OWM Technical Analysis

NIST | OFFICE OF WEIGHTS AND MEASURES

Specifications and Tolerances (S&T) Committee Agenda Items:

Full Analysis

In preparation for the 2026 Annual Meeting of the National Council on Weights and Measures (NCWM) on July 26 – 30, 2026

This publication is available free of charge: www.nist.gov/pml/owm/owm-technical-analysis

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NIST Office of Weights and Measures (OWM) Analysis
Specifications and Tolerances (S&T) Committee
2026 NCWM Annual Meeting Report

The NIST OWM Analysis is submitted to assist the Weights and Measures community as it deliberates on items before the Council. NIST OWM offers these comments and recommendations based on information and input available as of the date of this report. This does not address information received after this date.

Language shown in a boldface print by **~~striking out~~** information is to be deleted and by **<u>underlining</u>** information is to be added. Requirements that are proposed to be nonretroactive are printed in ***boldface italics***.

Assessment of items contained within this report is as of June 15, 2026, and does not address information received after this date.

For additional information or assistance please contact a NIST OWM Technical Advisor:

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Subject Series List for the Specifications and Tolerances Committee

Table 1. Reporting Structure

Note: The analysis considered information and comments submitted as of the date of this analysis and will not reflect any information presented after that date.
Source: Name and affiliation of submitter. **Submitter's Purpose and Justification:** The submitter's concise statement as to the intent or purpose of this proposal. The justification describes the national importance, background on the issue, and may contain references to supporting data or documents. The justification may be summarized by OWM. **NIST OWM Executive Summary:** High level points that summarize the Technical Aspects of the item and recommendations pertaining to the Item Under Consideration. **Table 2. Summary of Recommendations** **Item Under Consideration** – The latest language that the Committee has moved forward as the Item membership is considering. OWM has applied the appropriate formatting according to NIST Handbooks. **NIST OWM Detailed Technical Analysis** – A detailed analysis with background information and recommendations from the Office of Weights and Measures (OWM). **Summary of Discussions and Actions** – An OWM summary of details and discussion on this Item. This includes discussion and decisions of the Standing Committee. This may also include information from sectors, trade associations, task groups, and subcommittees.
Regional Association Reporting – An OWM summarization of the Regional Association Meeting finalized reports. • Each region will be identified by their regional acronym along with the year and meeting. • The meeting within each region will be in chronological order. • This information is taken directly from the Regional Association Final report. • The Technical Advisor may reach out to the regional Chair for clarification.

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Details of All Items
(In order by Reference Key)

GEN – GENERAL CODE

GEN-25.1 W G-S.5.6. Recorded Representations

(This item was withdrawn after being returned to the Committee)

Note: When developing the Final Report for the 2025 NCWM Annual Meeting, the Committee chose to withdraw this item from the S&T Agenda, providing the following rationale:

"The Committee agrees that QR codes are a method of delivering a receipt that is already allowed by G-S.5.6., and the additional example is not needed, therefore the Committee is withdrawing the item. However, the Committee believes that more clarification is needed as to what constitutes an electronic receipt and how to properly deliver it to address the security concerns that have been raised."

GEN-26.1 V G-S.5.6. Recorded Representations and Appendix D – Definitions: electronic receipt

Source: NCWM National Type Evaluation Program Committee

Submitter's Purpose and Justification:

Remove the examples from G-S.5.6. Recorder representations and add a definition to HB 44 for Electronic Receipts to assist in clarification for regulatory, manufacturers and NTEP as to what an electronic receipt is.

Original Justification:

Having a definition for an electronic receipt will benefit industry, the regulatory community and NTEP and promote uniformity.

NIST OWM Executive Summary

GEN-26.1 V G-S.5.6. Recorded Representations and Appendix D – Definitions: electronic receipt
NIST OWM Recommendation: Voting with suggested edits • The functional characteristics of a recorded representation are addressed with the addition of the proposed amendment to the definition of recorded representation. • Further amending the definition of recorded representation by including examples of acceptable forms of electronic recorded representations achieves the intent of the item without being prescriptive and will provide additional clarification related to electronic recorded representations.

GEN-26.1 V G-S.5.6. Recorded Representations and Appendix D – Definitions: electronic receipt
• The proposed edit also eliminates the need for a new definition of "electronic receipt", which causes confusion as there is no definition of the word receipt, and an electronic receipt is identical to an already defined electronic recorded representation.

Table 2. Summary of Recommendations

GEN-26.1 V G-S.5.6. Recorded Representations and Appendix D – Definitions: electronic receipt

	Status Recommendation		**Note***	**Comments**
Submitter	Voting			
OWM	Voting		1	
WWMA				Submitted after the regional associations met.
NEWMA	Voting			
SWMA				Submitted after the regional associations met.
CWMA	Voting			
NCWM	Voting			
	Number of Support Letters	**Number of Opposition Letters**	**Comments**	
Industry				
Manufacturers				
Retailers and Consumers				
Trade Association				

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

Item Under Consideration:

NOTE: This item has been edited to properly identify the section of the handbook affected.

Amend NIST Handbook 44, Section 1.10. 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 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. Recorded representations referenced in specific codes shall be made available to the customer in hard copy form, unless otherwise specified by the customer. 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, 2023, **and 20XX**)

and Appendix D 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 **that the consumer can obtain in a readily accessible, reasonably permanent form, which is unalterable**. [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, 5.54, 5.55, 5.56(a), 5.56(b), 5.57, 5.58, 5.60]

electronic receipt. – A version of a recorded representation in electronic form accessed or delivered via email, Dynamic QR Code, Short Message Service (SMS) or approved Mobile Device application installed on a Smart Phone or Tablet. A Toll -Free Customer Support Number may also be utilized to request an electronic receipt via email or SMS.
(Added 20XX)

NIST OWM Detailed Technical Analysis:

While NIST OWM supports the intent of this item, after further analysis, the proposed new definition for electronic receipt is overly prescriptive, limiting the form of an electronic receipt to an email, Dynamic QR Code, Short Message Service (SMS) or approved Mobile Device application which is installed on a Smart Phone or Tablet. When another technology is developed to transmit the information required on a recorded representation, the definition of an electronic receipt would need to be amended to accommodate it. OWM suggests incorporating the acceptable forms of transmitting information specified in the definition of an electronic receipt into the definition of recorded representation as examples, with the qualifier "include, but are not limited to" as shown below:

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 **that the consumer can obtain in a readily accessible, reasonably permanent form, which is unalterable. Examples of electronic recorded representations include, but are not limited to: email, Dynamic QR Code, Short Message Service (SMS) or an approved Mobile Device application installed on a smartphone or Tablet. A Toll -Free Customer Support Number may also be utilized to request an electronic recorded representation**. [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, 5.54, 5.55, 5.56(a), 5.56(b), 5.57, 5.58, 5.60]

This would eliminate the prescriptive nature of the newly proposed definition and consolidate the information into one definition, making it easier to find. If the NCWM S&T Committee agrees with these suggestions and amends the item, OWM will support a Voting status. While some may view this as a substantial change, OWM views this as a reorganization of the information for ease of reference and to allow more efficient adoption of new technology.

The proposed edit also eliminates the need for a new definition of "electronic receipt", which causes confusion as there is no definition of the word receipt, and an electronic receipt is identical to an already defined electronic recorded representation.

Summary of Discussions and Actions:

At the 2026 NCWM Interim Meeting, Loren Minnich, NIST OWM, indicated support for this item, but noted that the proposed addition of a definition for electronic receipt wouldn't address many of the concerns

brought forward with respect to all forms of recorded representations (See discussion related to GEN-25.1 in the 2025 NIST Summary of U.S. Legal Metrology Activities and the 2025 NCWM Annual Report) and that the current definition of recorded representation is not complete because it does not include parameters for obtaining the information..

To properly address these concerns, OWM suggested adding an amended definition of recorded representation to this item, which would add language identifying the functional characteristics of a recorded representation, as shown here:

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 **that the consumer can obtain in a readily accessible, reasonably permanent form, which is unalterable**. [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, 5.54, 5.55, 5.56(a), 5.56(b), 5.57, 5.58, 5.60]

Matt Douglas [California Department of Agriculture, Division of Measurement Services (CDA DMS)] recommended a developing status because the proposed definition is for a term in the General Code, which will apply to all device types. Matt agreed with the NIST technical analysis and proposed addition for this item, but felt that specifications and user requirements would be necessary for a QR code to be used to facilitate access to recorded representations. He voiced support for a voting status with the removal of the QR Code reference and the addition of the NIST-recommended language.

Marc Paquette (VT, Chair NTEP Committee) shared that the new definition for electronic receipt will provide clarity and voiced support for the amended definition of recorded representation proposed by NIST OWM, indicating support for Voting status with this addition to the item.

Jason Flint (NJ) expressed support for a Voting status with the addition of the amended definition of recorded representation proposed by NIST OWM.

Steve Griffith [National Electrical Manufacturers Association (NEMA)] supported a Voting status for this item.

Jim Pettinato (Guidant Measurement, Chair MMA), representing the MMA, voiced support for the item in principle, but didn't support the prescriptive nature of the definition for electronic receipt, and suggested an Assigned status.

Mal Skowron (Tesla) supported a Voting status, as the item provides needed clarity.

Kristin Walter (AR) identified that there are devices that are currently providing electronic receipts as the primary option for receiving the transaction information, and is concerned with the implications associated with adding this definition. Kristin recommended a Developing status.

Anthony Willingham (Electrify America) spoke in support of the item and believes it will remove the ambiguity from NIST HB 44 regarding what constitutes an electronic receipt.

Brent Price (Gilbarco) supported a Developing status and agreed with the comments provided on behalf of the MMA, noting that other methods of providing a receipt may be developed that are not referred to in the proposed definition of electronic receipt.

Mike Harrington (IA) recommended Voting status.

Matt Douglas (CDA DMS), referring to QR codes, suggested that additional specifications are needed to ensure that this form of an electronic receipt provides consumers proper access.

Robbie Parke (WA) agreed with the comments from AR, adding that the default option should be for a device to provide a printed receipt.

Michael Kielty (Endress-Hauser) agreed with the comments from AR and the MMA representative, and suggested the possibility that this definition could be overlooked because of its location in Appendix D, recommending a Developing status.

Justin Wilson (ChargePoint), addressing comments suggesting adding requirements to specific codes, reminded commenters that G-S.5.6. applies to all commercial devices and that the submitters of GEN-25.1 were advised to address their concerns starting with that paragraph.

Alison Wilkinson (MD) agreed with the comments from CDA DMS, AR, and the MMA and recommended a Developing status.

Regional Association Reporting:

Western Weights and Measures Association

Submitted after the 2025 WWMA Annual Meeting.

Southern Weights and Measures Association

Submitted after the 2025 SWMA Annual Meeting.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, A representative from the State of Vermont is in support of this proposal and the work that NTEP Committee has done to give clarity to jurisdictions. A representative from the State of New Jersey agrees with new language in publication 16 and feels concerns about QR codes and dynamic QR codes can be worked out later. A representative from the State of New York agrees with Vermont and New Jersey and requests the last sentence be removed. "A Toll-Free Customer Support Number may also be utilized to request an electronic receipt via email or SMS." Customers who opt to receive any information electronically should not have to request it. New York would fully support this proposal with the language change.

The Committee recommends a Voting status.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommends this item remain as Voting.

Scale Manufacturers Association (SMA)

Submitted after the 2025 SMA Fall Meeting.

SCL – SCALES

SCL-22.2 A UR.3.1.X. Required Minimum for Cannabis Products

Source: NCWM Cannabis Task Group

Submitter's Purpose and 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.

NIST OWM Executive Summary

SCL-22.2 A UR.3.1.X. Required Minimum for Cannabis Products

[1]**NIST OWM Recommendation:** Assigned

- Stakeholders should carefully consider the 100 e minimum load being proposed.
- A purchase with a net weight of 0.8 g, would only represent 80 e (0.8 g ÷ 0.01 g) on a scale with an e = 0.01 g.
- OWM is about to publish a Special Publication with an analysis of the suitability aspects when considering scales for the sale of cannabis products. This publication is to help the cannabis task group and other stakeholders determine suitable requirements for these scales.

[1] In contrast to hemp, marijuana remains a Schedule I substance under the Controlled Substances Act. NIST does not have a policy role related to the legalization of the production, sale, distribution, or use of cannabis (including hemp and marijuana). NIST participates in the National Council of Weights and Measures (NCWM) as part of NIST's statutory mission to promote uniformity in state laws, regulations, and testing procedures.

Table 2. Summary of Recommendations
SCL-22.2 A UR.3.1.X. Required Minimum for Cannabis Products

	Status Recommendation	Note*	Comments
Submitter			
OWM	Assigned		
WWMA	Assigned		Based on the previous version
NEWMA	Assigned		Based on the previous version
SWMA	Voting		Based on the previous version
CWMA	Assigned		Based on the previous version
NCWM	Assigned		

	Number of Support Letters	Number of Opposition Letters	Comments
Industry			
Manufacturers		1	A&D
Retailers and Consumers			
Trade Association	1		Scale Manufacturers Association
Regulatory	1		Florida Dept. of Ag & Consumer Services

***Notes Key:**

1. Submitted modified language
2. Item not discussed or not considered
3. No meeting held
4. Not submitted on agenda
5. No recommendation

Item Under Consideration:

Amend NIST Handbook 44, Section 2.20. Scales Code as follows:

UR.3. Use Requirements.

