving forward but more information is needed concerning their use. Bob Murnane (Seraphin Test Measures) stated that not much more can be done without data to show that meters can be used as a standard. Seraphin stated that there is a paper discussing direction for the task group. Tina Butcher (NIST OWM) stated that testing for the different types of the master meters would occur simultaneously to speed up the data collection and analysis of the data. Charlie Stutesman (KS) asked if there was a date for conclusion of the task group activities and expressed the need to stay on top of this item. He suggested that there may be a need to set a sunset date for the activities of the task group. Loren Minnich (KS) reported that NCWM set an original goal of July 2021 to complete the mission, but it is not a deadline. Tina Butcher reported on what the master meters group is trying to achieve. Tina reminded the group that the Fundamental Considerations allows States to use master meters. OWM is assisting states with determining that these "master meters" would be viable for use as a field standard Adding something to the Fundamental Considerations to clarify that states can use them may be helpful. NIST is currently focusing on the Coriolis meter but what will come out of the study will be protocols that States can apply to other meter technologies. The CWMA S&T Committee recommends that this item remain an assigned item.

**SWMA Report**

**Regional recommendation to NCWM on item status:**

- ☒ Recommend as a Voting Item on the NCWM agenda
- ☐ Recommend as an Information Item on the NCWM agenda
- ☐ Recommend as an Assigned Item on the NCWM agenda
  *(To be developed by an NCWM Task Group or Subcommittee)*
- ☐ Recommend as a Developing Item on the NCWM agenda
  *(To be developed by source of the proposal)*
- ☐ Recommend Withdrawal of the Item from the NCWM agenda
  *(In the case of new proposals, do not forward this item to NCWM)*
- ☐ No recommendation from the region to NCWM
  *(If this is a new proposal, it will not be forwarded to the national committee by this region)*

**Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)*

Mr. 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.

Mr. Keilty also stated that he simply wants the use of master meters recognized as Field Standards and recommends this item be moved forward as Voting with the revisions made.

This committee feels this item is fully developed and recommends it be moved forward as a Voting item.

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

## MFM-22.1 V Table T.2. Accuracy Classes and Tolerances for Mass Flow Meters.

**Source:**
NIST, Office of Weights and Measures

**Purpose:**
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.

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

**Table T.2.**
**Accuracy Classes and Tolerances for Mass Flow Meters**

| Accuracy Class | Application or Commodity Being Measured | Acceptance Tolerance | Maintenance Tolerance | Special Tolerance |
|---|---|---|---|---|
| . . . | . . . | . . . | . . . | . . . |
| 2.0 | - Compressed natural gas as a motor-fuel<br>**- All other hydrocarbon gases and any other hydrocarbon gas/air mix applications not shown in the table** | 1.5 % | 2.0 % | 2.0 % |
| . . . | . . . | . . . | . . . | . . . |

**Previous Action:**
New

**Original Justification:**
Since the 1991 adoption of the Mass Flow Meters (MFM) Code the Application section of the code has recognized devices designed to dynamically measure the mass in two applications; liquids and hydrocarbon gas in the vapor state. In fact, these applications remain unchanged in the current 2020 handbook. These applications will not change with the upcoming publication of the 2022 edition of the handbook in late fall 2021.

Table T.2 Accuracy Classes and Tolerances for Mass Flow Meters was included in the MFM Code in 1994 in response to criticism that mass flow meters had an unfair advantage over other metering technology when used in the same product applications. Including Table T.2. in the code also resulted in corresponding requirements for marking a mass flow meter with an accuracy class to which the device is expected to perform. The tolerance table format has aligned the tolerances for similar product applications across multiple measuring device codes throughout the handbook (except in the codes for milk meters and electric vehicle fueling systems).

Prior to amending the MFM Code in 1994 to include the new tolerance table format there were only two applicable tolerances for MFM, they were designated paragraphs T.2 and T.3 as follows:

*Tolerance paragraphs T.2 and T.3 shown below were excerpted from the 1992 edition of NIST Handbook 44 MFM Code*

**T.2. Tolerances for Liquid-Measuring Devices.** – The maintenance tolerance shall be 0.5 percent of the measured quantity. The acceptance tolerance shall be 0.3 percent of the measured quantity.

**T.3. Tolerances for Vapor-Measuring Devices.** – Maintenance and acceptance tolerances for mass flow meters shall be 2.0 percent and 1.5 percent, respectively.

The original Acceptance Tolerance of 1.5 percent and Maintenance Tolerance of 2.0 percent applicable to gaseous products were never modified and deemed also applicable to the compressed natural gas (CNG) motor fuel product application when CNG was recognized for the first time in the MFM Code in 1994 as part of new Table T.2. Accuracy Classes and Tolerances for Mass Flow Meters. Multiple new product applications were added to the new tolerance table in the MFM Code in 1994, but these applications and products were consistent with those recognized in tolerance tables in other measuring device codes. It should be noted that the modification of the MFM tolerances in 1994 did not result in the carryover of the gas tolerances and designation of the corresponding new accuracy class to the hydrocarbon vapor product application that appeared in paragraph A.2 Vapor (Gases).

During the January 2021 NCWM Interim Meeting, Mr. Michael Keilty (Endress+Hauser Flow) noted that there is no specific tolerance recognized in MFM Code Table T.2 for "other gases." Consequently, this 2022 proposal is being submitted to amend the MFM Code to include the hydrocarbon vapor product application under current Accuracy Class 2.0 along with CNG engine fuel because it appears hydrocarbon gases in the vapor state were inadvertently overlooked in 1994 when the liquid/vapor (T.2./T.3.) tolerance paragraphs were moved into Table T.2. under a single table format that specifies all tolerances applicable to mass flow meters.

This proposal is a housekeeping item that clarifies the originally intended hydrocarbon (HC) vapor products tolerances that should have carried over from paragraph format to a new table format (Table T.2.) during the 1994 modification of the NIST Handbook 44 Section 3.37 Mass Flow Meters Code. The primary intent of the 1994 amendments to the code were to recognize for the first time compressed natural gas as an engine fuel when sold through a retail motor-fuel dispenser. It should be noted that HC vapor products and their corresponding tolerances (i.e., Acceptance of 1.5 percent and Maintenance of 2.0 percent) had been recognized since the 1991 adoption of the code. Should the community receive comments in opposition to or be questioned about the appropriateness of using the 1991 levels of permissible error for HC vapor products; measuring device manufacturers, laboratories and regulatory officials are being advised about this proposal and solicited for their input. Hearing no opposition to the proposal the community can move forward to correct the 1994 oversight. Requests to include the recognition of newer product applications in this proposal might be considered in 2022. However, if there is not sufficient data to support adding other products to the Table T.2 tolerances at this time, it is recommended these additional new product applications become a separate proposal or be revisited in 2023 or a later date.

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

**Arguments in Favor:**

**Regulatory:**

- 

**Industry:**

- 

**Advisory:**

- 

**Arguments Against:**

**Regulatory:**
- 

**Industry:**
- 

**Advisory:**
- 

**Neutral Comments:**

**Regulatory:**
- 

**Industry:**
- 

**Advisory:**
- 

**Item Development:**
New

**Regional Associations' Comments:**
New

| **SWMA Report** |
|---|
| **Regional recommendation to NCWM on item status:**<br><br>☒ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda<br>☐ Recommend as an Assigned Item on the NCWM agenda<br>*(To be developed by an NCWM Task Group or Subcommittee)*<br>☐ Recommend as a Developing Item on the NCWM agenda<br>*(To be developed by source of the proposal)*<br>☐ Recommend Withdrawal of the Item from the NCWM agenda<br>*(In the case of new proposals, do not forward this item to NCWM)*<br>☐ No recommendation from the region to NCWM<br>*(If this is a new proposal, it will not be forwarded to the national committee by this region)* |
| **Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)* |
| 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.<br><br>This committee recommends moving this item forward as a Voting item. |

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

## BLOCK 7 ITEMS (B7) TOLERANCES ON TESTS USING TRANSFER STANDARDS

**Source:**
Seraphin Test Measure Company, A Division of Pemberton Fabricators, Inc.

**Purpose:**
The purpose of these proposals is to change the language in the tolerance paragraphs that already specify that larger tolerances when a transfer standard is used, but that the OIML R117 Reduced MPE formula shall be used. Unless the proposed changes to 2021 S&T Agenda Block 1 Item GEN-19.1. are accepted, these proposals should not proceed.

### B7: CLM-22.1 D T.3. On Tests Using Transfer Standards.

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

**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.~~ **When commercial meters are tested using a Type 2 transfer standard, the tolerance applied to the meter under test shall be determined as:**

**Reduced MPE = (4/3 x MPE – U)**

**Where:**

**MPE = the applicable tolerance**

**U = uncertainty associated with the Type 2 transfer standard at the 95% confidence level.**

**(Amended 202X)**

### B7: CDL-22.1 D T.3. On Tests Using Transfer Standards.

**Item Under Consideration:**
Amend Handbook 44, Carbon Dioxide Liquid-Measuring Devices Code as follows:

**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.~~ **When commercial meters are tested using a Type 2 transfer standard, the tolerance applied to the meter under test shall be determined as:**

**Reduced MPE = (4/3 x MPE – U)**

**Where:**

**MPE = the applicable tolerance**

**U = uncertainty associated with the Type 2 transfer standard at the 95% confidence level.**

**(Amended 202X)**

### B7: HGM-22.1 D T.4. Tolerance Application on Tests Using Transfer Standard Test Method.

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

**T.4. Tolerance Application on Tests 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.~~ **When commercial meters are tested using a Type 2 transfer standard, the tolerance applied to the meter under test shall be determined as:**

**Reduced MPE = (4/3 x MPE – U)**

**Where:**

**MPE = the applicable tolerance**

**U = uncertainty associated with the Type 2 transfer standard at the 95% confidence level.**

**(Amended 202X)**

**Previous Action:**
New

**Original Justification:**
In the codes mentioned above, 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 changes incorporate the OIML R117 formula to state how the tolerance is to be increased when transfer standards are used. The formula effectively places an upper limit on how large the uncertainty associated with the transfer standard can be.