…

UR.3.15. Minimum Load for Cannabis Products. - Scales used to weigh Cannabis and Cannabis products that have a total weight of 113 grams (4 ounces) or less shall be Class II and the minimum load shall be 100 e.

[Nonretroactive as of January 1, 20XX]

(Added 20XX)

NIST OWM Detailed Technical Analysis:

On November 21, 2025, NCWM added a supporting document under item SCL-22.2, which is an updated version of this item submitted by the Scales Subgroup of the NCWM Cannabis Task Group. That version had formatting that is inconsistent with NIST Handbook 44. At the 2026 NCWM Interim Meeting, NIST OWM provided the committee with these versions of that item (the full document, "Suggested Language from NIST OWM", dated 01-06-2026, is available as a supporting document on the NCWM website under the 2026 NCWM Annual Meeting/Meeting Documents tab):

> ***UR.3.1.2. Minimum Load for Cannabis Products. - Scales used to weigh Cannabis and Cannabis products that have a total weight of 113 grams (4 ounces) or less shall be Class II and the minimum load shall be 100 e.***
> ***[Nonretroactive as of January 1, 20XX, to become retroactive as of January 1, 20XX]***
>
> **(Added 20XX)**
>
> or
>
> ***UR.3.15. Minimum Load for Cannabis Products. - Scales used to weigh Cannabis and Cannabis products that have a total weight of 113 grams (4 ounces) or less shall be Class II and the minimum load shall be 100 e.***
> ***[Nonretroactive as of January 1, 20XX, to become retroactive as of January 1, 20XX]***
>
> **(Added 20XX)**

The NCWM S&T Committee made further edits to the language provided by NIST OWM.

Based on the item under consideration for SCL-22.2 in the 2026 S&T Agenda in PUB 16, it would seem to indicate that there is language in paragraph UR.3.1.X of the 2025 version of NIST Handbook 44 that is being removed, as it appears in the agenda as bold and stricken text. This stricken language is the previous version that was the item under consideration and should not be part of the item under consideration.

The portion of SCL-22.2 that is now proposed for consideration is this:

UR.3.15. Minimum Load for Cannabis Products. - Scales used to weigh Cannabis and Cannabis products that have a total weight of 113 grams (4 ounces) or less shall be Class II and the minimum load shall be 100 e.

[Nonretroactive as of January 1, 20XX]
(Added 20XX)

The Committee retained the Assigned status of the item. Stakeholders should carefully consider the minimum load being proposed, 100 e, as it would require a scale with an e of 0.005 g for any transaction less than 1 g, an e of 0.002 g for any transaction less than 0.5 g and an e of 0.001 g for transactions less than 0.2 g. For example, if a purchase had a net weight of 0.8 g, this would only represent 80 e (0.8 g ÷ 0.01 g) on a scale with an e = 0.01 g. If the proposed value was 20 e, the minimum net load that could be weighed on a scale with an e = 0.01 g would be 0.2 g. Some jurisdictions require a scale that weighs cannabis or other "high value" commodities to have a 0.01 g resolution (some of these scales have an e = d, some have a d less than e). For a scale that has an e = 0.1 e and a d = 0.01 g, a 100 e minimum load would be 10 g (100 e x 0.1g). For a scale with e = d = 0.01 g, the minimum load would be 1 g (100 e x 0.01 g).

Summary of Discussions and Actions:

During the 2026 NCWM Interim Meeting, Corey Hainy (SMA) provided the SMA position, indicating that the SMA supported the item as shown in the 2026 S&T Interim Meeting Agenda as Voting, not the updated version provided by the task group and shared during open hearings. Loren Minnich (NIST OWM) stated that the Cannabis Task Group has experienced a lot of turnover and that the most recent version of the item forwarded to the S&T Committee by Evan Foisy, is the result of several variations of paragraphs developed by OWM and shared with the Scales Subgroup of the Cannabis Task Group. One concern with the item as proposed in the 2026 S&T Interim Meeting Agenda is that it would be a sub-paragraph of UR.3.1. **Recommended** Minimum, but the language in that item, numbered UR.3.1.X., establishes a **required** minimum load (It should be noted that, as described in the Introduction section of NIST Handbook 44, the "numerical designation … of paragraph identification … fixes both the relationship and the limitation of the requirements of the paragraph".) OWM is also concerned with the proposed minimum load of 100 e, and suggests that stakeholders carefully consider how this would affect the minimum amount of cannabis that can be weighed. Stakeholders should also consider what an appropriate period of time is for the paragraph to transition from nonretroactive to retroactive status. Matt Douglas (CDA DMS) identified that this item has been on the agenda for a few years and has changed significantly. There was a version that DMS supported, but not this version, and noted that this item may be affected by another item (SCL-25.1). Robert Huff (DE) commented that this item was delayed by the item that addresses Table 8 (SCL-25.1), but that the item that required an e of 0.01 g and an NTEP approved scale was the item DE supported. DE supports a Voting status for the previously mentioned item, but a Developing status for this item.

During the NCWM 2025 Annual Meeting, the Committee looked forward to the continued development of the item. The Committee continues to encourage the task group to work with NIST OWM to ensure there is no future conflict with SCL-25.1 as updated by the Committee at the Annual Meeting.

During the NCWM 2025 Interim Meeting, the Committee encouraged the task group to address the issues that have been raised and to work with NIST OWM to resolve the conflict with SCL-25.1 that was noted during open hearings. The item status remains Assigned.

During the 2024 Annual Meeting, Charlie Rutherford (Co-Chair of the Cannabis Task Group) provided the Committee with updated language for this item that removed the proposed amendments to Table 7a and Table 8 and further developed the proposed paragraph UR.3.1.X.

During the 2024 NCWM Interim Meeting, the Committee updated the item to the latest version from the task group and the title to reflect the current Item Under Consideration. The Committee has some concerns with the language “National Type Evaluation Program compliant” in the note being added to Table 8. The Committee also heard support during open hearings for a previous version of the item and concerns about the use of the terms "all cannabis" and “non-retail cannabis". The Committee has given this item an assigned status and requests the task group address the concerns that have been raised.

During the 2023 NCWM Annual Meeting, the Committee received a request for assigned status of the item from the Co-Chair of the NCWM’s Cannabis Task Group (TG). The SMA noted in comments it provided that user requirements do not typically apply to a particular commodity. The SMA supported further development of the item and the additions to Table 7A. The Committee updated the item to include proposed new paragraph UR.3.1.2., as recommended by NEWMA and shown in the Item Under Consideration of this report. The Committee also agreed to assign the item to the TG per recommendations from the submitters.

During the 2023 NCWM Interim Meeting, the Committee received a request for assigned status of the item from the co-Chair of the NCWM’s Cannabis Task Group (TG). The SMA noted in comments it provided that user requirements do not typically apply to a particular commodity. The SMA supported further development of the item and the additions to Table 7A. The Committee updated the item to include proposed new paragraph UR.3.1.2., as recommended by NEWMA and shown in the item under consideration of this report. The Committee also agreed to assign the item to the TG per the request from the submitters.

The NIST OWM Technical Advisors assigned to the S&T Committee opted to participate virtually in the 2022 NCWM Annual Meeting due to COVID-19. During S&T open hearings, there was an audio problem with the virtual platform being used by the NCWM that prevented those participating virtually to hear much of the open hearing testimony. With regard to this particular item, no testimony could be heard by those attending virtually. A member of the national S&T Committee, who had attended the 2022 NCWM Annual Meeting in person reported that the Committee was given an update from Charles Rutherford (NCWM Cannabis Task Group Co-Chair). In his update, Co-Chair Rutherford requested that this item remain Assigned to the Task Group for further discussion. The Scales Focus Group will be regrouping, with Lou Sakin (Towns of Holliston, Hopkinton, Northbridge, Massachusetts) as the Chair, for further development of the item. The Committee agreed that this item will retain an Assigned status.

During the 2022 NCWM Interim Meeting, the Committee received a somewhat wide range of comments during open hearings.

The Cannabis Scales Focus Group recognizes that, in addition to the proposed modifications of Table 7a, guidance is needed to assist businesses and inspectors in identifying suitable devices for use in various applications used to weigh Cannabis.

The Cannabis Scales Focus Group plans to continue discussions on the best method(s) for developing that guidance. This may include one or more of the following:

- Developing a guidance document to assist users, scale service companies, and inspectors in identifying appropriate scales for Cannabis weighing applications.

- Revisiting proposed modifications to paragraph UR.1. to either include:
  - Proposing minimum requirements for Class II all weighing applications (non-product specific) as is already in place in some states; or
  - Proposing minimum requirements for Class II weighing applications used specifically for Cannabis.)

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

Regional Association Reporting:

Western Weights and Measures Association

During the WWMA 2025 Annual Conference, Mr. Loren Minnich (NIST Office of Weights and Measures): This new item has a note that identifies the reason the word cannabis is italicized is it is the scientific name; he is not sure if the language is necessary. He suggested moving this to a note in the section being proposed. Mr. Matthew Douglas (State of California, Division of Measurement Standards): Agreed with NIST, in moving the language from subsection A to a note. He also had questions about the intent regarding retroactive versus nonretroactive. He recommended that the item remain Assigned to the task group. Mr. Kurt Floren (Los Angeles County, California): Questioned whether there is another version of this item that does not appear in the agenda. He stated that the scientific name of a plant must be italicized, and this explains why. He also pointed out that there is an item to delete Table 8. He stated that this gives guidance to the cannabis industry on what scale is suitable and this item accomplishes what the task group is intending. Mr. Aaron Yanker (WWMA S&T Committee Chair): Clarified what is posted on the website is the most current version. Mr. Loren Minnich (NIST Office of Weights and Measures): Stated during the NCWM Annual it was suggested that NIST OWM work with the Cannabis Task Group to make sure that the two items do not affect each other. They are moving away from that and trying to get Table 8 to be clearer. They felt that the values in the table were not large enough for cannabis. NIST did not think this was a viable option, because changing Table 8 would change it for all scales. Mr. Cory Hainy (Representing the Scale Manufactures Association): SMA supports the continued development of this item. Mr. Jason Flint (New Jersey): Asked if the new language was sent to all the other regions? Mr. Aaron Yanker (WWMA S&T Committee Chair): Stated he would follow up, it is unknown currently.

The 2025 WWMA S&T Committee recommends that this item remain Assigned to the NCWM Cannabis Task Group and looks forward to further development by the NCWM Cannabis Task Group, with consideration to comments heard during Open Hearings.

During the 2024 WWMA Annual Meeting, the following comments were provided:

Aaron Yanker (Cannabis Task Group member): The item as printed in this agenda has not changed from the 2024 NCWM annual. Please review that document for current comments. The task group is still working on the item to address comments heard at the annual meeting including grams equivalent, commercial performance, all cannabis products etc.. The item is being worked on by the group to hopefully get the item read for a vote.

Corey Hainy (SMA): The SMA supported development of the item at the April meeting. We will meet in November to review item further. 7.a language replaced with “all cannabis”. Reference to Table 8 with new proposed changes.

Steve Harrington (Oregon Department of Agriculture, Weights and Measures Program): Position is the same as last year. It is difficult to set up something in HB44 that is so commodity specific.

Matthew Douglas (State of California, Division of Measurement Standards): Supports the assigned status. Consideration should be made regarding the other item on the agenda that may remove Table 8. Reference to NTEP traceability is not necessary in HB44.

The 2024 WWMA S&T Committee recommends an Assigned status and looks forward to further development by the NCWM Cannabis Task Group, with consideration to comments heard during open hearings.

At the 2023 WWMA Annual Meeting, NCWM Cannabis Task Group Co-Chair Wolpert stated this item is still being developed by the task group and requested the item remain assigned to the task group.

Kevin Schnepp (California) questioned basing the suitability of a scale on the type of product. Recommended this item remain assigned to the task group. Steve Harrington (Oregon) echoed California.

Kurt Floren (Los Angeles County, California) referred to previous language of the item which stated weight ranges for the suitability of the device and the current language now references a product type. Recommended referring to the previous language of weight ranges. Commented Table 7a. is not enforceable and the item should remain assigned to the Task Group.

Cory Hainy (SMA) recommended a change of language in Table 7a. class III devices, replace the word “All Cannabis” with “non-retail Cannabis”. Recommend adding a comment in Table 7a. for reference to Table 8. for scale selection.

Wendy Hahn (Stanislaus County, California) echoed Kurt Floren with an additional concern that the table is confusing and someone may select a class of device that may not be suitable.

Aaron Yanker (Colorado Dept. of Agriculture Weights and Measures) supports this item with the proposed changes heard on the floor.

The WWMA 2023 S&T Committee recommends this item remain Assigned to the NCWM Cannabis Task Group and recommends the Task Group consider the comments heard during the open hearing.

During the WWMA’s 2022 Annual Meeting, Cannabis Co-Chair Rutherford remarked that everything in this book isn't updated. They have added “and cannabis” to Table 7. cannabis talks about cannabis and hemp. They expect to finish soon. What is in the book is old and doesn’t apply any more.

Due to timing constraints during Open Hearings, the Committee did not take comments on Assigned Items. The Committee did allow the source to provide updates on these items. An update from the Co-Chair Rutherford was provided. The WWMA S&T Committee recommends that this item remain Assigned.

During the WWMA 2022 Annual Meeting, Co-Chair Rutherford stated that everything in this book isn't updated. They have added "and Cannabis" to Table 7. He also clarified that cannabis talks about cannabis and hemp. The Task Group expects to finish soon. He said that what is in the book is old and no longer applies.

During open hearings, due to timing constraints, the Committee did not take comments on assigned items. The Committee did allow the source to provide updates on these items. An update from the Co-Chair Rutherford was provided. The WWMA S&T Committee recommends that this item remain assigned.

During the 2021 Annual Meeting Open Hearings, Josh Nelson (Ex-Officio NCWM S&T Committee) put forward to address some issues for cannabis, recommend developing - still needs work and continue to work forward.

Matt Douglas (California Division of Measurement Standards) remarked that California supports further development, add non retroactive date - subsection A states up to capacity… lists suitability requirements based on California, however, this info is not a standard.

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

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

Erin Sullivan (Colorado Department of Agriculture) asked if this pertain to cannabis in any form or concentration?

Josh Nelson asked if this is what is going into NIST HB 44 - each jurisdiction has to define their own. For Oregon, medical is much different than retail. Retail has to abide by this and medical does not. Verbiage in A, B, and C does need additions.

Erin Sullivan is this grows vs. dispensaries? Different products in processing facilities are weighed with many containers on the scales. Do states determine the regulation?

Josh Nelson asked if it is up to the states to determine how to apply tares and increments in which product is weighed.

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

Josh Nelson remarked it is not limited to flowers or bud. Mentions dabs. Is there a packaging requirement for the label? Oregon does. There must be a legal for trade scale that can prove they are meeting net contents. They must ensure that their process is being executed correctly. He thinks this is not limited to flower/bud.

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

Josh Nelson welcomes written input for this topic from anyone. Don Onwiler was a big proponent in this; Josh Nelson will continue to develop this.

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

Josh Nelson remarked this needs to be expanded upon, in Oregon. Even the growers have to do track and trace. Any scale weight that is used for the cannabis tracking system needs to be Weights and Measures compliant. Maybe has to address even a class III scale. They will look more into it.

Joe Moreo (Agriculture Commissioner/Sealer) stated over time we are going to need one level for concentrates, one for food, one for flower, one size fits all will not work.

Josh Nelson agrees that one size does not fit all. This will start to give limitations as to what a particular weight will be. Not trying to pigeonhole any device into one category, just trying to figure out what works, that's the intent.

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

Southern Weights and Measures Association

During the 2025 SWMA Annual Meeting, Mauricio Mejia, Florida – supports the item and recommends Voting status. Alison Wilkinson, Maryland – Cannabis Task Group hasn't met in some time. Item has been in assigned status for a while. MD believes we need this scale suitability to move forward. Requests the group meet and replace lost members to allow this item to continue. Recommends Voting Status. Corey Hainey, SMA – supports the continued development of the item. Would like to remove Statement B – replace "considered" with "the". Robert Huff, Delaware – Member of the Task Group – haven't met and is unsure who is the current chair. The task group was waiting on 25.1 (removing Table 8) to see how the changes would affect their work on this item. Recommends Voting Status.

The committee recommends Voting status on this item.

At the 2024 SWMA Annual Meeting, Cory Hainy, SMA spoke in support of developing status and recommended cannabis references be replaced with retail cannabis.

The committee recommended the item remains assigned.

At the 2023 SWMA Annual Meeting, the Committee heard no comments on this item during Open Hearings.

The Committee recommends this item remain an Assigned item.

During the 2022 SWMA's Annual Meeting, Charlie Rutherford stated that Table 1A has been updated in the item. The SWMA S&T Committee recommended this item remain as an Assigned Item.

At the 2021 SWMA Annual Meeting, Russ Vires (SMA) stated that they have no position on this item at this time.

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

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

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

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

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

Charlie Rutherford stated that he supports this item moving forward as a Voting item with the changes suggested by Cardinal Scale and Matt Curran.

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

Northeastern Weights and Measures Association

During the 2026 NEWMA Annual Meeting, a Representative from the State of New Jersey representing the task group provided an update from the cannabis task group. The focus group for this section has not met in some time, but the group is discussing this item and should have a path forward for this item by the NCWM Annual Meeting. A Representative from the State of New York stated that the term "total weight" in UR.3.15. implies multiple packages, so the term should be changed to either net weight or gross weight.

The Committee recommends this item remain as Assigned.

During the 2025 NEWMA Interim Meeting, a representative from NY – Subpart (c) – Would like clarity on use of "total weight" is this intended to mean net or gross weight. Representative from NJ – New language for the proposal has been submitted and wanted to know if this was shared with NEWMA. Recommends the item stay assigned.

The S&T Committee recommends that the item remain Assigned.

During the 2025 NEWMA Annual Meeting, no comments were heard from the floor on this item. The Committee received written comments from the SMA indicating support for continued development of the item and offered language changes to (b) under UR 3.1.X, which can be found in the supporting documents.

The Committee recommended retaining an Assigned status and the body concurred.

At the 2024 NEWMA Interim Meeting, Michael Peeler (NJ) commented that since the tables and additional user requirements have been removed, the item is fully developed and recommends a voting status.

Mike Smith (NY) commented that subsection (c) should clarify if "total weight" is net weight or gross weight.

Scott Dolan (VT) commented the word "traceable" implies something metrological and believes it should be replaced with "has received".

Cheryl Ayer (NH) agrees with NY and VT.

After hearing comments from the floor, the Committee recommended a Voting status for this item with the following changes to (c) that appear below, and body concurred.

(c) Scales used for commercial purposes to buy or sell all Cannabis products or the production of Cannabis products that have a total net weight of 3 ounces or less shall be a Class II scale with a National Type Evaluation Program Certificate of Conformance, and have a verification scale interval (e) of not greater than 0.01 g. A scale with a higher accuracy class than that specified as "typical" in Table 7a. Typical Class or Type of Device for Weighing Applications may be used.

At the 2024 NEWMA Annual Meeting, Lou Sakin (Holliston, MA), representing the Cannabis Task Group, gave an update on this item. Lou commented that it is still Assigned and the task group continues to work on this item. The task group has met with NIST staff and the task group will meet in June to rewrite the entire item. Lou requested that any suggestions to move this item forward would be appreciated and to please contact task group chair. Brandi Harder (Rice Lake), representing the SMA, commented that the SMA supports the item with edits including replacing "All Cannabis" with "non-retail Cannabis" in Table 7a Class III, and add a note in to Table 7a that states "Refer to Table 8 for guidance on scale selection for Cannabis".

The Committee recommended maintaining an Assigned status and body concurred.

During the 2023 NEWMA Interim Meeting, a regulator from Holliston, Massachusetts, and a Cannabis Task Group member recommended this item remain as assigned pending the Verification Scale Division Task Group item, as it impacts this item. Upon consensus of the body, the Committee recommends this item be Assigned.

At NEWMA's 2023 Annual Meeting, Charlie Rutherford (CPR Squared) spoke as the Cannabis Task Group Co-Chair. They stated the team is sorting out d and e, which will inform group as how to move forward. Lou Sakin explained that the language in the handbook charts say "may" and gives an option of d or e. Hopes d and e task group would come up with more precise language. The Cannabis Task Group Scales Focus Group received input from other participants in NCWM with concern of adding language in the tolerance chart that specifies the tolerances will apply to cannabis. The purpose was to follow form with precious metals and other items of high dollar value. Language in Table 8 says 'may' but may add language that says "shall" to apply to cannabis due to dollar value of the product in the marketplace. Doug Bowland (SMA) indicated support of development. Suggested that in Table 7a Class 3, replace wording with" non-retail cannabis" and refer to table 8 for cannabis selection. The exact SMA language changes were submitted in writing. Lou Sakin stated that as a field inspector, when scales are tested in a recreational facility, that is retail and should fall under the jurisdiction of this particular section. Some states require NTEP from seed to sale, which covers entire family of devices.

After hearing comments from the floor, the Committee recommended to the body that this item maintain an Assigned status, and the body concurred.

During the 2022 NEWMA Interim Meeting, the Committee recognized comments received the from Cannabis Task Group from the Chair Sakin (Cannabis TG Scales). Cannabis TG Co-Chair Rutherford commented that the Cannabis Scales Focus Group is under new leadership lead by Lou Sakin. Co-Chair Rutherford pointed out that the Item Under Consideration is not current and current language was sent to the NEWMA. Co-Chair Rutherford requested a Voting status for this item. Lou Sakin indicated that the new language was submitted to SWMA and NEWMA. The TG chose to modify tables instead of changing the entire code. He believes that the item is fully developed and ready for a Voting status. James Cassidy requested that this item move forward as Voting with changes as proposed in the submitted documentation.

After hearing comments from the floor, the Committee agreed that the item has merit. The Committee agreed that the item, with recommended changes below, is ready for a Voting status.

Section 2.20. UR.3.1.2 Required Minimum Loads for Cannabis products.

The recommended minimum loads specified in Table 8 shall be considered required minimum loads for scales used to weigh Cannabis and Cannabis-containing products.

[Nonretroactive as of January 1, 20XX]

And

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

Class	Weighing Application or Scale Type
I	Precision laboratory weighing and weighing of all Cannabis products
II	Laboratory weighing, precious metals and gem weighing, grain test scales, and weighing of all Cannabis products
III	All commercial weighing not otherwise specified, grain test scales, retail precious metals and semi-precious gem weighing, grain-hopper scales, animal scales, postal scales, vehicle on-board weighing systems with a capacity less than or equal to 30 000 lb, and scales used to determine laundry charges, and weighing of all Cannabis products
III L	Vehicle scales (including weigh-in-motion vehicle scales, vehicle on-board weighing systems with a capacity greater than 30 000 lb, axle-load scales, livestock scales, railway track scales crane scales, and hopper (other than grain hopper) scales
IIII	Wheel-load weighers and portable axle-load weighers used for highway weight enforcement

Notes:

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

The use of italicized text in the references to "Cannabis" in this table is only to denote its proper taxonomic term; the italicized font does not designate a "nonretroactive" status as is the convention used throughout NIST Handbook 44.

(Amended 1985, 1986, 1987, 1988, 1992, 1995, 2012, and 2021)

During the 2022 NEWMA Annual Meeting, James Cassidy (Massachusetts) commented as the Co-Chair of the NCWM Cannabis Task Group. He supported the Assigned status so the Task Group can continue to develop the item from comments received at the 2022 Interim. Russ Vires (SMA) supported continued development and indicated that a user requirement typically does not pertain to a specific commodity. Russ Vires suggested the words "retail cannabis" should be added to the "Class II" section of Table 7a and the words "bulk cannabis processing and sales" should be added to the "Class III" section of Table 7a.

Tina Butcher (NIST OWM) read the following statement: "As a non-regulatory metrology institute, NIST defers to federal agencies with regulatory authority under the Controlled Substances Act (CSA) for the scheduling of drugs or other substances. NIST does not have a policy role related to the production, sale, distribution, or use of cannabis (including hemp and marijuana). While the 2018 Farm Bill removed hemp from the list of controlled substances under Schedule 1 of the CSA, marijuana remains on that list. NIST must respect that distinction even as it exercises its statutory authority to develop and disseminate national weights and measures standards for the production, distribution, and sale of products in the commercial marketplace. NIST remains committed to providing technical assistance to the weights and measures community. OWM has provided key technical points for the community to consider in its deliberations of cannabis-related proposals, and OWM would be happy to provide any necessary clarification. OWM comments are intended to encourage technically sound application of legal metrology laws, regulations, and practices to the measurement and sale of these products."

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

During the 2021 NEWMA Interim Meeting Open Hearings, Eric Golden made suggestions to change the language in this item to the following:

UR.1.X. ***Cannabis***

(a) 0.01g for net weighments up to 10 g
(b) 0.1g for net weighments greater that 10g , up to 100 g, and
(c) 1 g for net weighments greater than 100g , up to capacity

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

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

Eric Golden commented that national uniformity would be good and many states have informational publications that outline requirements in their state for Cannabis scale requirements. Jimmy Cassidy (Massachusetts) recommended Voting status with the changes above. Matt Curran (Florida) commented that harmonization with table 8 would be a good idea if possible. Lou Sakin questioned if Cannabis should be in italics. The Committee suggests making the change to italics for Cannabis.

The NEWMA S&T Committee recommended that this item be given Voting status with suggested edits.