The current paragraphs already state that, when transfer standards are used, the tolerances are to be increased by two standard deviations for the repeatability of the transfer standard. One can argue that effect of the proposed changes is small and not necessary. The proposed changes are intended to provide consistency with the changes proposed in the amended proposals of 2021 S&T Agenda Block 1 Item GEN-19.1.

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

**Arguments in Favor:**

**Regulatory:**
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**Industry:**
•

**Advisory:**
•

**Arguments Against:**

**Regulatory:**
•

**Industry:**
•

**Advisory:**
•

**Neutral Comments:**

**Regulatory:**
•

**Industry:**
•

**Advisory:**
•

**Item Development:**
New

**Regional Associations' Comments:**
New

| **SWMA Report** |
|---|
| **Regional recommendation to NCWM on item status:**<br><br>☐ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda<br>☐ Recommend as an Assigned Item on the NCWM agenda<br>*(To be developed by an NCWM Task Group or Subcommittee)*<br>☒ Recommend as a Developing Item on the NCWM agenda<br>*(To be developed by source of the proposal)*<br>☐ Recommend Withdrawal of the Item from the NCWM agenda<br>*(In the case of new proposals, do not forward this item to NCWM)*<br>☐ No recommendation from the region to NCWM<br>*(If this is a new proposal, it will not be forwarded to the national committee by this region)* |
| **Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)* |
| 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.<br><br>This committee recommends this item be assigned Developing status. |

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

# EVF – ELECTRIC VEHICLE FUELING SYSTEMS

## EVF-21.1 W A.1. General

**Source:**
ABB, BTCPower, Electrify America, Edison Electric Institute, EVConnect, EVgo, Greenlots, Rivian, Siemens, Tesla, Tritium

**Purpose:**
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.

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

**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.**

**Previous Action:**
- 2021: Developing Item

**Original Justification:**
While it is important to ensure that consumers are receiving accurate and transparent information regarding the accuracy of EV charging stations, the cost to retrofit existing stations that often do not include an integrated meter, especially DCFC where commercial DC metering technology is not readily available today, will be cost prohibitive. In CA Initial Statement of Reasons (ISOR) for adopting specifications and tolerances requirement for commercial EVSE, CA estimated that it costs approximately $4,500 to upgrade existing Level 2 stations and $20,000 to upgrade existing DCFC. To put this into context, CA DMS utilized 2015 DOE data stating that the average commercial Level 2 EVSE costs between $3,000-$6,000 and the average DCFC up to $40,000 or more. The retrofit costs would represent a significant investment amount that does not seem warranted. The ISOR is available here: https://www.cdfa.ca.gov/dms/pdfs/regulations/EVSE_ISOR.pdf. According to DOE AFDC station locator there are 23,000 level 2 station with 66,000 connectors in the U.S. and 3,700 DCFC stations with 14,000 connectors. Being conservative and utilizing just the number of stations, it would cost $92M to upgrade the existing Level 2 station in the U.S. today and $74M to upgrade the existing DCFC stations, a number that is expected to grow as more stations are deployed. Placing this excessive upgrade burden on manufacturers and network operators is not feasible and an alternative pathway needs to be explored to ensure consumer transparency and EVSE accuracy for existing stations without requiring extensive retrofits. This number also does not include the amount of public funding across various states that has been invested in these EVSE that would prematurely potentially be ripped out and replaced. It could also have the unintended consequence that the EV industry stops charging for charging services at existing sites or shut them down if the investment in retrofits is greater than the benefit of continuing to operate. Stranded assets across the country are a valid concern and should not be taken lightly. It is important to not prematurely replace EVSE in the field until the useful life of the system has been obtained. Spending a significant amount of capital to upgrade existing stations rather than investing in new infrastructure does not appear aligned with EV deployment goals. Therefore, it is recommended that there is consideration for making sure requirements are non-retroactive and there is a phase in timeline for existing stations. The language utilized above is similar to what CA DMS implemented, which was the first state to adopt a version of Handbook 44 Sec 3.4 for EVSE. The date for DC EVSE is set at January

1, 2023 to match California's timeline but also because this is when DC metering technology is expected to be commercially available in the market and integrated into DC EVSE by most EVSE manufacturers that are either working on their own product or with third party meter manufacturers.

In general, it appears that there is some openness to considering how legacy EVSE that are in the ground today should be treated when considering that DC metering technology integrated into the EVSE was not commercially available when many of these stations were developed. The main concern that has been raised is regarding whether there should be an overall exemption for existing EVSE to the measurement provisions in HB 44 Sec 3.4 or whether existing EVSE should be exempt from certain requirements in the subsections of Sec 3.4 that are not feasible to attain. In reviewing the subsections of Sec 3.4, the proposal submitters determined that it would not be feasible to meet most subsections of Sec 3.4 with equipment that is in the ground with the exception of S.5 Marking (except S.5.2) and S.6 printing requirements. To ensure there is not confusion between which stations were in the ground prior to dates referenced above, EVSE owners and operators will need to work with local weights and measures officials on a self-reporting mechanisms or some other mechanism for tracking station service dates. CA will be the first state that will need to determine how this process will operate in the field given it has already adopted the exemption noted above and compliance for new AC stations is effective January 1, 2021. On the consumer side, EVSE operators and owners today can provide certain provisions to ensure the accuracy of the commercial transaction that can be facilitated outside of having a meter integrated into the EVSE. For instance, some owners and operators may be able to utilize the accuracy that is traceable via the measurement technology in the EV that accounts for any losses and ensure the consumer is being accurately and fairly billed for what he or she is receiving.

The submitter requested voting status for this item in 2021.

**Comments in Favor:**

**Regulatory:**

- 2021 Interim: Mr. Samuel Ferris (California) supported Developing status but noted that an exemption from requirements in the handbook is not common and that the life span of the equipment may only be seven to ten years.

**Industry:**

- 2021 Interim: Ms. Francesca Wahl (Tesla) and Mr. Keith Bradley (Electrify America) supported Developing status.
- 2021 Interim: Ms. Francesca Wahl (Tesla) supported this item.
- 2021 Interim: Mr. Kevin Miller (Charge Point) expressed concerns with allowing an exemption for 10-years and equipment should be able to meet the requirements and supports a Developing status for this item.
- 2021 Annual: Francesca Wahl (Tesla) noted that she will be working to incorporate feedback and will work with the EVF National Work group to develop an updated proposal. Ms. Wahl also provided a letter to the S&T committee concerning the Developing status for this item.

**Advisory:**

-

**Comments Against:**

**Regulatory:**

-

**Industry:**

-

**Advisory:**

- 2021 Interim: Ms. Diane Lee (NIST OWM) noted that the proposal is not clear as written and expressed concerns with an exemption for 10 years.
- 2021 Annual: Ms. Juana Williams (NIST, OWM), stated that it was unclear as to the exact type of use that entitles an EVSE to an exemption to NIST HB 44 requirements. She also pointed out that the exemption would allow a generation of devices to operate for 10-years without have to comply with the requirements and could be viewed as competitively unfair to traditional or other alternative vehicle fueling applications.

**Neutral Comments:**

**Regulatory:**
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**Industry:**
•

**Advisory:**
•

**Item Development:**
The committee assigned Developing status for this item at the 2021 Interim Meeting. For more information or to provide comment, please contact:

Ms. Francesca Wahl
Tesla
650-435-0422, fwahl@tesla.com

The Committee suggests that the submitters of this item consider the responses to the proposal from the regional meetings, NIST, OWM and EVFS work group and update the item under consideration to address the comments and as necessary prepare a revised proposal for the EVFS work group to address the concerns with this item.

**Regional Association Comments:**

WWMA 2020 Annual Meeting: Tesla, EV Connect, EV Go – Francesca Wahl – presentation: Sec 3.4 charging evolves and technology changes. They are trying to address the tentative code CA is now using. Charging involves many different speeds and levels. Trying to fit charging into what consumers are doing rather than making it a separate event (based on convenience). Metering technology is now becoming more commercial. Retro-fit costs are excessive. Add the 10-year phase-in that CA currently recognizes. Copy of the presentation that was provided is available on the WWMA website. Kevin Schnepp (CA) commented that the 10-year extension was political in CA and may not be necessary at the national level. He believes the indicator should not be solely tied to a mobile device. The extension of the accuracy may not be necessary for the national level. Note that some areas have sub-meters at residential units that fall under commercial device applications. California-DMS would ask the committees look at the concessions that California made as to whether this should be applied to NIST HB 44. Mahesh Albuquerque (Colorado) supports all the proposals to move on to a voting item. He agrees with the comments made but wants to keep the process moving forward. Perhaps change the exception time to say "up to 10 years" allowing jurisdictions to make their own determination. Ms. Juana Williams (NIST OWM) submitted written comment after open hearings and will be posted on the WWMA website. The Committee agrees to recommend this item be assigned a Developing status. The Committee also recommends the submitter continue to work with their stakeholders and jurisdictions to develop the item and consider language with regards to the 10-year period.

SWMA 2020 Annual Meeting: During the Open Hearings, the Committee heard from Ms. Francesca Wahl who gave a presentation on the industry's support of these items, and willingness to develop them. The Committee also heard from Ms. Tina Butcher (OWM) who stated that the item needs terminology work, and that she had concerns about a 10-year blanket exemption for these devices. She also noted that some of these devices do not currently contain a meter. The Committee also heard from Ken Ramsburg (Maryland) who stated that he did not agree with a blanket

exemption. After consideration of this item the Committee recommends that this item be given Developing status and assigned to the national work group.

CWMA 2021 Annual Meeting: Juana Williams (NIST OWM) provided comments on this item. The item is unclear. The potential lies for an entire generation of device to be exempt from Section 3.40 for entire period of use. Companies have expended money and resource to be compliant and allowing such an exemptions create competitive disadvantage environment in the marketplace. The USNWG will not consider this item until it is reworked by the submitter. Charlie Stutesman (KS) feels this item should be withdrawn as a 10-year exemption not acceptable. NIST Handbook 44, Section 3.40, has been published as a tentative code since 2015 and should be a consideration in the establishment of enforcement dates. The CWMA S&T Committee recommends that this item be Withdrawn.

NEWMA 2021Annual Meeting: Juana Williams (NIST OWM) has concerns on the lack of clarity of the proposal and what is exempted and why. Conflicts with the general code were outlined. The 10-year exemption on devices from HB44 is not supported. Jimmy Cassidy (MA) Supports the comments by NIST and recommends withdrawal of the item. No comments were received in support of the item. The NEWMA S&T Committee recommends that the item be Withdrawn.

**SWMA Report**

**Regional recommendation to NCWM on item status:**

- ☐ Recommend as a Voting Item on the NCWM agenda
- ☐ Recommend as an Information Item on the NCWM agenda
- ☐ Recommend as an Assigned Item on the NCWM agenda
  *(To be developed by an NCWM Task Group or Subcommittee)*
- ☐ Recommend as a Developing Item on the NCWM agenda
  *(To be developed by source of the proposal)*
- ☒ Recommend Withdrawal of the Item from the NCWM agenda
  *(In the case of new proposals, do not forward this item to NCWM)*
- ☐ No recommendation from the region to NCWM
  *(If this is a new proposal, it will not be forwarded to the national committee by this region)*

**Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)*

The committee received no comments on this item.

This committee recommends this item be Withdrawn due to the item allowing a 10 year exemption.

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

## EVF-20.1 V S.1.3.2. EVSE Value of the Smallest Unit.

*NOTE: The item under consideration includes editorial changes by the submitter, NIST, OWM, to correctly reflect the appropriate strikeout/underlines when editing existing text in NIST HB 44. NIST OWM included other recommendations for changes to the text in their analysis, but these changes were more than editorial.*

**Source:**
NIST, Office of Weights and Measures

**Purpose:**
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.

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

**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 0.0005 MJ or 0.0001 kWh.**

**(Amended 2020)**

**Background/Discussion:**
This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Ms. Juana Williams
NIST, Office of Weights and Measures
301-975-3989, juana.williams@nist.gov

In 2014 the U.S. National Work Group (USNWG) on Electric Vehicle Fueling and Submetering (EVFS) deliberated about the Electric Vehicle Fueling System's appropriate value for the display of electrical energy when sold in kilowatt-hour units of measurement. Based on the typical EVSE's ratings (i.e., charging power and current) the work group agreed that the value of the indicated or recorded charge should be in increments of 0.001-kilowatt hour (kWh). Members of the work group noted that the value could be inexpensively modified. Most recently it has been determined that the currently specified value of 0.001 kWh for the electricity unit of measurement in relation to the time for a test standard to complete an accuracy test at 10 % of the maximum deliverable amperes increases the length of the test by a factor of 25.

Each Handbook 44 code specifies the appropriate unit(s) of measurement (indicated and recorded) that is permitted for all device applications that a code applies to. The accepted SI (metric) unit of measurement for a device application in each code is in most cases followed by its equivalent corresponding recognized U. S. customary unit. Measurements in SI or customary units can be supported through calibrations by an accredited (or recognized) laboratory. Each handbook code also specifies the maximum value for a unit of measurement that can be indicated or recorded by the device for a specific product application or rate of delivery.

Unlike the scales' codes, the EVSE code specifies the "smallest" value of the unit that is permitted to be indicated for the quantity of electricity being measured; whereas the scales codes specify the value that the unit *shall be equal to* or *shall not be greater than*. The language in the scales code clearly states that there is only one acceptable value for the unit of measurement or establishes a value that the unit cannot exceed.

The measuring devices codes specify that the smallest value for the unit of delivery indicated or recorded for a commodity *shall not exceed* a specific value. The value varies depending on the type of commodity and/or device's

flow rate or falls into the category of all other meters. Yet it is clear the unit of measurement's value cannot be exceeded although lesser values are acceptable if the device has that capability, maintains accuracy, and sales in that particular indicated or recorded quantity are appropriate.

To provide adequate resolution (i.e., value of the kWh unit) in the EVSE's customer display of the electrical energy transaction information and to facilitate accuracy testing of the system two alternate proposals were developed that recommend somewhat different modifications of paragraph S.1.3.2. EVSE Value of Smallest Unit.

The first option for modifying the code that was developed and circulated to the Electric Vehicle Fueling Equipment (EVFE) Subgroup for consideration would be to recognize EVSEs equipped with a customer display of 0.005 MJ or 0.001 kWh and a test mode display on the EVSE face, accessible internally, or activated by controls accessed by the official that indicates in 0.0005 MJ or 0.0001 kWh increments.

Also, part of the information circulated to the Subgroup included a second option of modifying the value of the displayed and/or recorded kilowatt-hour energy units from 0.005 MJ or 0.001 kWh to a higher resolution of 0.0005 MJ or 0.0001 kWh. The first option shown below would modify paragraph S.1.3. EVSE Units to include a new subparagraph S.1.3.3. EVSE Value of Smallest Unit Test Mode to allow for a higher resolution value of the kilowatt-hour indications as a test mode display separate from the display used for the display transaction. The test mode display would either continuously indicate on the face of the dispenser or an internal display accessible during the inspection and test of the dispenser or display the quantity by using controls on the device.

**S.1.3. EVSE Units.**

**S.1.3.3. EVSE Value of Smallest Unit Test Mode. – EVSE shall display the electricity measured for each transaction in 0.0005 MJ or 0.0001 kWh energy units through:**

**(a) a continuous indication on the face of the EVSE;**

**(b) an internal display accessible during the inspection and test of the EVSE; or**

**(c) a display of the quantity by using controls on the device.**
**(Added)**

**S.1.3.~~3~~4. Value Defined. …**
**(Amended 2020)**

A test display mode is permissible for the mass flow meter compressed natural gas and liquefied natural gas dispenser applications. Although this option was entertained by the USNWG in 2014, further discussion would be needed to provide guidelines on how the indication must operate to comply with handbook requirements. When this option was circulated in 2019 to the USNWG EVFE Subgroup, the interest was more in favor of a single higher resolution display (i.e., 0.0001 kWh). However, there was some concern expressed about potential rounding issues were there to be two separate indications having different display resolution.

Since the 2015 adoption of Handbook 44, Section 3.40 paragraph S.1.3.2. EVSE Value of Smallest Unit has specified that the smallest unit of indicated delivery by an EVSE, and recorded delivery if the EVSE is equipped to record, shall not be greater than 0.005 MJ or 0.001 kWh. It is anticipated that the community would question the cost to modify the equipment's design; however, after discussions about the possible quantity value of "d" as large as 0.1 kWh, industry indicated that the value for the unit of measurement could be inexpensively modified. The EVSE code has tentative status and to date no equipment has undergone the type evaluation process. The community anticipates there will be slight modifications to requirements and test procedures to address various generations of equipment, design configurations, and business models in the marketplace.

NCWM 2020 Interim Meeting: Ms. Tina Butcher (NIST OWM) reported that this item was submitted by NIST OWM to modify the value for "d" specified for Kilowatt-hour for EVSEs to recommend a higher resolution for "d" that does not significantly lengthen the time to conduct the accuracy test of EVSE. Ms. Butcher added that it is uncertain if the

item is fully developed and request it be made developing. Mr. Kevin Schnepp (CA) stated California has already made the change, however he supports a Developing status for this item. Mr. Jim Willis (NY) provided similar comments to those of Mr. Schnepp. *Note: The NIST OWM analysis includes a recommended that the phrase "shall not be greater than" be removed.*

During the Committee's work session, the committee agreed that this item should be given a Developing status to allow the submitter to continue to work with the work group concerning this item.

NCWM 2021 Annual Meeting: Ms. Juana Williams explained that NIST OWM recommends the community reconsider the original proposed modifications of paragraph S.1.3.2 which do not limit the electrical energy unit to being expressed only as a single fixed numerical value but permit 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. Proposed new paragraph S.1.3.X. Expressed Value of EVSE Electrical Energy Unit will clarify the value of the quantity unit shall only be expressed as either decimal multiples or submultiples of the numbers 1, 2, or 5 as shown below.

> **S.1.3.X. Expressed Value of EVSE Electrical Energy Unit. – The electrical energy unit value shall be a decimal multiple or submultiple of 1, 2, or 5.**

The Committee recommended a Developing status for this item.

**Regional Association Comments:**

2020 Regional Meetings of the WWMA and SWMA: These regions adhered to a condensed agenda due to the COVID pandemic and did not consider this item.