Central Weights and Measures Association

During the 2026 CWMA Annual Meeting, the Committee recommends this item remain as Assigned.

During the 2025 CWMA Interim Meeting, the committee recommends this item remains Assigned based on comments made during open hearing.

At the 2025 CWMA Annual Meeting, no comments were heard.

The Committee recommends this item remain Assigned.

At the 2024 CWMA Interim Meeting, a regulator from Wisconsin commented that while cannabis is illegal in Wisconsin, they still offered support for states to pursue regulation for their citizens in the cannabis industry.

A regulator from Minnesota noted that this item references Table 8. and that item SCL-25.1 seeks to remove Table 8.

A representative from NIST OWM supports this item remaining assigned. It was reiterated that item SCL-25.1 seeks to remove Table 8. and a suggestion was made that this item reduces the “3 ounce” requirement or to convert the “3 ounce” reference to grams to minimize excessive scale intervals.

The committee recommends this item remain assigned to the NCWM Cannabis Task Group to address NIST OWM concerns.

At the 2024 CWMA Annual Meeting, the Co-Chair of the Cannabis Task Group commented that they are still working on this item and would like it to remain as Assigned.

A representative of the Scale Manufacturer's Association commented that the SMA supports this item with the following changes: In Table 7a Class III, replace the words "All Cannabis" with "Non-retail Cannabis". Add in notes section in Table 7a; "Refer to table 8 for guidance on scale selection for Cannabis".

The Committee recommends that this item remain as Assigned.

At the 2023 CWMA Interim Meeting, no comments were heard. The Committee recommends this item remain Assigned.

At the CWMA's 2022 Annual Meeting, Co-Chair Rutherford stated this will be better developed once e vs. d is finalized. Hopefully the Task Group gets work done to submit updated language by Aug 15, 2023. Thomas Schuller (SMA) stated the SMA supported this item.

The CWMA S&T Committee recommends this item remain as Assigned to the Task Group.

During the 2022 CWMA Interim Meeting Open Hearings, Charlie Rutherford (ASTM International) remarked the old version is still listed in today's agenda. Pushing the suitable scales discussion to a later date. The submitter provided updates to Table 7a. which add Cannabis verbiage to the weighing application column for Classes I, II, and III.

The CWMA S&T Committee recommended this item remain Assigned with the NCWM Cannabis Task Group.

During the 2022 CWMA Annual Meeting Open Hearings, Doug Musick (Kansas) welcomed the attempt to define suitability; recommended the following:

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

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

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

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

(c) 1g for net weighments greater than 100g.
(Added 20XX)

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

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

Charlie Stutesman (Kansas) questioned why only metric units are referenced and not also include inch-pound units. The CWMA S&T Committee recommended this item remain with the NCWM Cannabis Task Group and that the suggested changes are considered.

During the 2021 CWMA Interim Meeting Open Hearing, the Committee heard comments from the floor. Loren Minnich (Kansas) is not sure of the intent and that it needs more developing. Eric Golden agreed with is it "e" or "d", will send notes to Committee. Ivan Hankins (Iowa) would support item with Eric Golden's language. Eric Golden continued by recommending the following change to which will add clarity to the listed weight ranges in SCL-22.2 (in red):

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

UR.1.X. Cannabis. – The ~~scale division~~ verification scale interval, e, 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) 1 g for net weighments greater than 100g, up to capacity.
(Added 20XX)

CWMA S&T Committee recommended as Voting Item with the proposed changes from Cardinal Scales.

Scale Manufacturers Association

During the 2026 SMA Spring Meeting, the SMA supports the intent of this item and looks forward to its further development.

During the 2025 SMA Fall Meeting, the SMA supports the latest version and recommends this as a voting item.

During the 2025 SMA Spring Meeting, they supported the continued development of this item. Recommendation: Remove (b) statement under UR 3.1.X. If (b) stays the word "considered" needs to be removed and replaced with "the".

During the 2024 SMA Fall Meeting, they supported the continued development of this item. Recommendation: Remove (b) statement under UR 3.1.X. If (b) stays the word " considered" needs to be removed and replaced with " the ".

During the 2024 SMA Spring Meeting, the SMA indicated they support the continued development of this item and continue to recommend that in Table 7a Class III, replace the word "All Cannabis" with "non-retail Cannabis" and add in notes section in Table 7a; "Refer to table 8 for guidance on scale selection for Cannabis".

During the 2023 SMA Fall Meeting, they supported the continued development of this item. The following was suggested:

1. In Table 7a Class III, replace the word "All Cannabis" with "non-retail Cannabis".

2. Add in notes section in Table 7a; "Refer to table 8 for guidance on scale selection for Cannabis".

During the SMA 2023 Spring Meeting, they supported the continued development of this item. The following was suggested:

3. In Table 7a Class III, replace the word "All Cannabis" with "non-retail Cannabis".

4. Add in notes section in Table 7a; “Refer to table 8 for guidance on scale selection for Cannabis”.

During the 2022 Fall SMA meeting, they supported the continued development of this item.

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

5. The words “retail cannabis” should be added to the “Class II” section of Table 7a.

6. The words “bulk cannabis processing and sales” should be added to the “Class III” section of Table 7a.

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

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

7. The words “retail cannabis” should be added to the “Class II” section of Table 7a.

8. The words “bulk cannabis processing and sales” should be added to the “Class III” section of Table 7a.

During the 2021 SMA Fall and 2022 SMA Spring Meetings, the SMA supported the continued development of this item.

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

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

SCL-24.2 D Multiple Sections Regarding Tare

Source: Ross Andersen, New York, Retired

Submitter’s Purpose and Justification:

Reduce confusion regarding net weight and tare issues by defining terms and adds specific requirements for tare operations and for marking and printing of net, gross and tare weight values.

NOTE: This proposal and justification were modified by the submitter before the fall 2025 regional association meetings.

Based on comments received and extensive discussion with OWM staff, I submit this revised proposal as part of the continuing development of this item. This revision replaces the original item.

The proposal consists of three sections. Part 1. establishes the terminology that is important to understand the meaning of key terms. Part 2. addresses the question of proper testing of weighing instruments, both gross and net indications. Part 3. addresses identification of indicated weight, recorded weight values, and externally calculated weight values. Part 3 also includes the subject of mathematical agreement.

Part 1. Preliminaries: Terminology of Weighing

The language surrounding "weight" is highly nuanced. This reflects thousands of years of evolution in commercial activity and even radical changes that occurred within my lifetime with the invention of digital weighing instruments. The important issue is that a weighing instrument provides weight indications reacting to whatever load it senses. It is the operator that operates the instrument and converts these weight indications into weight values that are used in the commercial transaction based on knowledge of the specific load or loads involved in the weighing operation. The applicable rules for weight indications and weight values are:

- Weighing instruments produce **weight indications** reacting to changes in applied load in real time. Analog indications are unrounded, but Digital indications are rounded per G-S.5.2.2.(c).

- Weighing instruments may record **weight values** from weight indications. Analog must comply with G-S.5.2.2.(b) and digital must comply with G-S.5.2.2.(a)&(d). *Recorded values don't change with applied load.*

- Weighing instruments may externally calculate **weight values** from two measured weight values using the formula: Gross – Tare = Net (and variations).

Analog instruments have a single scale of weight indication beginning at no load zero balance. All digital instruments have a scale of indication beginning at no-load zero parallel to the analog instruments. Some digital instruments have a tare mechanism and will have two scales, one beginning at no-load zero and the other beginning at tare load zero after operation of a tare mechanism.

The loads used by the operator in the weighing process are as follows:

- Dead load – meaning the load receiver and support structure.

- No load – meaning the dead load plus any additional load that is not part of the transaction, e.g., the scoop used with a computing scale in a candy store, or dirt and debris that accumulates on a vehicle scale.

- Service load – meaning the item(s) subject to a charge for service based on weight. The terms gross, tare and net have no relevance to a service load.

- Tare load – meaning the tare materials delivered with the commodity.

- Net load – meaning the commodity.

- Gross load – meaning the net load plus the tare load.

The term weight in common usage has the following variants.

- Weight, or gross weight – meaning (a) the indication of an instrument on the measurement scale beginning at no load zero, (b) the weight value derived from weight or gross weight indications for any load, or (c) the weight value derived from weight indications for the gross load.

- Net weight – meaning (a) the indication of an instrument on the measurement scale beginning at tare load zero, (b) the weight value derived from net weight indications for any load, or (c) the weight value derived from net weight indications for the gross load.

The key is that weight values must be derived from indications and require the operator to identify the associated load. Another important takeaway is that multiple meanings for the same term results in always being forced to consider the context to understand the requirement.

Part 2. Testing Procedures for Weighing

Amend section S.1.1.1. and add a new section S.1.1.3. as follows:

S.1.1.1. Digital Indicating Elements.

(a) A digital zero indication shall represent a balance condition that is within ± ½ the value of the scale division d. **<u>This does not apply to weight classifiers or to the counting feature on prescription scales.</u>**

(b) After zero-setting (gross zero or net zero after a tare operation) the effect of zero deviation on the result of the weighing shall be not more than ***~~± 0.25 e~~.<u>:</u>***

<u>(i) ± 0.5 e for Class IIIL scales and Class IIII highway weight enforcement scales with values of n = 400 or greater, or</u>

<u>(ii) ± 0.25 e for all other scales. On a multi-interval scale, e shall be replaced by e_I.</u>

<u>(Amended 202X)</u>

[Nonretroactive as of January 1, 2025]

(c) A digital indicating device shall have a "center-of-zero" indicator that indicates a zero-balance condition when the deviation from zero is not more than ***~~± 0.25 e~~ <u>the corresponding values in S.1.1.1.(b)</u>****. A "center-of-zero" indicator may operate when zero is indicated for gross and/or net mode(s). The "center-of-zero" indicator is not mandatory on a device equipped with an auxiliary indication or equipped with an enabled zero tracking mechanism that maintains a "center-of-zero" condition* ***~~to ± 0.25 e~~ <u>compliant with S.1.1.1.(b)</u>.***

(Amended 202X)

[Nonretroactive as of January 1, 1993]

(d) 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, 2019, and 2024)

<u>S.1.1.3. Analog Indicating Elements. – After zero-setting the effect of zero deviation on the result of the weighing shall be not more than:</u>

(a) ± 0.5 e for Class IIIL scales and Class IIII highway weight enforcement scales with values of n = 400 or greater, or

(b) ***± 0.25 e for all other scales.***

[Nonretroactive as of January 1, 202X]

(Added 202X)

Add a new Note N.1.13., and amend T.N.2.1. and T.N.3.3. as follows:

N.1.13. Testing Requirements. – When measuring errors for compliance with Table 6., the following shall apply.

(a) For Class IIIL scales and Class IIII highway weight enforcement scales with values of n = 400 or greater, the test load shall be applied at a zero/reference value accurate to ± 0.5 e, and the error calculation shall resolve the error to the nearest 1 e.

(b) For all other scales, the test load shall be applied at a zero/reference value accurate to ± 0.25 e, and the error calculation shall resolve the error to the nearest 0.2 e.

(Added 202X)

T.N.2.1. General. – The tolerance values ~~**are positive (+) and negative (–)**~~ **herein prescribed shall be applied to errors of overregistration and underregistration.** ~~**with the weighing device adjusted to zero at no load. When tare is in use, the tolerance values are applied from the tare zero reference (zero net weight indication); the tolerance values apply to the net weight indication for any possible tare load using certified test loads.**~~ **The tolerances apply to errors in gross indications when no tare mechanism is in use, and they apply to errors in net indications when a semi-automatic tare mechanism is in use. (See N.1.13.)**

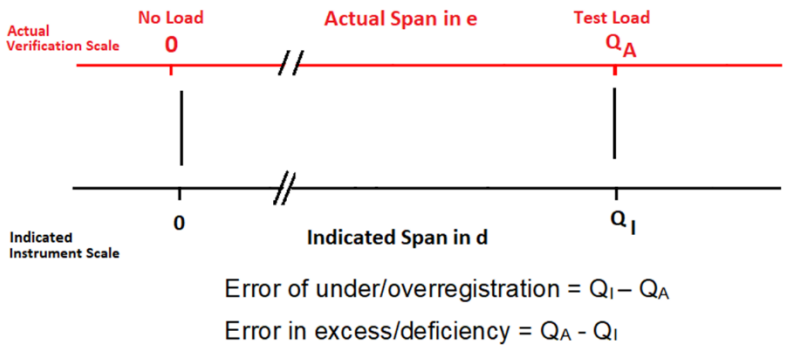
T.N.3.3. Wheel-Load Weighers and Portable Axle-Load Weighers of Class IIII. – The tolerance values are two times the values specified in T.N.3.1. Maintenance Tolerance Values and T.N.3.2. Acceptance Tolerance Values **for scales with n of 400 or greater.**

(Amended 1986 **and 202X**)

Original Justification:

The current S.1.1.1.(a) was written for normal rounding scales. The +/- 0.5 division is an absolute requirement meaning zero must extend from -0.5 d to + 0.5 d and must be 1 d wide. The new exemption in part (a) for weight classifiers is necessary because classifiers round mostly up instead of half up/half down. The width of the zero division is typically much smaller than 1 d for these instruments to provide for rounding up. The exemption in part (a) for pill counters is necessary because counting scales round mostly down. The zero pill indication could extend from no load to just under 1 pill (both plus and minus) making the zero division almost 2 d wide. Both of these types of scales are covered by the accuracy of zero requirements in part (b) ensuring center of zero is accurate.