CWMA 2021 Annual Meeting: Ms. Juana Williams (NIST OWM) provided information on this item. OWM recommends that this item remain developing. Ms. Williams suggested the following change to the proposal:

> **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**~~ **0.0005 MJ or 0.0001 kWh.**
>
> **(Amended 2020)**

The USNWG has not reached a consensus on this item and recommends that it remain Developing. The CWMA S&T Committee recommends this item remain Developing.

NEWMA 2021 Annual Meeting: Ms. Juana Williams (NIST OWM) provided information on this item. OWM recommends that this item remain developing. Ms. Williams suggested the following change to the proposal:

> **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**~~ **0.0005 MJ or 0.0001 kWh.**
>
> **(Amended 2020)**

In addition, Mr. Jim Willis (NY) is not convinced that the resolution needs to be that fine and questions if it is necessary. Juana Williams (NIST OWM) responded that the MMQ may play a role and that there are other factors involved in testing and test time. Lou Sakin (MA) shared concerns about the financial impact to meter manufactures meeting finer tolerances. Juana Williams (NIST OWM) elaborated on the full load and light load testing procedures.

NIST believes this modification would help avoid any unintentional implication that increments in units such as 0.0003 or 0.0007 MJ or kWh (i.e., Increment other than 1,2,5) would be appropriate. The NEWMA S&T Committee recommends that the item be remain Developing.

| **SWMA Report** |
|---|
| **Regional recommendation to NCWM on item status:**<br><br>☒ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda<br>☐ Recommend as an Assigned Item on the NCWM agenda<br>*(To be developed by an NCWM Task Group or Subcommittee)*<br>☐ Recommend as a Developing Item on the NCWM agenda<br>*(To be developed by source of the proposal)*<br>☐ Recommend Withdrawal of the Item from the NCWM agenda<br>*(In the case of new proposals, do not forward this item to NCWM)*<br>☐ No recommendation from the region to NCWM<br>*(If this is a new proposal, it will not be forwarded to the national committee by this region)* |
| **Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)*<br>The committee received no comments on this item.<br><br>This committee recommends the item move forward as a Voting item. |

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

## EVF-21.5 W T.2. Load Test Tolerances.

**Source:**
ABB, BTCPower, Electrify America, Edison Electric Institute, EVConnect, EVgo, Greenlots, Rivian, Siemens, Tesla, Tritium

**Purpose:**
To create separate metering requirements for DC EVSE due to significant technology differences and challenges between AC and DC systems.

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

**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 %**

**Previous Action:**

- 2021: Developing Item

**Original Justification:**

Proposed changes to the text to differentiate alternating current (AC) EVSE from direct current (DC) EVSE. Metering for DC architected systems is considerably more complicated and in ways that the original drafting of this provision never contemplated. For example, the tentative code when initially written never contemplated 350kW EVSE or liquid cooled cabling from the charging post to the connector. As such, it is necessary to separate the implementation dates of some of the specifications, tolerances, and other technical requirements. DC metering solutions are still being researched and developed and are not yet commercially available to be integrated into DC chargers at scale and at reasonable cost. While the supply chain for the physical meters themselves is slowly catching up, the metering system in a DC EVSE, particularly high-power DC EVSE that utilize liquid-cooled cables, goes beyond the physical meter itself which is incorporated in the main housing of the EVSE. For example, measurements may also need to be taken at the connector end of the dispenser and software and algorithms must be developed, validated, and integrated into the EVSE system to allow for accurate metering of kWh delivered to the vehicle. Implementing more complex metering systems needed for DCFC requires significant design and manufacturing changes to DC EVSE.

The proposed tolerances account for the fact that these systems are still in development and are untested. The proposed timeline provides the industry with enough time to develop, test, validate, and deploy reliable DC metering system technology. This timeline is also consistent with the timeline approved by the State of California which accounts for the vast majority of the EVSE market. EVSE manufacturers are working diligently to meet the California timeline and are confident that it can be met.

While it is important to ensure that consumers are receiving accurate and transparent information regarding the accuracy of EV charging stations, it is also important that the technology to deliver high accuracy is available and reliable.

There is concern about both the proposed timeline and the accuracy requirement. Some are concerned that the accuracy specification of 2.5% acceptance and 5% maintenance is too high and does not provide sufficient consumer confidence that all charge sessions are equal regardless of provider and station. The proposers would note that this is a new and evolving technology where charging providers place a premium on customer experience as they compete for this growing market. Thus far, customers have not registered complaints about lack of transparency. Some are concerned that the timeline for instituting a metering regime is too far into the future. The proposers acknowledge the few years it will take to have reliable DC metering systems commercially available at scale but are working as quickly as possible to develop and integrate these systems into their chargers. Some are also concerned that the metering requirements have been in a place for several years already and therefore the EVSE community should not need more years to develop solutions. The proposers note that current DC EVSE technology was never contemplated by the existing metering regime and DC technology, particularly high-power DC EVSE, were not in existence at the time the original specifications were set. For example, the first 350kWh EVSE with liquid cooled cables weren't deployed in the US until 2018.

The submitter requested voting status for this item in 2021.

**Comments in Favor:**

**Regulatory:**
- 2021 Interim: Recommended Developing status.

**Industry:**
- 2021 Interim: Mr. Michael Krauthamer (AFTE) and Mr. Keith Bradley (Electrify America), supported the item and recommended Developing status.
- Annual 2021: The submitters requested to maintain Developing status.

**Advisory:**
-

**Comments Against:**

**Regulatory:**
-

**Industry:**
- Interim 2021: Mr. Samuel Ferris (CA) recommended a Developing status for this item. Mr. Kevin Miller (Charge Point) recommended that this item be withdrawn and noted that his devices meet the tolerance in NIST HB 44.

**Advisory:**
-

**Neutral Comments:**

**Regulatory:**
-

**Industry:**
-

**Advisory:**
-

**Item Development:**
The Committee assigned Developing status for this item at the 2021 Interim Meeting**.** For more information or to provide comment, please contact:

Mr. Asaf Nagler
ABB
202-639-4075, asaf.nagler@us.abb.com

**Regional Association Comments:**

WWMA 2020 Annual Meeting: During the open hearings for these items a presentation by Tesla, EVConnect and EVgo was given in which a slide spoke to this item stating the need to separate the requirements for AC and DC systems. Extending the tolerances based on the extension of time allowing time for higher accuracy phase in.

Kevin Schnepp (CA) believes the phase in for tighter tolerances may be too long. Accuracy will become a greater issue as this becomes more prevalent. Clarification needs to be made; the submitter references public access; we deal

with commercial use. The term public access should be changed to commercial use. Also, with technology changing so rapidly, 13-year phase in period is too long.

Mr. Kurt Floren (L.A. County, CA) agrees with Kevin's comments.

Ms. Tina Butcher (NIST OWM) agrees with Kevin and consumers generally expect the tolerances be the same. Look at a shorter period of time to avoid consumer confusion.

The Committee agrees, and recommends this item be assigned a developing status. The Committee also recommends the submitter continue to work with their stakeholders and jurisdictions to develop the item. The Committee further recommends the submitter provides additional data beyond their original justification to support the necessity for two separate tolerances.

SWMA 2020 Annual Meeting: During the Open Hearing the Committee heard from Ken Ramsburg (Maryland) who stated that he would like real world data before determining the tolerances. He also stated that the proposed tolerance is more than double the current tolerance.

After considering this item the Committee recommends this item be given Developing Status and be developed further by the national work group.

CWMA 2021 Annual Meeting: Ms. Juana Williams (NIST OWM) Provided background and technical information on this item. The question was raised about the number of DC devices versus the number of AC device currently in the marketplace. Can the DC devices already in the marketplace meet the current tolerances? A marking on the device indicating the dual tolerance use be on the dispenser. The proposal needs to have a "sunset" date for the higher tolerances. Charlie Stutesman (KS) believes this item should be withdrawn as it provides too long of a time period before devices have to comply. The CWMA S&T Committee recommends that this item be withdrawn.

NEWMA 2021 Annual Meeting: Juana Williams (NIST OWM) shared NIST comments on this item and concerns on relaxing tolerances if existing devices in the marketplace are already meeting tolerances. If there are specific technical issues that justify the tolerances proposed, industry has not provided data in support. No sunset date was provided and devices with dual tolerances will not be distinguishable from each other. Lou Sakin (MA) questioned the rhyme or reason behind a 2033 date for the change in device tolerance. Jim Willis (NY) commented that there is currently no available test equipment to verify the need for relaxed tolerances on DC systems. The NEWMA S&T Committee recommends that the item be withdrawn.

**SWMA Report**

**Regional recommendation to NCWM on item status:**

- ☐ Recommend as a Voting Item on the NCWM agenda
- ☐ Recommend as an Information Item on the NCWM agenda
- ☐ Recommend as an Assigned Item on the NCWM agenda
  *(To be developed by an NCWM Task Group or Subcommittee)*
- ☐ Recommend as a Developing Item on the NCWM agenda
  *(To be developed by source of the proposal)*
- ☒ Recommend Withdrawal of the Item from the NCWM agenda
  *(In the case of new proposals, do not forward this item to NCWM)*
- ☐ No recommendation from the region to NCWM
  *(If this is a new proposal, it will not be forwarded to the national committee by this region)*

**Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)*

The committee received no comments on this item.

This committee recommends this item be Withdrawn because we believe that current tolerances are attainable.

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

## TXI – TAXIMETERS

### TXI-22.1 V Table S.5. Categories of Device and Methods of Sealing

**Source:**
NIST, Office of Weights and Measures

**Purpose:**
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.

**Item Under Consideration:**
Amend Handbook 44, Taximeters Code as follows:

| ***Table S.5.***<br>***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.*** ~~***, 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.***~~ |

**Previous Action:**
New

**Original Justification:**
Many of the current models of taximeters utilize compact, mobile-type devices (e.g., small compact electronic indicating elements, cellular telephones, computing tablets) that present a challenge based on their physical size to provide appropriate locations for provisions to attach a physical seal. For those devices, provision for applying a security seal can be accomplished through the use of electronic means (e.g., data change audit trail) however, that option is not currently included.

The current verbiage included in Table S.5. under "Methods of Sealing" for Category 1 devices includes reference to paragraph S.5.2. "Taximeters Calibrated to Specific Vehicles" which recognizes the use of an electronic link to prevent the intentional or inadvertent use of a taximeter in a vehicle that the taximeter was not connected to when the taximeter was calibrated. Taximeters using the mechanical components of the vehicle (e.g., rotation of wheels, transmission) for input in the calculation of distance measurement must maintain those parameter values such as the size and level of inflation of tires for the distance measurement to be accurate. A change of these values can render the calibration of the taximeter inaccurate. This is not a type of sealing that a regulatory official would typically replace if removed/broken and it is believed that the inclusion in this portion of the Taximeters Code was not appropriate. This type of electronic "paring" between the vehicle and the taximeter is sufficiently addressed in S.5.2. and therefore, the reference in Table S.5. is not needed.

The addition of this electronic means for sealing for taximeters will align the language in this code with fifteen other HB 44 specific device codes.

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

**Arguments in Favor:**

**Regulatory:**
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**Industry:**
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**Advisory:**
•

**Arguments Against:**

**Regulatory:**
•

**Industry:**
•

**Advisory:**
•

**Neutral Comments:**

**Regulatory:**
•

**Industry:**
•

**Advisory:**
•

**Item Development:**
New

**Regional Associations' Comments:**
New

| **SWMA Report** |
|---|
| **Regional recommendation to NCWM on item status:**<br><br>☒ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda<br>☐ Recommend as an Assigned Item on the NCWM agenda<br>*(To be developed by an NCWM Task Group or Subcommittee)*<br>☐ Recommend as a Developing Item on the NCWM agenda<br>*(To be developed by source of the proposal)*<br>☐ Recommend Withdrawal of the Item from the NCWM agenda<br>*(In the case of new proposals, do not forward this item to NCWM)*<br>☐ No recommendation from the region to NCWM |

| *(If this is a new proposal, it will not be forwarded to the national committee by this region)* |
|---|
| **Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)* |
| The committee heard no comments on this item.<br><br>This committee recommends this item move forward as a Voting item. |

**See Block 3 Items: Tolerances for Distance Testing.**

## GMA – GRAIN MOISTURE METERS 5.56 (A)

### GMA-19.1 D Table T.2.1. Acceptance and Maintenance Tolerances Air Oven Method for All Grains and Oil Seeds.

**Source:**
NTEP Grain Analyzer Sector

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

**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.~~<br>~~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.<br>Acceptance and Maintenance Tolerances Air Oven Reference Method<br>for All Grains and Oil Seeds | |
|---|---|
| Tolerance | Minimum Tolerance |
| 0.03 of the percent moisture content | 0.5 % in moisture content |

(Amended 2001 **and 20XX**)

**Background/Discussion:**
This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Mr. Karl Cunningham
Illinois Department of Agriculture
217-785-8301, karl.cunningham@illinois.gov

Samples and list of grains that AMS, FGIS request from states to include in their ongoing calibration program. States and other interested parties wanted to verify that corn samples from their state were included in the calibration data for NTEP meters because of variations states reported between UGMA meter and other meter technologies on corn samples.

During the 2016 Grain Analyzer Sector Meeting, numerous instances of inconsistent moisture meter measurements involving grain shipments from U.S. interior facilities to U.S. export port facilities were reported. The Sector received a suggestion that if the UGMA can make better measurements, then the Sector should consider reducing the applicable tolerances in NIST HB 44. At the 2016 and 2017 Grain Analyzer Sector meetings Mr. Charlie Hurburgh (Iowa State University) agreed to chair a GA Sector Task Group to review the current NIST HB 44 tolerance with both UGMA meters and Non-UGMA meters. During the 2018 meeting Mr. Hurburgh reported that based on data he analyzed from Iowa State Weights and Measures Grain Inspection reports, UGMA meters read closer to the reference air oven moisture results than non-UGMA meters.

It was also noted during the 2018 NTEP Grain Analyzer Sector meeting that the current tolerances were developed in 1991 and have not been changed to coincide with the change in technology for these devices; and this action is needed for grain industry risk management.

Prior to the 2019 NCWM Interim Meeting, all four regional weights and measures associations agreed to forward the proposal as a voting item on the Interim Agenda. 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.

NCWM 2019 Interim Meeting: The NCWM S&T Committee heard comments to agenda item GMA-3. Mr. Loren Minnich (KS) commented that he spoke with Ms. Diane Lee (NIST OWM) and she reported that one state was concerned with the application of the reduced tolerances to all grain types, specifically grains with hulls or husks. He suggested that this item be assigned a "Developing" status to allow for more research into this issue. The committee also received written comments from NIST, OWM (see NIST, OWM Analysis posted on the NCWM Website). During the 2019 Interim Meeting, the S&T Committee considered the comments during the opening hearing and comments submitted prior to the meeting and assigned a "Developing" status for this item.

NCWM 2019 Annual Meeting: Ms. Diane Lee (NIST OWM) provided an update on the history of the item. She noted that the GA Sector will review data from Arkansas at its 2019 meeting intended to assure that proposed changes to the tolerances can be applied to all grains. Ms. Lee speaking on behalf of the Sector stated that the Developing status assigned to this item is appropriate.

NCWM 2020 Interim Meeting: The Committee heard from Ms. Diane Lee (NIST OWM) who stated that when this item was initially submitted the GMM Sector agreed to reduce tolerance based on data that was limited to corn and soybeans. Following the review of the initial data, additional data from Long Grain Rough Rice was reviewed and the sector agreed that additional data was needed on other grains to include oats, rice, and barley, prior to changing the tolerances. Ms. Lee requested that the item remain developing status as additional data is collected.

During the Committee's work session, the committee agreed to retain this item as Developing to allow the submitter to continue working with members of the grain analyzer sector to collect additional data.

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.

NCWM 2021 Annual 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 requested that this item remain Developing. During the Committee's work session, the Committee agreed to a Developing status for this item

**Regional Association Comments:**

WWMA 2020 Annual Meeting: No report due to the constraints of holding a virtual meeting.

SWMA 2020 Annual Meeting: No report due to the constraints of holding a virtual meeting.

CWMA 2021 Annual Meeting: Ms. Diane Lee (NIST OWM) gave an update on the need for additional data on other grains. OWM recommends that this item remain developing. The CWMA S&T Committee recommends that this item remains Developing.

NEWMA 2021Annual Meeting: Ms. Diane Lee (NIST OWM) gave background information on this item and informed the committee that the submitter is currently gathering data from other States. The next grain sector meeting is in August, and this should complete the analysis. NIST and grain sector support this as a developing item. The NEWMA S&T Committee recommends this as a Developing item.

**SWMA Report**

**Regional recommendation to NCWM on item status:**

- ☐ Recommend as a Voting Item on the NCWM agenda
- ☐ Recommend as an Information Item on the NCWM agenda
- ☐ Recommend as an Assigned Item on the NCWM agenda
  *(To be developed by an NCWM Task Group or Subcommittee)*
- ☒ Recommend as a Developing Item on the NCWM agenda
  *(To be developed by source of the proposal)*
- ☐ Recommend Withdrawal of the Item from the NCWM agenda
  *(In the case of new proposals, do not forward this item to NCWM)*
- ☐ No recommendation from the region to NCWM
  *(If this is a new proposal, it will not be forwarded to the national committee by this region)*

**Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)*

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.

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

# MDM – MULTIPLE DIMENSION MEASURING DEVICES

## MDM-22.1 W S.1.7. Minimum Measurement.

**Source:**
Parceltool P/L

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

**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**)

**Previous Action:**
New

**Original Justification:**
The 12 d minimum measurement is designed for instruments that use an internal rounding function to round the actual measurement up or down to the nearest value of d before being displayed. For measurement of 12 d, or less, the potential error in the measurement is considered too large and therefore the specification of the 12 d minimum measurement is in place.

Measurements below 12 d are commonplace when using a mobile tape (tape measure) type of device for determining measurements. An accepted practice for this type of device is for the Measurement to be rounded up to the nearest whole unit of measurement (e.g., 1 inch) before being used to calculate any charges.

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

**Arguments in Favor:**

**Regulatory:**
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**Industry:**
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**Advisory:**
•

**Arguments Against:**

**Regulatory:**
•

**Industry:**
•

**Advisory:**

- 

**Neutral Comments:**

**Regulatory:**

- 

**Industry:**

- 

**Advisory:**

- 

**Item Development:**
New

**Regional Associations' Comments:**
New

| **SWMA Report** |
|---|
| **Regional recommendation to NCWM on item status:**<br><br>☐ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda<br>☐ Recommend as an Assigned Item on the NCWM agenda<br>*(To be developed by an NCWM Task Group or Subcommittee)*<br>☐ Recommend as a Developing Item on the NCWM agenda<br>*(To be developed by source of the proposal)*<br>☒ Recommend Withdrawal of the Item from the NCWM agenda<br>*(In the case of new proposals, do not forward this item to NCWM)*<br>☐ No recommendation from the region to NCWM<br>*(If this is a new proposal, it will not be forwarded to the national committee by this region)* |
| **Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)* |
| Russ Vires, Mettler Toledo, requested that this item be withdrawn because the justification was invalid.<br><br>This committee recommends this item be Withdrawn due to having no justification provided for the change. |

# BLOCK 3 ITEMS (B3) TOLERANCES FOR DISTANCE TESTING IN TAXIMETERS AND TRANSPORTATION NETWORK SYSTEMS

**Source:**
New York Department of Agriculture and Markets

**Purpose:**
Provide the same distance-measurement tolerances for the Taximeters Code and Transportation Network Systems Code.