The error in the Scales Code is calculated from the indication on the instrument scale (in d) and a test load on the verification scale (in e). See figure below. After aligning the zeros of the two measurement scales, you calculate error of under/overregistration as indicated quantity Q_I minus actual quantity Q_A with quantity in weight units. For this to work effectively, the zeros must be accurately aligned and the rounding error in the error calculation must be minimized. Note the small offset between the zeros.



The current zero accuracy requirement in S.1.1.1.(b) of +/- 0.25 e was clarified in amendments made 2024. However, the tolerance structure of class IIIL and IIII highway weight enforcement scales is very different from the other classes with many more e's of tolerance (up to 20 for IIIL and up to 10 for IIII). The 0.25 e accuracy of zero error becomes excessively small for these devices, for example, +/- 5 lb on a 200,000 lb x 20 lb IIIL vehicle scale. This is almost at the limit of detection. After the change, any zero indication within +/-10 lb (+/-0.5 d) is sufficiently accurate. More on this subject follows below. This is reflected in the new test note as well.

The n = 400 or greater limitation for weight enforcement scales is similar to the 2,000 minimum n for class IIIL. Permitting twice the tolerance when n is less than 400 can increase the relative tolerance to 4 %, e.g., 2 e at 50 e load. A search of NTEP approve weight enforcement scales did not reveal any instruments currently with n values less than 400. It is not necessary to update the nonretroactive dates in S.1.1.1.(b) or (c) as the new requirement is less stringent for the class IIIL and highway weight enforcement scales. Note, the accuracy of zero also applies to a strain-load reference value in a strain-load test which will be a non-zero value.

The new paragraph S.1.1.3. is necessary to apply the accuracy of zero requirements equally to analog instruments. This recognizes that analog zero adjustments may have finite variability.

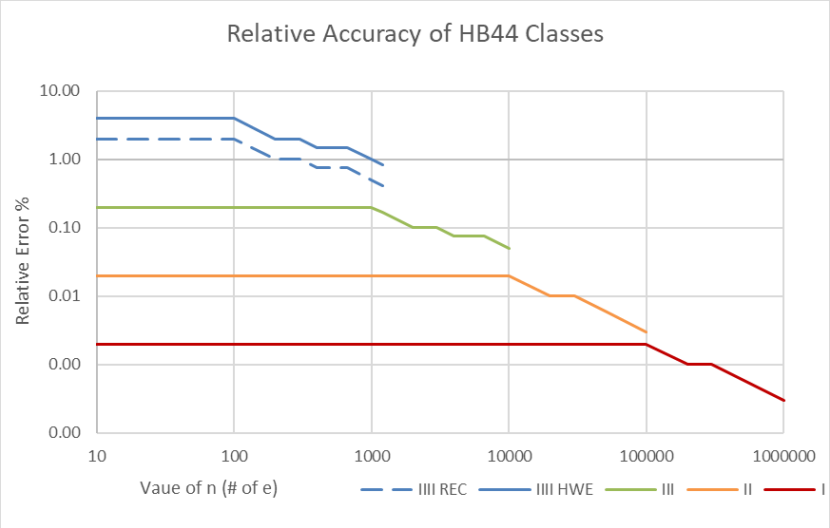
The new test note N.1.13. sets both zero accuracy requirements and resolution requirement for testing the scale. More information of the tolerance structures in the Scales Code and the issue of resolving errors is added below.

The changes to T.N.2.1 clarify that tolerances apply to errors of under/overregistration. The current plus or minus could also be errors in excess/in deficiency. The deleted language is clarified to explain how to conduct the tests to apply the tolerances to both gross and net indications. The limitation to semi-automatic tare reflects the fact that net zero is not normally seen at any time in the transaction and that accurate zero to S.1.1.1.(b) cannot be assumed with these tare methods. Semi-automatic tare must comply with S.1.1.1.(b).

Understanding Scales Code Tolerances

With the step tolerances in the Scales Code, the increased tolerances with increased test loads give us a false sense that tolerances increase as test loads increase. Yet the tolerances are actually decreasing when you look at them relatively rather than absolutely. In addition, we expect weighing instruments to be close to linear in performance. This is why we test at the maximum load in each tolerance step. The result, as the capacity moves into the second, third, or fourth step, is decreased probability of failing at lower steps.

The relative accuracy of the HB44 weight classes in the Scales Code (other than IIIL) are presented in the graph below. The scale tolerances based on relative error can be thought of as tolerance at capacity divided by the capacity, or e's of tolerance divided by n. The basic principle is that more e's generally reflects more accuracy (smaller tolerance) both within a class and between classes.



- Class IIII for highway weight enforcement ranges from 2 e per 50 e or 4% to 10 e per 1,200 e or 0.8%.
- Class IIII for recycling ranges from 1 e per 50 e or 2% to 5 e per 1,200 e or 0.4%.
- Class III ranges from 1 e per 500 e or 0.2% to 5 e per 10,000 e or 0.05%.
- Class II ranges from 1 e per 5,000 e or 0.02% to 3 e per 100,000 e or 0.003%.
- Class I ranges from 1 e per 50,000 e or 0.002% to 3 e per 1,000,000 e or 0.0003%.

Class IIIL is an anomaly, since it does not follow the principle of increasing accuracy with larger n. This class is a constant 0.2% tolerance over the entire class range from n = 2,000 to n = 10,000. The connection to class III is that class IIIL shares the same relative tolerance (0.2%) as Class III up to 1,000 e. The key is to see that the e and d of IIIL are significantly smaller than the equivalent class III for n up to 1,000. If you make a 0.2% accurate class III instrument with 200,000 lb capacity, you get a d of 200 lb. Yet the equivalent class IIIL has 20 lb d. In many respects class IIIL is like having auxiliary indication for class III. Consider the comparison table below for a 200,000 lb scale.

Consideration	III	III	IIIL
Scale Division d/n	20 lb/10,000	200 lb/1,000	20 lb/10,000
Tolerance @ 100 k/200 k	100 lb/100 lb	200 lb/400 lb	200 lb/400 lb
Suitable Test Load	80,000 lb	100,000 lb	30,000 lb
Accuracy of Zero	5 lb	50 lb	10 lb
AZT Window	10 lb	100 lb	60 lb
Print Stability	20 lb	200 lb	60 lb
Minimum Load	400 lb	4,000 lb	1,000 lb

If we tried to fit a 200,000 lb x 20 lb scale (column 2) into class III, not only do the tolerances get far too small but you also are faced with stringent requirements (shaded areas) such as:

- testing at a minimum of 80,000 lb to test at 4,000 e with its 60 lb (3 e) tolerance.
- trying to enforce 0.25 e accuracy at zero which is at the limit of detection.
- the scale would have to return to zero within 10 lb in order to get into the AZT window of ½ d.
- indication stability would have to be within 20 lb (+/-1 d) to print with wind.
- the 20 d minimum load would permit weighing down to 400 lb.

Increasing the d to 200 lb (column 3) returns the tolerances to the current 0.2% but some of those values that were too small at 20 lb d now are too large, like the 200 lb print motion and 4,000 lb minimum load. Class IIIL with its smaller 20 lb divisions (column 4) solved many problems (and required a good number of compromises).

Class IIII weight enforcement scales in contrast to class IIII follow a similar pattern to the IIIL vs III. The doubling of the tolerance along with the n = 400 minimum solved many problems.

Consideration	IIII	IIII	IIII(2xT)
Scale Division d/n	50 lb/400	200 lb/100	50 lb/400
Tolerance @ 10 k/20 k	100 lb/150 lb	200 lb/400 lb	200 lb/300 lb
Accuracy of Zero	12.5 lb	50 lb	12.5 lb
AZT Window	25 lb	100 lb	25 lb
Print Stability	50 lb	200 lb	50 lb
Minimum Load	500 lb	2,000 lb	500 lb

Resolving Errors

NTEP specifies that error calculations be resolved to 0.2 e or finer parallel to R76, reducing rounding error to a maximum of 0.1 e. The resolution of the error to 0.2 e is important because the value of d may be smaller than e with auxiliary indication, larger than e for most weight classifiers, greater than 3 e for counting scales, and equal to e for other scales. When computing error ($Q_I - Q_{A)}$ the different resolution of the indication results in very different resolution in the error.

This means rounding errors in calculating the error may be 0.05 e with e = 10 d auxiliary indication, ~10 e with e = 0.1 d weight classifiers, ~3 e with e = 0.33 d counting, and 0.5 e for other scales. R76 stipulated 0.2 e or finer to standardize the measurement of error. The principle is that once error resolution is reduced to 0.2 e or less, rounding error is considered insignificant.

The codification of these parameters formally authorizes the NTEP practices and clarifies that the rounding error is not included in the tolerances in Table 6. This does not prevent field tests from resolving errors to 1 e, when considering enforcement discretion. Just as many tests are not normally performed in field tests, this test may be modified for convenience with the full understanding that the practice can significantly increase the tolerances above the intended values.

To resolve error calculations to 0.2 e you can use one of three test methods:

1. Test at a whole number of e and resolve the indication to 0.2 e of finer. For example, for class II at the first tolerance step apply a load of 5000 e and resolve the indication to 0.2 e by (a) interpolating

the analog indication to 0.2 e or finer, (b) by using indications with auxiliary indication to 0.2 e or finer, or (c) using extended display mode with temporary d = 0.2 e or finer.

2. Test at a whole number of d and apply test load in increments of 0.2 e or finer. For analog the test begins at the zero graduation and ends at a load graduation by adjusting the test load. For digital, the break points between divisions is used beginning at 0.5 d and ending at the test indication +0.5 d. For the first step in class III this could mean a final indication of 500.5 d. The span from 0.5 d to 500.5 d is precisely 500 d.
3. Test at a random point (as with the dynamic monorail). The instrument records values with auxiliary indication to 0.2 e or finer and the actual value is found on a reference scale with verified scale divisions = 0.2 e or finer.

The proposed resolution of the error for classes IIIL and IIII weight enforcement is to the nearest 1 e. This means error weights are not require ever to test these scales. The important issue is how rounding error in the indication impacts the pass/fail threshold. Remember, in field tests the instrument has to fail in order to take action. You find the fail threshold by adding the rounding error to the tolerance.

Consider a class III scale when testing at 500 e where the tolerance is 1 e or 0.2%, If you resolve error to 1 d, the rounding error is 0.5 d or e. This means you will not fail the scale until the error exceeds 1.5 e or 0.3%. That's 50 % more than the Table 6. tolerance. If you resolve the error to 0.2 e as described above, the rounding error is reduced to 0.1 e and you will not fail until the error exceeds 0.22%. This explains why HB44 directs that tests be performed at the tolerance break points which represent the tightest tolerance in each tolerance step. It also partially explains why class IIIL was created.

With large capacity scales of class III it would be a hardship to test at the first tolerance break point at 500 e. Consider a IIIL of 200,000 lb with d/e = 200 lb. That requires 100,000 lb of test weights to get to the tolerance break point. Bringing 4 weight trucks to test a single scale is not an acceptable solution. Often you can only muster 150 e (30,000 lb) of test weights where the fail threshold is 1%. That's not a meaningful test.

For large capacity Class III with error resolution 1 d

@ 500 e load – (1 e tolerance + 0.5 e rounding error) / 500 e * 100 = 0.30 % fail threshold

@ 150 e load – (1 e tolerance + 0.5 e rounding error) / 150 e * 100 = 1.0 % fail threshold

Now follow R76 rule of resolving error to 0.2 e. The fail threshold is better, 0.22 % at 500 e, but it is still 0.73% at 150 e. Again this cannot hold the scale to 0.2% error.

For large capacity Class III with error resolution 0.2 d

@ 500 e load – (1 e tolerance + 0.1 e rounding error) / 500 e * 100 = 0.30 % fail threshold

@ 150 e load – (1 e tolerance + 0.1 e rounding error) / 150 e * 100 = 0.73 % fail threshold

This rounding issue s is one reason class IIIL was created. Consider a class IIIL with e = 20 lb resolving error to 1 e. The values below show the fail threshold at the first four steps. Even at only 30 k test load the effective tolerance is very close to the 0.2% desired. Also, this test is repeated upscale with the strain-load test evaluating the 0.23 accuracy over another part of the weighing range.

For Class IIIL error resolution 1 e (direct reading to nearest d means 0.5 e rounding error)

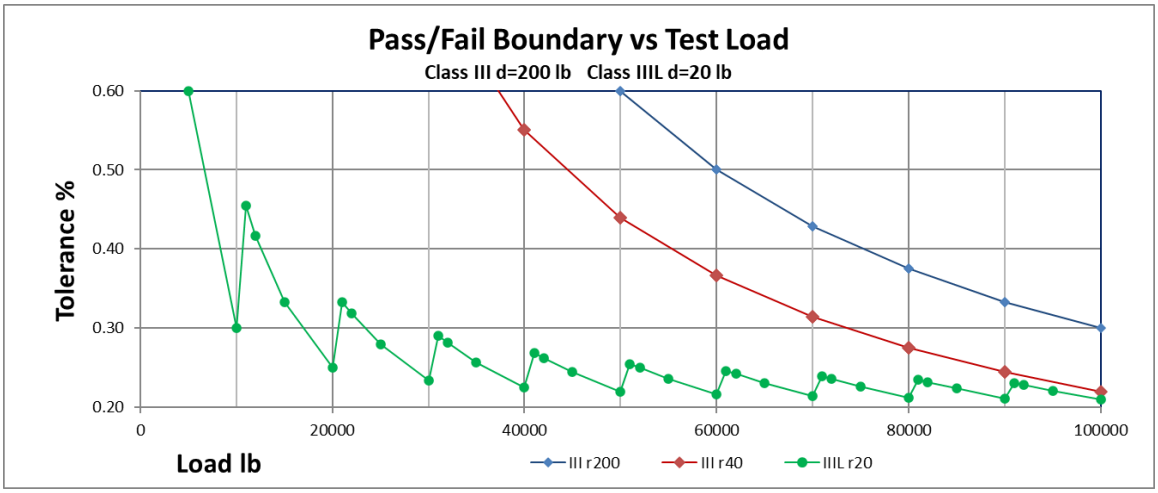
@ 500 e load – (1 e tolerance + 0.5 e rounding error) / 500 e * 100 = 0.3 % fail threshold

@ 1,000 e load – (2e tolerance + 0.5 e rounding error) / 1,000 e * 100 = 0.25 % fail threshold

@ 1,500 e load – (3 e tolerance + 0.5 e rounding error) / 1,500 e * 100 = 0.23 % fail threshold

@ 2,000 e load – (4 e tolerance + 0.5 e rounding error) / 2,000 e * 100 = 0.23 % fail threshold

In the graphic below, the fail thresholds are shown for class III with d = 200 lb and class IIIL with d = 20 lb. The blue line for class III depicts rounding to nearest d (200 lb) while the red line for class II depicts rounding to the nearest 0.2 d (40 lb) as proposed. The green line for class IIIL depicts rounding to nearest 1 d (20 lb). This means rounding error to 1 e is sufficient to evaluate the 0.2 % tolerance for class IIIL.



Note that NTEP presently uses the 0.2 e resolution for class IIIL. Consider that in tests close to CLC you are using 4 lb error weights to evaluate a tolerance of maybe 160 lb.

Part 3. Identification of Weight Indications and Recorded and Calculated Weight Values

Add a new S.1.15. and S.1.16. as follows:

S.1.15. Identification of Weight Indications.

(a) Gross indications need not be identified, but may be identified by the symbol "G" to the right of the weight value, e.g., 4.48 kg G.

(b) Net indications shall be identified by the symbol "N" to the right of the weight value, e.g., 4.48 kg N.

(c) ***However, it is permitted to replace the symbols "N" or "G" with the terms "net" or "net weight", or "gross" or "gross weight" respectively adjacent to the weight display.***

(Added 20XX)
(Nonretroactive as of January 1, 202X)

S.1.16. Identification of Recorded and Calculated Weighing Results.

(a) Recorded values shall match associated indicated values, including any gross or net identification of the corresponding indication using the symbols "G" or "N" to the right of the weight value, e.g., 4.48 kg G.

(b) If only net weight values are recorded without corresponding gross or tare values, they may be recorded without any identification. This applies also where semi-automatic zero setting and semi-automatic tare are initiated by the same key.

(c) Recorded values may include additional gross, net, and/or tare identification based on operator knowledge of the applied. If gross, tare, and net weight values are all recorded

together, the net and tare values shall at least be identified by the corresponding symbols "N" and "T."

(d) However, it is permitted to replace the symbols "G", "N" and "T" by corresponding text, e.g., "gross" or "gross weight," "net", or "tare" respectively either before or after the weight value, e.g., 10 kg N or Net 10 kg.

(e) When gross, net and tare values are recorded together, one of these values may be calculated from two recorded weight values based on the formula Gross – Tare = Net. The calculation shall be mathematically correct. See Note. In the case of a multi-interval or multiple range scale the calculated weight value may be presented with a smaller scale division. Example:

455 kg	***Gross Weight (WR2 d = 5 kg)***
- 14 kg	***Tare Weight (WR1 d = 2 kg)***
= 441 kg	***Net Weight (mathematically correct but d is 1 kg)***

Note: when gross, net, and tare values are recorded together and all three values are independently measured, it is not possible to ensure mathematical agreement due to rounding errors.

(***Nonretroactive as of January 1, 202X)***
(Added 20XX)

Justification: These new sections provide clear specifications for identifying net weight and the use of tare mechanisms. Because these changes may be significant, they are proposed as nonretroactive. There is nothing in the Scales Code to specify how to identify weight indications and recorded values. Without these sections, any decisions regarding appropriate identifications are arbitrary. Note that NTEP relies heavily on G-S.5.2.4. Values, but general rules are not sufficient in this case. Also, Pub 14 has no legal standing and HB44 must be clear on its own.

The new S.1.15. recognizes that indications can only be gross or net. Not identifying gross indications is a long-standing practice, and this requires an explicit exemption from G.S.5.2.4. However, these indications may be identified as gross. Net weight indications, when a tare mechanism is in use, must be identified as net. A tare weight display is a recoded value covered in the proposed S.1.16. The OWM has suggested this could be accomplished through examples of acceptable indications or by combining indications and recorded requirements. However, legal requirements cannot be expressed through examples. Examples are only used to further clarify stated requirements and could be valuable in a comprehensive training program for weight indications.

In S.1.16. the specifications governing recorded and calculated weight values are added. This section comes largely from R76 section 4.6.11. This is presented separate from indications in S.1.1.5., since it adds multiple layers of options that are not suitable for indications.

In (a) the General Code principle (G-S.5.2.2.) that recorded values should mirror the associated indications is reinforced. If the indication has gross or net identification, then the recorded values must include it as well.

In (b) Net values presented alone (no gross or tare weights) are exempt from identification consistent with the UWML definition of Net Weight. This includes weighing the net load with gross indications as well as gross load with net indications. In the latter case, the indication is required to identified "net" but the recorded value is exempt.

In (c) the option for the operator to add information that is not available from the indication is recognized. The scale can only indicate gross or net weight and cannot know what load is on the load receiver. The operator knows that the gross indication of the tare load is Tare Weight, the gross indication of the gross load is Gross Weight, the gross indication of the net load is Net Weight, and the gross indication of the service load is weight. It is the operator that adds this information through controls on the instrument. This section also exempts Gross Weight from being identified when gross, tare and net are presented. Gross is exempted since there is a long standing trade practice to not require identification of gross indications, also from R76.

In (e) the calculation of weight values is permitted, based on using two recorded weight values and calculating the third using the formula gross – tare = net. In this sense, calculation is external to the weighing capability of the instrument. A good example is the weigh-in/weigh-out system. The net weight is calculated by subtracting the tare weight from the gross weight. This is unlike internal calculations for keyboard or programmed tare performed internally. The example shows that the calculated value has a 1 kg d that is smaller than either the 2 kg or 5 kg d of the instrument indications.

The note is vital to explain that if gross, tare, and net values are each measured independently with semi-automatic tare, 25 % of the time the results will not be in mathematical agreement due to rounding errors. For example, with d = 1 lb and gross = 23.7 lb, tare = 3.4 lb and net = 20.3 lb, the corresponding measured values indicated and recorded will be 24 lb G, 3 lb T and 20 lb N (no mathematical agreement). This particularly impacts multiple range and multi-interval scales. If all three values are measured, the agreement of digital values in G-S.5.2.2. requires that digital values indicated and recorded agree exactly. If gross, net and tare values are all measured they may be in different weighing ranges it is likely that they will not be in mathematical agreement.

The Office of Weights and Measures has suggested that the calculated value part of S.1.16. be put in a separate section. The proposal keeps it with recorded values because the scale is using recorded values to perform the calculations. The proposal followed R76 as these were all in the same section.

The submitters requested that this be a Retroactive Voting item in 2025.

NIST OWM Executive Summary

SCL-24.2 D Multiple Sections Regarding Tare

NIST OWM Recommendation: Developing

- NIST OWM recognizes the issues raised by the submitter. The error introduced into the measurement under the current requirements can be as much as the acceptance tolerance for single interval scales and a multiple of the acceptance tolerance for multi-interval scales.
- NIST OWM believes that the proposed amendments may help solve these issues. However, there are still parts of this item that are not yet fully developed. NIST OWM supports further development of the item.

Table 2. Summary of Recommendations
SCL-24.2 D Multiple Sections Regarding Tare

	Status Recommendation		Note*	Comments
Submitter	Voting			
OWM	Developing			
WWMA	Developing			
NEWMA	Developing			
SWMA	Withdrawal			
CWMA	Developing			
NCWM	Developing			
	Number of Support Letters	**Number of Opposition Letters**	**Comments**	
Industry				
Manufacturers				
Retailers and Consumers				
Trade Association		1		

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

Item Under Consideration:

NOTE: This item has been edited to correct formatting errors. The Item Under Consideration now reflects the structure required by NIST Handbook 44.

Amend NIST Handbook 44, Section 2.20. Scales Code and Appendix D, Definitions as follows:

S.1.1.1. Digital Indicating Elements.

(a) A digital zero indication shall represent a balance condition that is within ± ½ the value of the scale division d. **This does not apply to weight classifiers or to the counting feature on prescription scales.**

(b) After zero-setting (gross zero or net zero after a tare operation) the effect of zero deviation on the result of the weighing shall be not more than ***± 0.25 e.:***

(i) ± 0.5 e for Class IIIL scales and Class IIII highway weight enforcement scales with values of n = 400 or greater, or

(ii) ± 0.25 e for all other scales. On a multi-interval scale, e shall be replaced by e_1.

(Amended 20XX)
[Nonretroactive as of January 1, 2025]

(c) A digital indicating device shall have a "center-of-zero" indicator that indicates a zero-balance condition when the deviation from zero is not more than ***± 0.25 e the corresponding values in***

S.1.1.1.(b). *A "center-of-zero" indicator may operate when zero is indicated for gross and/or net mode(s). The "center-of-zero" indicator is not mandatory on a device equipped with an auxiliary indication or equipped with an enabled zero tracking mechanism that maintains a "center-of-zero" condition* ~~***to ± 0.25 e***~~ ***compliant with S.1.1.1.(b)*****.**
[Nonretroactive as of January 1, 1993]

(Amended 20XX)

(d) 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, 2019, 2024**, and 20XX**)

S.1.1.3. Analog Indicating Elements. – After zero-setting the effect of zero deviation on the result of the weighing shall be not more than:

(i) ± 0.5 e for Class IIIL scales and Class IIII highway weight enforcement scales with values of n = 400 or greater, or

(ii) ± 0.25 e for all other scales.

[Nonretroactive as of January 1, 20XX]
(Added 20XX)

S.1.15. Identification of Weight Indications.

(a) Gross indications need not be identified, but may be identified by the symbol "G" to the right of the weight value, e.g., 4.48 kg G.

(b) Net indications shall be identified by the symbol "N" to the right of the weight value, e.g., 4.48 kg N.

(c) However, it is permitted to replace the symbols "N" or "G" with the terms "net" or "net weight", or "gross" or "gross weight" respectively adjacent to the weight display.

[Nonretroactive as of January 1, 20XX]

(Added 20XX)

S.1.16. Identification of Recorded and Calculated Weighing Results.

(a) Recorded values shall match associated indicated values, including any gross or net identification of the corresponding indication using the symbols "G" or "N" to the right of the weight value, e.g., 4.48 kg G.

(b) If only net weight values are recorded without corresponding gross or tare values, they may be recorded without any identification. This applies also where semi-automatic zero setting and semi-automatic tare are initiated by the same key.

(c) Recorded values may include additional gross, net, and/or tare identification based on operator knowledge of the applied. If gross, tare, and net weight values are all recorded together, the net and tare values shall at least be identified by the corresponding symbols "N" and "T."

(d) However, it is permitted to replace the symbols "G", "N" and "T" by corresponding text, e.g., "gross" or "gross weight," "net", or "tare" respectively either before or after the weight value, e.g., 10 kg N or Net 10 kg.

(e) When gross, net and tare values are recorded together, one of these values may be calculated from two recorded weight values based on the formula Gross – Tare = Net. The calculation shall be

mathematically correct. See Note. In the case of a multi-interval or multiple range scale the calculated weight value may be presented with a smaller scale division. Example:

455 kg	***Gross Weight (WR2 d = 5 kg)***
- 14 kg	***Tare Weight (WR1 d = 2 kg)***
= 441 kg	***Net Weight (mathematically correct but d is 1 kg)***

Note: when gross, net, and tare values are recorded together and all three values are independently measured, it is not possible to ensure mathematical agreement due to rounding errors.