## B3: TXI-20.1 D T. Tolerances

**Item Under Consideration:**
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

**Item Under Consideration:**
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.**

**Background/Discussion:**
This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Mr. Jim Willis
New York Department of Agriculture and Markets
518-485-8377, james.willis@agriculture.ny.gov

Taximeter manufacturers are submitting devices identical to the devices in the Transportation Network Measurement Systems code; however, they are faced with a tighter tolerance for over-registration. Both devices are typically computer pads or cell phones. Taximeter companies want to take advantage of some of the same technology used by TNMS companies, however, the tolerance for taximeters is much tighter than the tolerance for TNMS meters. During type evaluation, it is common to drive more than 1 mile to incorporate tunnels and valley effect. If the same tolerance was applied, taximeters would have the same chance of passing as TNMS meters.

Some jurisdictions that test taximeters may not want the tolerance for a 1-mile course to be raised given the good history of their test programs. This is the reason I am proposing maintaining the 1 % tolerance at 1 mile or less.

Some TNMS companies may be concerned that their device will not pass a 1 % tolerance, but we believe that on a straight, 1-mile course, devices operating properly should have no problem passing.

NCWM 2020 Interim Meeting: The Committee heard from NIST OWM explaining that the proposal is not technically correct by inserting language that refers to "intervals" in the tentative HB 44 TNMS Code. These types of systems do not calculate a charge for fare using intervals (i.e., segments) of the total travel in a trip as do taximeters. TNMS calculate fare charges based on the entire distance/time in a trip. Additionally, these two different systems (taximeters and TNMS) are becoming more similar and the differences that were used to distinguish them from one another are beginning to fade. OWM noted there is a need for the USNWG on Taximeters that developed the tentative TNMS Code to meet and discuss the potential of a merger of these two HB 44 Codes. Mr. Kurt Floren (Los Angeles County, California.) pointed out that taximeters have been and still are meeting existing tolerances and therefore he questions the need to expand those tolerance values.

Mr. Stan Toy (Santa Clara County, California) expressed his belief that the tolerances for taximeters do not need to be expanded and that this item should be withdrawn. Mr. Jim Willis (New York) pointed out that New York Weights and Measures has issued its own type approval for taximeters that use location services such as GPS to measure distance. He stated further that NY would support a Developing or Assigned status.

During the Committee's work session, it was agreed to assign a Developing status with the understanding the USNWG on Taximeters has offered to assist the submitter in further development of the proposal.

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.

NCWM 2021 Interim Meeting: Mr. John Barton (NIST OWM) stated that OWM noted issues of concern in this proposal during the 2020 NCWM Interim Meeting regarding how tolerances are applied to taximeters in contrast to how they are applied to TNMS. This proposal does not seem to recognize these differences. OWM also notes the many opposing comments made pertaining to the increase of tolerances for taximeters which have complied with existing tolerances for decades. The NIST USNWG on Taximeters has been conducting meetings with a goal of merging the HB 44 Taximeters and TNMS Codes. This work will include a number of modifications to both codes that will affect the specifications, test procedures, user requirements, and possibly the tolerances. The USNWG has offered to work with the submitter of this proposal.

Mr. Willis representing the submitter of this item stated a willingness to work the USNWG on Taximeters.

During the committee's work session, the members noted the submitter's willingness to work with the taximeter work group and agreed to maintain this item's Developing status.

**Regional Association Comments:**

2020 Regional Meetings of the WWMA and SWMA: These regions adhered to a condensed agenda due to the COVID pandemic and did not consider this item.

CWMA 2021 Annual Meeting: Comments taken on the whole block. John Barton (NIST OWM) provided comments. It is not necessary to increase tolerances on taxi meters. The taxi meters have been meeting these for decade. This addresses transportation network system primarily and adjustments to tolerances are being made to both codes. The practice of measuring intervals for taximeters is not followed when measuring distances in TNS. The USNWG is looking at possibly combining Taximeters and TNS into a single code. In order for this item to move forward it will need to be reworked. The submitter has agreed to work with the USNWG. The CWMA S&T Committee recommends that this Item Block be Withdrawn.

NEWMA 2021 Annual Meeting: Comments were received on the entire block. John Barton (NIST OWM) commented on his recognition of the effort by the submitter to align tolerances between the two codes on transportation for hire systems but is not sure that tolerances can be applied in this manner. Work group is working toward uniformity and recommends a developing item or that the submitter withdraw and resubmit in the future. Jimmy Cassidy (MA) spoke in support of the intent of this item to provide a level playing field and supports the development of this item. Jim Willis (NY, submitter) provided background information on this item and elaborated on the purpose and intent. He explained TNMS systems are being held to one tolerance but when TNMS system technology is used in taxi meters, they are held to tighter tolerances and can fail under test at values that would pass the TNMS tolerances. Jimmy Cassidy (MA) again expressed his desire for a level playing field and that both systems meet the same tolerances. NEWMA S&T Committee recommends this item with a Developing status.

| **SWMA Report** |
|---|
| **Regional recommendation to NCWM on item status:**<br><br>☐ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda<br>☐ Recommend as an Assigned Item on the NCWM agenda<br>*(To be developed by an NCWM Task Group or Subcommittee)*<br>☒ Recommend as a Developing Item on the NCWM agenda<br>*(To be developed by source of the proposal)*<br>☐ Recommend Withdrawal of the Item from the NCWM agenda<br>*(In the case of new proposals, do not forward this item to NCWM)*<br>☐ No recommendation from the region to NCWM<br>*(If this is a new proposal, it will not be forwarded to the national committee by this region)* |
| **Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)* |
| The committee heard no comments on this item.<br><br>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. |

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

## OTH – OTHER ITEMS

### OTH-16.1 D Electric Watthour Meters Code under Development

**Source:**
NIST, Office of Weights and Measures

**Purpose:**
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.

**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.

Ms. 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 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 draft code 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 NIST 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 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 requests comments be submitted to the SG Chair or Technical Advisor by the end of March 2022. The SG will review and address comments, updating the draft code as needed and requesting the NCWM S&T Committee to post updated versions for review as available. The SG will finalize a draft for submission in the 2022-2023 NCWM cycle.

The above approach will 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 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, Lisa Warfield, or Technical Advisor, Tina Butcher. Contact information is included in the "Background" section of this item

**Background/Discussion:**
This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

**Electric Vehicle Refueling Subgroup:**
Ms. Tina Butcher, Chair
NIST Office of Weights and Measures
301-975-2196, tbutcher@nist.gov
Or
Ms. Juana Williams, Technical Advisor
NIST Office of Weights and Measures
301-975-2196, juana.williams@nist.gov

**Electric Watthour Meters Subgroup:**
Ms. Lisa Warfield, Chair
NIST Office of Weights and Measures
301-975-3308, lisa.warfield@nist.gov
Or
Ms. Tina Butcher, Technical Advisor
NIST Office of Weights and Measures
301-975-2196, tbutcher@nist.gov

This item was submitted as a Developing item to provide a venue to allow the USNWG to update the weights and measures community on continued work to develop test procedures and test equipment standards within its Electric Vehicle Refueling Subgroup. This item will also serve as a forum in which to report work on the development of a proposed tentative code for electric watthour meters in residential and business locations by the USNWG's Electric Watthour Meters Subgroup and a placeholder for its eventual submission for consideration by NCWM.

Ms. Tina Butcher (NIST OWM), Chairman of the USNWG on Electric Refueling & Submetering has continued to provide regular updates to the Committee on this work. See the Committee's 2016 through 2018 Final Reports for details.

NCWM 2018 Interim Meeting: No comments were heard on this item and the Committee agreed to maintain its "Developing" status. The Committee did not take comments during open hearings on Developing items at the 2018 NCWM Annual Meeting and agreed to allow only the submitter of a Developing item (or block of Developing items) to provide an update on the progress made to further develop the item(s) since the 2018 NCWM Interim Meeting. The Committee received an update on this item from Mrs. Tina Butcher (NIST OWM), Chair of the USNWG on Electric Refueling & Submetering. See the Committee's 2018 Final Report for Details.

OWM personnel were unable to attend the 2019 NCWM Interim Meeting due to the Federal Government shutdown in early 2019 due to a lack of appropriations; however, OWM provided written comments to the Committee on this item in the advance of the meeting, including the following update on this item:

- 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.
- The SG met in September 2017, November 2017, May 2018, and August 2018. All meetings included web-conferencing to allow those not able to attend in person to participate.
- The SG developed a proposed addition to NIST Handbook 130's Uniform Regulation for the Method of Sale (MOS) of Commodities (see Item MOS-8 on the L&R Committee's Agenda) to specify a method of sale for electrical energy sold through these systems and submitted the proposal to the four regional weights and measures association meetings in Fall 2018.
    - Three of the four regions recommend the MOS proposal on the L&R Agenda as a voting item, with the fourth abstaining due to lack of experience with these systems within the region.
- The SG continues work on a proposed code for EWH-type meters for NIST Handbook 44 and expects to have a draft ready for the 2020 NCWM cycle.
- OWM requests this item be maintained on the S&T Committee's agenda as a Developing Item while the SG finalizes its proposed HB 44 draft. OWM will continue to apprise the Committee of progress.
- At their Fall 2018 meetings, all four regional associations indicated support for maintaining this as a Developing item on the Committee's agenda.
- The SG will hold its next in-person meeting in February 2019 in Sacramento, CA. *(Technical Advisor's Note: This meeting was rescheduled to April 2019.)*
- Those interested in participating in this work please contact SG Chairman, Lisa Warfield, or Technical Advisor, Tina Butcher. Contact information is included at the beginning of this item.