(Nonretroactive as of January 1, 20XX)

(Added 20XX)

N.1.13. Testing Requirements. – When measuring errors for compliance with Table 6., the following shall apply.

(a) For Class IIIL scales and Class IIII highway weight enforcement scales with values of n = 400 or greater, the test load shall be applied at a zero/reference value accurate to ± 0.5 e, and the error calculation shall resolve the error to the nearest 1 e.

(b) For all other scales, the test load shall be applied at a zero/reference value accurate to ± 0.25 e, and the error calculation shall resolve the error to the nearest 0.2 e.

(Added 202X)

T.N.2.1. General. – The tolerance values ~~**are positive (+) and negative (−)**~~ **herein prescribed shall be applied to errors of overregistration and underregistration.** ~~**with the weighing device adjusted to zero at no load. When tare is in use, the tolerance values are applied from the tare zero reference (zero net weight indication); the tolerance values apply to the net weight indication for any possible tare load using certified test loads.**~~ **The tolerances apply to errors in gross indications when no tare mechanism is in use, and they apply to errors in net indications when a semi-automatic tare mechanism is in use. (See N.1.13.)**

T.N.3.3. Wheel-Load Weighers and Portable Axle-Load Weighers of Class IIII. – The tolerance values are two times the values specified in T.N.3.1. Maintenance Tolerance Values and T.N.3.2. Acceptance Tolerance Values **for scales with n of 400 or greater.**

(Amended 1986 and 202X)

NIST OWM Detailed Technical Analysis:

Paragraph S.1.2.1 is the only requirement in the current Scales Code that specifies how a net weight must be calculated, and it only applies to multi-interval or multiple range scales. It requires the Net Weight to be mathematically correct when calculated from the Gross & Tare Weight.

Net = Gross – Tare

The consequence of the requirement of mathematical agreement is that the calculated value has a rounding error. On a normal single-interval scale, this rounding error can be as big as 0.5 e. If the calculation is performed as suggested in the example included in paragraph S.1.2.1, then this rounding error occurs in the Net value, which is the value that is used for the commercial transaction.

Example 1:

An item is weighed on a scale with e = 1 g using a pushbutton tare.

Assume the actual tare value = 10.5 g and the actual gross weight= 31.4 g

=> The actual net weight is = 31.4 g - 10.5 g = 20.9 g

The indications of the Gross and Tare values rounded to e are:
Gross = 31 g, Tare = 11 g

Due to mathematical agreement, the Net is calculated from these rounded values:
Net = Gross – Tare = 31 g – 11 g = 20 g

The indication of Net is 20 g, while in reality, it should be 21 g.

When using error weights to determine the error in the Net value, the Net indication changes from 20 g to 21 g when adding a 0.1 g error weight. This is because the internal gross load changes from 31.4 g to 31.5 g which causes the gross indication to round up to 32 g (32 g – 11 g = 21 g), assuming the scale rounds up at 0.5 g. Again, assuming the scale rounds to 21 g when the internal value reaches 20.5 g, you would assume the internal net weight was 20.4 g before applying the 0.1 g error weight. **This indicates an error of -0.5 e (20.4 g – 20.9 g)**. This error, due to rounding only, is equal to the acceptance tolerance. On top of this rounding error, there is the intrinsic error (the inaccuracy) of the scale.

On a multi-interval scale this problem is even bigger.

Example 2:

A multi-interval scale is used to fill propane tanks: 6/15 kg x 0.002/0.005 kg

The tank is filled with propane that weighs 0.999 kg. The actual weight of the empty tank is 7.003 kg and

=> The actual gross = 7.003 kg + 0.999 kg = 8.002 kg

Indications rounded to e:
Gross = 8.000 kg (e=0.005 kg)
Tare = 7.005 kg (e=0.005 kg)

Net calculation due to mathematical agreement:
Net = Gross – Tare = 8.000 kg – 7.005 kg = 0.995 kg

Because the net value falls in the lower range, its corresponding scale division is 0.002 kg and should be displayed as 0.998 kg. The acceptance tolerance is 0.5 e = 0.001 kg.

The difference between the indication and the true value is 0.003 kg which is **3x the acceptance tolerance**.

The current language in the scale code and our test procedures have several shortcomings that facilitate the problem of rounding errors, and this creates non-uniformity:

1) The general interpretation of NIST HB 44 is that Gross, Tare, and Net calculations must be in mathematical agreement, but there is no such requirement. Only the example in paragraph S.1.2.1 seems to suggest that they must be in mathematical agreement, but a clear requirement is missing.

2) To obtain the most accurate measurement, it is generally accepted that rounding must be the very last operation when calculating a weight value. However, to achieve mathematical agreement, S.1.2.1. forces rounding of the first two weight values and then calculation of the third one. This is the only way to guarantee mathematical agreement. Therefore, as prescribed in S.1.2.1, rounding is NOT the final operation.

3) Mathematical agreement also requires that one of the values is a calculated value, but the code does not specify which value shall be calculated. This leads to different implementations of the tare operation on instruments in the field.

4) S.1.2.1 conflicts with S.5.3. Multi-Interval and Multiple Range Scales, which states that on a multi-interval scale and multiple range scale, the value of "e" shall be equal to the value of "d". The examples in S.1.2.1 show Net values with a scale division that deviates from the verification scale interval.

5) As Example 1 and Example 2 show, the deviation in the Net value can be large and even cause the scale to be out of tolerance.

6) Mathematical agreement causes a deviation in one of the three values (Net, Tare or Gross). This deviation can cause non-compliance with G-S.5.2.2.c. which states that a digital value must be rounded off to the nearest minimum unit.

7) When the Net zero is calculated from the rounded Gross and rounded Tare values as shown in S.1.2.1., an offset is introduced in the Net zero. This offset can exceed the 0.25 e tolerance for the accuracy of the zero prescribed by S.1.1.1. Digital Indicating Elements causing the scale to be non-compliant.

8) The size of the rounding error depends on the actual loads. Since tests are normally performed with test loads equal to an exact number of verification scale intervals (e.g., a tare weight of exactly 50 e and a net load of 200 e), the rounding error observed is zero (or close to zero), and the problem remains hidden. A better way to test the tare function on a scale is to use a tare weight close to the changeover point between two indications.

The submitter acknowledges that mathematical agreement cannot be guaranteed if all three values are weighed by the scale, but the language in the proposed paragraph S.1.16.(e) repeats the example in S.1.2.1. and the other parts of the item don't seem to provide clarification regarding when mathematical agreement (or mathematically correct calculations) are acceptable.

NIST OWM believes it is beneficial to make a clear distinction between the weight values obtained through a continuous weighing operation and weight values that are the result of the mathematical calculation of separate weighing operations.

Figure 1: Tare operation (A) versus a calculated weight value (B)

A tare operation is applied during a single weighment (see figure 1A). Weighing results obtained through a tare operation are not necessarily in mathematical agreement since the internal analog values are rounded off to the applicable scale division. A calculated weight value is the result of a mathematical calculation (see figure 1B) and therefore always in mathematical agreement.

OWM suggests omitting proposed part (e) of paragraph S.1.16 from the item and works towards adding or amending a paragraph that addresses when it is acceptable to require a mathematically correct net weight determination (calculated value vs determined value). Deleting the second paragraph and examples in S.1.2.1 should be considered as a starting point to correct this issue.

Summary of Discussions and Actions:

This item is new for the 2026 NCWM cycle. There has been no discussion at the NCWM level.

Regional Association Reporting:

Western Weights and Measures Association

At the 2025 WWMA Annual Meeting, the following comments were received:

Mr. Cory Hainy (Scale Manufactures Association): SMA does not support this item. SMA does not see confusion with the current language and does not warrant the changes to this section of the handbook. SMA recommends the item be Withdrawn.

Mr. Matthew Douglas (State of California, Division of Measurement Standards): As presented, he is having difficulty with what language is part of the amendments. It is difficult to identify what parts were under consideration. The language is confusing for enforcement, recommended a Developing status.

Mr. Loren Minnich (NIST Office of Weights and Measures): Confirmed NIST OWM has not had time to develop their analysis yet.

The 2025 WWMA S&T Committee recommends that this item remain Developing. The Committee recommends that the submitter continue to work with NCWM to further develop the item and clarify the language.

The Committee additionally recommends that the submitter of the item address the formatting and move the justification found throughout this item to the appropriate section under Original Justification.

Southern Weights and Measures Association

At the 2025 SWMA Annual Meeting, the following comments were heard:

Corey Hainey, Scale Manufacturing Association – There is a document containing their position on the website – carryover - SMA stated their stance in April. They are not in support of this item and recommend Withdrawn Status. They do not believe there is enough confusion to constitute a change.

The committee recommends Withdrawn status on this item.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, no comments were heard.

The Committee recommended Developing status.

At the 2025 NEWMA Interim Meeting, a Representative from NJ asked whether the committee was aware that the submitter is working with NIST on this item.

The Committee recommended developing status.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommended Developing status.

At the 2025 CWMA Interim Meeting, no comments were heard.

The Committee recommends this item remain Developing.

Scale Manufacturers Association (SMA)

At the 2026 SMA Spring Meeting, they opposed this item and recommended it be withdrawn.

Rationale: The SMA does not feel there is confusion to warrant the change.

At the 2025 SMA Fall Meeting, they opposed this item and recommended it be withdrawn.

Rationale: The SMA does not feel there is confusion to warrant the change.

SCL-25.1 V S.5.2. Parameters for Accuracy Class, S.6. Marking Requirements, and UR.3. User Requirements

Source: NIST Office of Weights and Measures

Submitter's Purpose and Justification:

To amend Table 8 to reference d as the value for determining the recommended minimum load.

Original Justification:

- UR.3.1. & Table 8 were adopted to reduce the error associated with rounding of the scale division (d).
- Most scales are configured with e = d; this proposal has no effect on these devices.
- Using d to determine the recommended minimum load is technically correct.

NIST OWM Executive Summary

SCL-25.1 V S.5.2. Parameters for Accuracy Class, S.6. Marking Requirements, and UR.3. User Requirements
NIST OWM Recommendation: Voting • Expressing the minimum load in scale divisions, d, is technically justified as it is a matter of display resolution, and not the tolerance or accuracy of the scale. OWM encourages the members to carefully read this justification in the detailed OWM analysis. • This proposal brings the Scales Code in line with OIML R 76 regarding its relationship to the scale division. • OWM believes that the item has been fully vetted and supports a voting status.

Table 2. Summary of Recommendations
SCL-25.1 V S.5.2. Parameters for Accuracy Class, S.6. Marking Requirements, and UR.3. User Requirements

	Status Recommendation	Note*	Comments
Submitter	Voting		
OWM	Voting		
WWMA	Informational		
NEWMA	Voting	1	
SWMA	Voting		
CWMA	Informational		
NCWM	Informational		

	Number of Support Letters	Number of Opposition Letters	Comments
Industry			
Manufacturers			
Retailers and Consumers			
Trade Association			

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

Item Under Consideration:

Amend NIST Handbook 44, Section 2.20. Scales Code as follows:

Table 8. Recommended Minimum Load

Class	Value of Verification Scale ~~Division~~Interval (~~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

***The value of "e" is specified by the manufacturer as marked on the device (see Table S.6.3.a).** 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**~~**interval** "e" is the value of the scale division immediately preceding the auxiliary means. For Class III and IIII devices

Table 8. Recommended Minimum Load		
Class	**Value of Verification Scale ~~Division~~Interval (~~d or~~ e*)**	**Recommended Minimum Load (d ~~or e*~~)**
~~the value of "e" is specified by the manufacturer as marked on the device;~~ "e" must be **~~less than or~~** equal to "d."		
**A minimum load of 10 d is recommended for a weight classifier marked in accordance with a statement identifying its use for special applications.		

(Amended 1990 **and 202X**).

NIST OWM Detailed Technical Analysis:

NIST Handbook 44 contains a definition for Minimum Capacity applicable to Sections 2.20. Scales, and 2.24. Automatic Weighing Systems. However, in Section 2.20, the term "minimum capacity" is not used or further defined in any of the specifications; it only appears in UR.1, Selection Requirements. When the Scales Code was reorganized in the 1980s, the draft language for Table 3 included a column titled Minimum Capacity. As the language developed, the values for Minimum Capacity specified in Table 3 eventually became Table 8 Recommended Minimum Load under UR.3.1. Recommended Minimum Load.

The intent of both the requirement for the recommended minimum load and the specification of the minimum capacity is the same: to discourage the use of a scale for weighing loads below this value. The minimum capacity and recommended minimum load depend on the accuracy class of the scale. The values of the minimum capacity as specified in OIML R 76 are identical to the values of the recommended minimum load in Table 8 of NIST Handbook 44, Section 2.20 Scales.