NCWM 2019 Interim Meeting: The Committee heard no comments on this item. At its work session, Committee members agreed with the submitter and the Regional Associations that this item should be assigned a Developing status.

NCWM 2019 Annual Meeting: Ms. Tina Butcher (NIST OWM) provided the Committee with an update on the further development of this item. Ms. Butcher reported that the EWH SG will meet next in August 2019 to continue its work

and requested this item remain on the S&T Committee agenda as a Developing item. During the committee's work session, the Committee agreed with the submitter to retain this item in a Developing status.

NCWM 2020 Interim Meeting: The Committee heard from Ms. Butcher who provided an update on developments in the Electric Watthour Meters Code which is also included in the NIST OWM analysis. Ms. Butcher requested that this item be given a developing status.

During the Committee work session, the committee agreed that this item should be given a Developing status.

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.

NCWM 2021 Interim Meeting: The Committee heard from Ms. Tina Butcher who provided an update on the developments in the Electric Watthour Code which is include in the NIST OWM analysis and Ms. Butcher requested that this item be given a developing status. The Committee agreed that the item be given a Developing status.

NCWM Annual Meeting: Ms. Tina Butcher, NIST OWM, provided an update on the developments in the Electric Watthour Code which is included in the NIST OWM analysis. Mrs. Butcher noted that the Electric Watthour Code is in Development and anticipates a Code by Fall 2021. There was discussion on definitions for electric master meters and possibly separating the definitions for gas and water master meters and Mrs. Butcher requested that this item be given a developing status. The Committee agreed that the item be given a Developing status.

**Regional Association Comments:**

2020 Annual Meetings of the WWMA and SWMA: These regions adhered to a condensed agenda due to the COVID pandemic and did not consider this item.

CWMA 2021 Annual Meeting: Ms. Tina Butcher (NIST OWM) reported that work was nearly complete on this item and that a draft version of the code should be ready for the next cycle of meetings. The CWMA S&T Committee recommends that this item remain Developing.

NEWMA 2021 Annual Meeting: Ms. Tina Butcher (NIST OWM) explained that the subgroup was focused on developing code, closing in on a draft code and hoped to have an item for the fall meetings. The subgroup requests that the item remain developing. NEWMA S&T Committee recommends this item remain with Developing status.

**SWMA Report**

**Regional recommendation to NCWM on item status:**

- ☐ Recommend as a Voting Item on the NCWM agenda
- ☐ Recommend as an Information Item on the NCWM agenda
- ☐ Recommend as an Assigned Item on the NCWM agenda
  *(To be developed by an NCWM Task Group or Subcommittee)*
- ☒ Recommend as a Developing Item on the NCWM agenda
  *(To be developed by source of the proposal)*
- ☐ Recommend Withdrawal of the Item from the NCWM agenda
  *(In the case of new proposals, do not forward this item to NCWM)*
- ☐ No recommendation from the region to NCWM
  *(If this is a new proposal, it will not be forwarded to the national committee by this region)*

**Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)*

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.

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

## OTH-22.1 D Appendix A: Fundamental Considerations, 3. Testing Apparatus

**Source:**
NIST, Office of Weights and Measures

**Purpose:**
To clarify 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.

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

**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), 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, 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 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.

**3.3. Accuracy of 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.

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.**~~

**Previous Action:**
New

**Original Justification:**
Footnote 2 of Handbook 44, Appendix A, Fundamental Considerations, Section 3. Testing Apparatus was added to:

(1) specify recommendations for suitable field test standards;
(2) require that field test standards meet specifications in Handbook 105 Series or other appropriate documentary standards; and
(3) note that guidance may be obtained from NIST OWM regarding appropriate specifications, tolerances, and other criteria for assessing the suitability of a field test standard for use in inspecting and testing commercial weighing and measuring equipment.

Footnote 2 also recognizes that the Director has the authority to approve additional field test standards and/or equipment beyond those recommended by NIST or specified in a Handbook 105 or other documentary standard. NIST OWM periodically receives inquiries regarding the use of various types of test equipment and test methods. OWM has worked with state weights and measures programs and industry to develop standards and procedures and recommendations on the use of such equipment/methods and, in some cases this has resulted in a specific recommendation or Handbook 105. However, as recognized, in Footnote 2, this does not preclude the Director from approving equipment for which a specific Handbook 105 or other documentary standard does not exist.

In order to be considered suitable for use in official testing of a commercial weighing or measuring device, field test standards and procedures need to meet a list of what is often referred to as the "Essential Elements of Traceability." This list includes elements outlined in NIST IR6969 GMP-13 Good Measurement Practice for Ensuring Metrological Traceability shown above in the proposed Section 3.1.1. Essential Elements of Traceability. Provided steps are taken to ensure that a given field test standard has been demonstrated to meet the requirements in these elements, it is appropriate for that field test standard to be used in the official inspection and testing of a commercial weighing or measuring device or for use by a service company in testing and placing a device back into service after service work.

While Footnote 2 already provides a statement regarding the authority of the Director to approve such 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.

The submitter acknowledges that Footnote 2 already provides a clear statement that the Director has authority to approve standards which are not addressed by a NIST Handbook 105 Series handbook. Some might argue that the proposed inclusion of additional information and guidance is not necessary.

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

**Arguments in Favor:**

**Regulatory:**
- 

**Industry:**
- 

**Advisory:**
- 

**Arguments Against:**

**Regulatory:**
- 

**Industry:**
- 

**Advisory:**
- 

**Neutral Comments:**

**Regulatory:**
- 

**Industry:**
- 

**Advisory:**
- 

**Item Development:**
New

**Regional Associations' Comments:**
New

| SWMA Report |
|---|
| **Regional recommendation to NCWM on item status:**<br><br>☐ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda<br>☐ Recommend as an Assigned Item on the NCWM agenda<br>*(To be developed by an NCWM Task Group or Subcommittee)*<br>☒ Recommend as a Developing Item on the NCWM agenda<br>*(To be developed by source of the proposal)*<br>☐ Recommend Withdrawal of the Item from the NCWM agenda<br>*(In the case of new proposals, do not forward this item to NCWM)*<br>☐ No recommendation from the region to NCWM<br>*(If this is a new proposal, it will not be forwarded to the national committee by this region)* |
| **Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)*<br>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.<br><br>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.<br><br>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. |

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

## OTH-18.1 W Appendix A: Fundamental Considerations, 3.2. Tolerances for Standards, 3.3. Accuracy of Standards

**Source:**
NIST, Office of Weights and Measures

**Purpose:**

(a) Add a definition for field standard that identifies the critical characteristics for field standards to comply with the Fundamental Considerations of Handbook 44; and

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

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

(d) 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.

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

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

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

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

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

**Background and Discussion:**
This item has been assigned to the submitter for further development. For more information or to provide comment, please contact:

Ms. G. Diane Lee
NIST, Office of Weights and Measures
301-975-3602, diane.lee@nist.gov

NCWM 2021 Annual Meeting: This item was presented at the 2021 Annual Meeting along with other related items as Block 1 – Terminology for Testing Standards (Verification Standards, Field Standards, Transfer Standards, Field Reference Standards, Etc.) Tolerances on Tests when Transfer Standards are Used, Minimum Quantity for Field Reference Standard Meter Tests. That block of items was assigned to the Field Standards Task Group for further development. Members of the task group provided updates and comments. The Committee recognizes that the Task Group has accomplished all it is able to at this point and is recommending the Task Group be disbanded. 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.

See the 2021 Annual Meeting Archive for additional discussion on the Block 1 agenda items at https://www.ncwm.com/annual-archive.

**Regional Association Comments:**

2020 Regional Meetings of the WWMA and SWMA: These regions adhered to a condensed agenda due to the COVID pandemic and did not consider this item.

CWMA 2020 Interim Meeting: The Committee heard from numerous regulatory officials that this item is a good addition to the handbook and recommended this item move forward as a voting item. We feel this item is fully developed and recommend this item as a voting item.

NEWMA 2019 Interim Meeting: The Committee and the body agree that this item should continue as a developing item. No comments were heard during open hearings.

| **SWMA Report** |
|---|
| **Regional recommendation to NCWM on item status:**<br><br>☐ Recommend as a Voting Item on the NCWM agenda<br>☐ Recommend as an Information Item on the NCWM agenda<br>☐ Recommend as an Assigned Item on the NCWM agenda<br>*(To be developed by an NCWM Task Group or Subcommittee)*<br>☐ Recommend as a Developing Item on the NCWM agenda<br>*(To be developed by source of the proposal)*<br>☒ Recommend Withdrawal of the Item from the NCWM agenda<br>*(In the case of new proposals, do not forward this item to NCWM)*<br>☐ No recommendation from the region to NCWM<br>*(If this is a new proposal, it will not be forwarded to the national committee by this region)* |
| **Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)* |
| Russ Vires, SMA, stated that he believed this item duplicates Block 1, and suggested withdrawal.<br><br>Don Onwiler, NCWM, stated that this item was a misprint and should be struck.<br><br>The committee recommends this item be Withdrawn. |

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

## OTH-22.2 V Appendix D – Definitions: face

**Source:**
NIST, Office of Weights and Measures

**Purpose:**
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.

**Item Under Consideration:**
Amend Handbook 44, 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)**

**Previous Action:**
New

**Original Justification:**
Multiple permanent measuring device code sections in NIST Handbook (HB) 44 specify that either the initial zero condition, the display of the unit price, or other marking information shall be posted or displayed on either the face or each "face" of the dispenser. Currently only the Liquid-Measuring Devices code's numerical designation (i.e., 3.30) is referenced in the NIST HB 44 Appendix D definition of the term "face." The term also has special meaning for three other types of measuring devices/systems (i.e., LPG, MFM [e.g., CNG and LNG], and gaseous hydrogen) yet those code's numerical designations are not shown in the [brackets] following the definition.

This proposal is a housekeeping item intended to correct the omission of multiple numerical designations of applicable code sections from the 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. Correcting this oversight can be accomplished by including in this distinct term references to all applicable handbook codes sections. The proposed modification of the definition provides the missing reference to a special term that clarifies the intended placement of essential transaction information on the device. This has benefits for the equipment manufacturer designing the device, but also ensures clear and easy access and use of the information by both the buyer and seller.

The wording of the current definition may seem a bit archaic; on the other hand, 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.

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 other than retail liquid measuring devices (i.e., code section 3.30) are listed below. Since the definition of "face" is applicable to these specific device types a modification of the handbook definition of the term "face" is warranted to include three additional device-specific code designations in the definition. Those 15 paragraphs are provided in their entirety in an *attachment* to this proposal (the text was excerpted from the 2020 edition of NIST Handbook 44). This detailed information was provided to assist the community in its review and consideration of the proposal for expanding the codes referenced in the definition of "face" from one to four sections. The applicable code paragraphs with requirements for either displaying or posting the initial zero condition, display of the unit price and quantity, and/or other marking information on the "face" of the retail device/dispenser are:

3.32 LPG and Anhydrous Ammonia Liquid-Measuring Devices Code paragraphs:
S.1.4.1. Indication of Delivery; For Retail Devices Only
S.1.5.1. Display of Unit Price and Product Identity
UR.2.7.1. Unit Price and Product Identity

3.37. Mass Flow Meters Code paragraphs:
S.2.5.1. Unit Price
S.2.6.2. Display of Quantity and Total Price
S.2.8. Indication of Delivery
S.5.2. Marking of Equivalent Conversion Factors for Compressed Natural Gas
S.5.3. Marking of Equivalent Conversion Factor for Liquefied Natural Gas
UR.3.1. Unit Price and Product Identity for Retail Dispensers.
UR.3.1.1. Marking of Equivalent Conversion Factors for Compressed Natural Gas

U.R.3.1.2. Marking of Equivalent Conversion Factor for Liquefied Natural Gas

3.39 Hydrogen Gas-Measuring Devices Code paragraphs:

S.2.4.1. Unit Price

S.2.5.2. Display of Quantity and Total Price

S.2.7. Indication of Delivery

UR.3.1. Unit Price and Product Identity for Retail Dispensers

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

**Arguments in Favor:**

**Regulatory:**

- 

**Industry:**

- 

**Advisory:**

- 

**Arguments Against:**

**Regulatory:**

- 

**Industry:**

- 

**Advisory:**

- 

**Neutral Comments:**

**Regulatory:**

- 

**Industry:**

- 

**Advisory:**

- 

**Item Development:**
New

**Regional Associations' Comments:**
New

**SWMA Report**

**Regional recommendation to NCWM on item status:**

- ☒ Recommend as a Voting Item on the NCWM agenda
- ☐ Recommend as an Information Item on the NCWM agenda
- ☐ Recommend as an Assigned Item on the NCWM agenda
  *(To be developed by an NCWM Task Group or Subcommittee)*
- ☐ Recommend as a Developing Item on the NCWM agenda
  *(To be developed by source of the proposal)*
- ☐ Recommend Withdrawal of the Item from the NCWM agenda
  *(In the case of new proposals, do not forward this item to NCWM)*
- ☐ No recommendation from the region to NCWM
  *(If this is a new proposal, it will not be forwarded to the national committee by this region)*

**Comments and justification for the regional recommendation to NCWM:** *(This will appear in NCWM reports)*

The committee heard no comments on this item.

This committee recommends moving this forward as a Voting item.

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

Mr. Alan Walker, Florida | Committee Chair
Ms. Jamie Yokum, West Virginia | Member
Mr. Heath Higdon, Kentucky | Member
Mr. Bryan Snodgrass, West Virginia | Member
Mr. Mark Lovisa, Louisiana | Member

**Specifications and Tolerances Committee**

# Appendix A

## Item Block 2 – Final Report of the Verification Scale Division Task Group

**Participants:**
Doug Musick, Chair (KS)
Ross Andersen (NY, Retired and original submitter of the item)
John Barton (NIST OWM)
Luciano Burtini (Measurement Canada)
Anthony Bong Lee (Orange County, CA)
Steve Cook (CA, Retired)
Darrell Flocken (NTEP)
Eric Golden (Cardinal Scale)
Jan Konijnenburg (Rice Lake Weighing Systems)
Richard Suiter (Richard Suiter Consulting)
Steve Timar (NY)
Howard Tucker (FL)

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 HB44 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]

$$n = \frac{Capacity}{e}$$

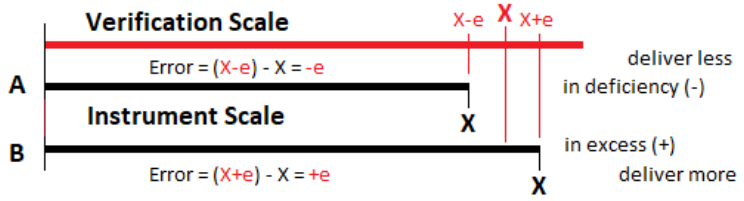
The values of e and d must be understood as referring to different things. The verification scale refers to the scale of measurement for the reference (or true value), think of the reference standard. The instrument scale refers to the scale of measurement of the instrument under test. Consider this 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 |

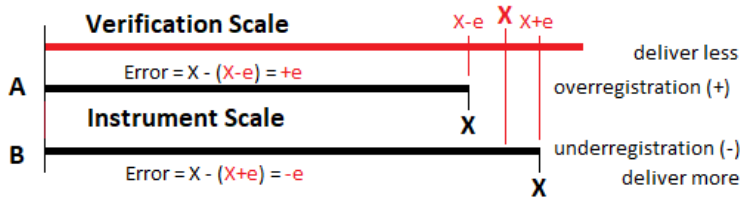
For weighing instruments, it turns out that e and d have no fixed relationship. It is different for weight classifiers (e < d), for most instruments (e = d), and for high resolution instruments (e>d). The critical point is that the instrument scale and the verification scale are independent of each other. 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

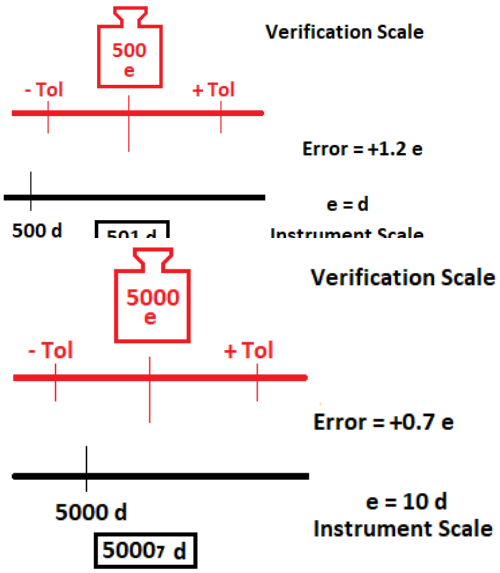



Error of Indication =
instrument scale – verification scale
+ overregistration
– underregistration




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 HB44 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).

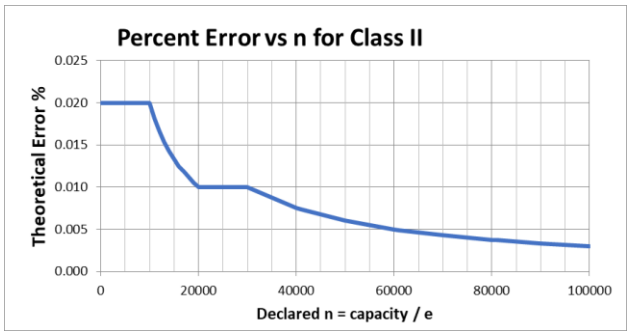
**T.N.1.3. Scale Division.** – The tolerance for a weighing device is related to the value of the scale division (d) or the value of the verification scale division (e) and is generally expressed in terms of d or e.

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 HB44.

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. HB44 does not require marking of minimum load. While R76 considers minimum load part of the class structure, HB44 does not.

It is this switch of e and d that causes confusion because the translation of R76 to HB44 lost some of the meaning. Much of the second part of this report covers the changes required to rectify the situation. The workgroup is attempting to ensure the Code states e when the requirement applies to e and d when it applies to d. The workgroup 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 HB44.

## 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 workgroup 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* |
| *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.~~ 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.).*

*[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 verification 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 verification scale divisions, n, shall be not less than 1000.*

*[4] On a multiple range or multi-interval scale, the number of verification divisions, n, for each range independently shall not exceed the maximum specified for the accuracy class. The number of verification 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 verification scale divisions, n, 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)

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 workgroup 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 HB44 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 + | |
| 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 workgroup 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 workgroup 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 HB44 a conscious decision was made to remove Min from the classification and make it a user requirement. Thus, HB44 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 HB44. 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 HB44. 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 HB44. In HB44 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 HB44. 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.<br>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 workgroup 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. HB44 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.