The minimum capacity is defined in NIST Handbook 44 as "*The smallest load that may be accurately weighed. The weighing results may be subject to excessive error if used below this value*". This definition is not entirely correct as it suggests loads below the minimum capacity (or recommended minimum load) may not be accurately weighed. **This is incorrect as the minimum capacity has nothing to do with the accuracy of the weighment (or the accuracy of the scale) but instead has to do with the uncertainty in the weighing result (the rounded weight value that is indicated), due to the relatively low resolution of the indication**.

When a scale is used for a commercial transaction, the uncertainty of the weighing result is a combination of the error in the actual weighment (accuracy of the scale) and the resolution of the indication, illustrated below:

$$u_t = \sqrt{u_w^2 + u_r^2} \qquad (1)$$

Where u_t is the total uncertainty of the weighing result, u_w is the uncertainty due to the inaccuracy of the weighment, and u_r is the uncertainty due to the resolution of the indication.

The uncertainty due to the resolution of the indication is half a scale division, 0.5 d. The uncertainty due to the inaccuracy of the weighment is not as straightforward.

Consider a scale that is certified to comply with the tolerances in NIST Handbook 44. The error at the lower end of the weighing range is allowed to be somewhere between -1 e and + 1 e. When not taking any other factors into account, it is justified to set the uncertainty of the weighment to 1 e. However, when considering the actual performance of a certified scale, it can be concluded that an error of 1 e is rarely found.

Figure 1 shows a more realistic error and tolerance of a class II scale with 30,000 verification scale intervals. Assuming that the scale is certified and that the error is linear, the error of a weighment will fall somewhere in the shaded area of the plot.

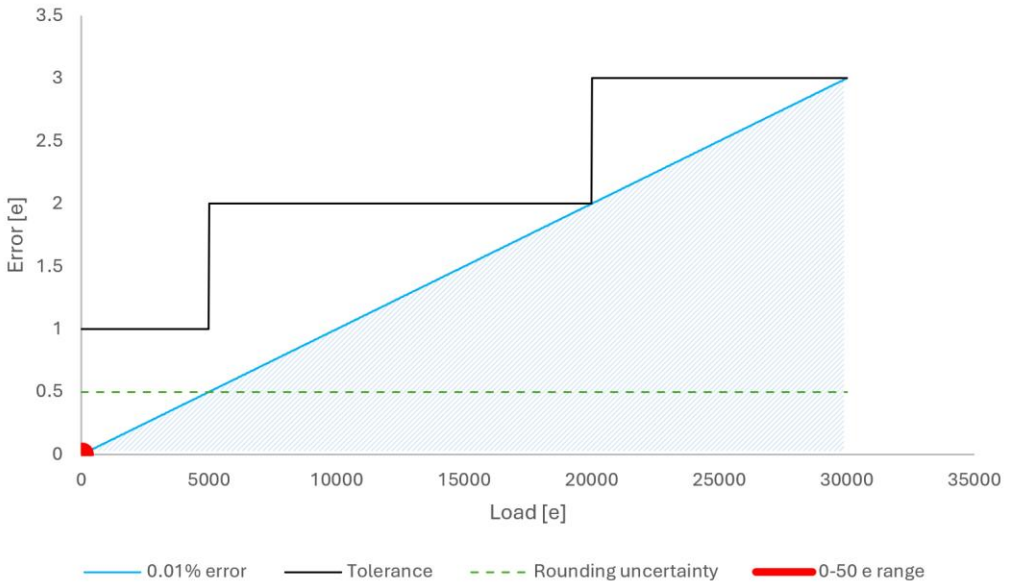


Figure 1: The maximum error, tolerance, and rounding uncertainty of a Class II scale

Currently, the recommended minimum load for a class II scale with a verification scale interval, e, of 0.1 g is equal to 50 e. The main question is whether it is justified to express the recommended minimum load in scale divisions, d. Therefore, the focus of the discussion is the range below 50 e. This particular range in Figure 1 is the red ”line”. However, since 50 e is so close to the zero point of the scale compared to the rest of the weighing range, the red line is plotted as a red dot practically on top of zero.

The maximum error at 50 e for the plot in Figure 1 can be estimated at:

$$E_{50e} = \frac{3\ e}{30{,}000\ e} \times 50\ e \qquad (2)$$

$$E_{50e} = \ 0.005\ e \approx 0\ e$$

That means that the uncertainty of the weighment, u_w, in formula 1, can be reduced from 1 e to 0.005 e.

When the scale division, d, is equal to the verification scale interval, e, the uncertainty of the weighment is 100 times smaller than the uncertainty due to the display resolution, u_r, of 0.5 e and can be neglected as shown in (2) above. The total uncertainty of the weighing result is therefore primarily determined by the resolution.

When the scale division, d, is 10x smaller than e, even then, the total uncertainty of the weighing result, u_t, is still primarily determined by the resolution, as shown below.

$$u_t = \sqrt{u_w^2 + u_r^2} \ \text{ where } \ u_w = 0.005\ e \ \text{ and } \ u_r = 0.5\ d = 0.05\ e$$

$$u_t = \sqrt{(0.005\ e)^2 + (0.05\ e)^2} \qquad (3)$$

$$u_t = 0.050249\ e \approx 0.05\ e = 0.5\ d$$

$$u_t \approx 0.5\ d$$

The current recommended minimum load is set to 50 e for a class II scale with a 0.1 g verification scale interval. That means that the possible error in the weighing result that is used for the transaction can be as much as 0.5 e/50 e = 1% leading to an error of up to 1% in the transaction price.

If a maximum error of 1% is deemed acceptable, then the minimum load for a scale with a scale division, d = 0.1 e, can be calculated as follows:

$$\frac{0.5\ d}{Min} = 1\%$$
$$Min = \frac{0.5\ d}{1\%} \quad (4)$$
$$Min = 50\ d$$

To summarize:

- when d = e, the recommended minimum load is 50 e, which is equal to 50 d.
- when d = 0.1 e, the recommended minimum load can also be 50 d to mimic the same uncertainty as when d equals e.

It is no surprise that in both cases the recommended minimum load equals 50 d, as it was already concluded that the uncertainty of the weighing result at such a small load only depends on the resolution of the indication, regardless of the verification scale interval, e, or the tolerance, which is based on e.

Summary of Discussions and Actions:

During the NCWM 2026 Interim Meeting, Loren Minnich (NIST OWM) gave a presentation supporting amending Table 8 to reference the scale division. Corey Hainy (SMA) indicated that the SMA supports "e", not "d" as the value to reference in Table 8 as referencing "d" will result in a much smaller minimum load. Matt Douglas (CDA DMS) agreed with the SMA's position and supported an Informational status to allow more time for consideration and suggested that "recommended" should be removed from UR.3.1. and Table 8, so the minimum load is required. Jim Willis (NY) supported the item as Voting or Informational if there are those who need more time to evaluate the item. In reference to Matt Douglas's comments regarding removing "recommended" from UR.3.1. and Table 8, Loren Minnich (NIST OWM) replied that OWM would support that, but it is a separate issue, and the value referenced in Table 8 needs to be clarified before addressing "recommended" vs. "required" minimum loads.

The NCWM S&T Committee assigned the item a Voting status.

During the NCWM 2025 Annual Meeting, the Committee updated the item based on the recommendations from NIST OWM (focusing on the proposal to base the minimum load on scale division, d), including amendments to the purpose, justification, and IUC, all of which have been implemented. The Committee is requesting further feedback on these changes.

During the NCWM 2025 Interim Meeting, the Committee retained the Informational status following the submitter's request and comments heard from the floor during the open hearing.

During the 2024 NCWM Annual Meeting, Loren Minnich (NIST OWM) asked the Committee to remove the paragraphs related to the recommended minimum load, which included UR.3.1. and Table 8. Recommended Minimum Load, from item SCL-23.3 because, as proposed, Table 8 referenced the verification scale interval (e) as opposed to the scale division (d), which is technically incorrect. Loren explained that the recommended minimum load requirement, as described in UR.3.1., is intended to reduce

the relative error due to rounding of the scale division (d) associated with the use of a device at light loads. The Committee agreed to remove the paragraphs and create a new item, SCL-25.1, that was assigned an Informational status. After the conclusion of the meeting, NIST OWM submitted a group of items intended to address this issue and the Committee agreed to accept these as the basis for SCL-25.1.

Regional Association Reporting:

Western Weights and Measures Association

During the WWMA 2025 Annual Meeting Mr. Loren Minnich (NIST Office of Weights and Measures) recommended that this table be updated to clarify that the determination for recommended load be based on the scale interval when a scale has an (e) not equal to (d), the recommended load is based on (e) right now. The table says to use (e) no matter what and that is confusing and technically incorrect. This will reduce rounding error, and its intended purpose is to reduce rounding errors with display of digital indication. The way that it is proposed now is the correct way. Mr. Matthew Douglas (State of California, Division of Measurement Standards) is generally supportive, however asked why the recommended minimum load would be based on (d) if the tolerances are based on (e)? Mr. Loren Minnich (NIST Office of Weights and Measures) clarified per the definition, tolerances are based on verification scale intervals and that Table 8 does not have to do with tolerance, just established suitable use of devices. He gave an example of a beam scale that is balanced between divisions, you can see where it's at but with a digital scale you cannot see that. You can see where it lands but not where it came from. This attempted to require a minimum load, so that rounding error does not have a significant effect on scale determination. That is why it is based on (d) and not (e). Mr. Khoa Lam (Los Angeles County, California) asked if this refers to Class I or II scales, where sometimes the last number is in a bracket, and we could see the (e) that was used to determine. Mr. Loren Minnich (NIST Office of Weights and Measures) stated that (d) value is the one in brackets, (e) is the one to the left of that. Mr. Cory Hainy (Representing the Scale Manufactures Association) stated that the SMA opposes this item as written as it also poses a burden to the scale manufacturer.

The 2025 WWMA S&T Committee recommends that this item remain Informational. The Committee looks forward to further development of this item and encourages stakeholders to review and provide feedback to the submitter of this item.

During the 2024 WWMA Annual Meeting, Loren Minnich (NIST OWM), stated the item proposes removing Table 8 and insert new table to specifications "Minimum Capacity", Everything would be based on "d". Minimum capacity is something that the user should be aware of and the specification to require marking the device. (clarifying question from the committee?) Yes-The intention is still "recommended". Still wants the user to use the scale in that way and believes it is more effective with one table. Mr. Minnich also stats that he prefers minimum capacity to minimum load.

Steven Harrington (Oregon Department of Agriculture, Weights and Measures Program) has concerns with "recommended" believes recommended limits the ability to make this enforceable.

Matthew Douglas (State of California, Division of Measurement Standards): Supports Mr. Harrington's comments and believes this item needs further development and recommends an informational status. The item has a recommended minimum load and minimum capacity, they are two different things. This needs clarification.

Corey Hainy (SMA): The SMA will meet in November to discuss all SCL items and develop a position.

The 2024 WWMA S&T Committee recommends this item remain Informational and looks forward to further development of the item with consideration of the comments heard during open hearings.

Southern Weights and Measures Association

During the 2025 SWMA Interim Meeting Corey Hainey, SMA – opposed the item, as written. Using d as minimum capacity allows for smaller load, increasing error. This would put a burden on the manufacturer, with little to no benefit to consumers. Mauricio Mejia, Florida – supports item as Voting.

The committee recommends Voting status on this item.

During the 2024 SWMA Annual Meeting, Cory Hainy, SMA – Association meets in November and will determine their status at that time. A letter was received of Ross Andersen for alternative language to be considered.

The committee recommends the item remain informational.

Northeastern Weights and Measures Association

During the 2026 NEWMA Annual Meeting, a representative from the NIST OWM stated that expressing the minimum load in scale divisions (d) is technically correct and addresses the uncertainty of the indication due to rounding of the scale division, rather than the tolerance or accuracy of the scale. This proposal aligns the Scales Code with OIML R 76 regarding its relationship to the scale division. It should be noted that Table 8 applies to all scales. If there are concerns with the suitability of scales used to sell cannabis, there are other methods to addresses these issues. OWM believes that the item has been fully vetted and supports a voting status. Representatives from the State of New Jersey and the State of New York believe the item is fully developed and support a voting status.

The Committee recommends this item remain as Voting.

During the 2025 NEWMA Interim Meeting, a representative from NY supports the use of “d” when determining the recommended minimum load because this is technically correct. Recommends voting status.

During the 2025 NEWMA Annual Meeting, no comments were heard from the floor on this item. The Committee received written comments from the SMA in opposition of the item as written, which can be found in the supporting documents.

The Committee recommended retaining an Informational status and the body concurred.

During the 2024 NEWMA Interim Meeting, Steve Timar (NY) commented that he originally did support the proposal but questioned how a recommendation could be enforceable. UR.3.1. “Recommended minimum load” should be “Required minimum load” for commercial transactions. It is part of device suitability and should be enforceable regardless of what commodity is being weighed and offered support for the submitter’s (Ross Anderson) proposed changes to replace Table 8 Recommended Minimum Load with Table T.N.1.4 and placing it in the Tolerance section of HB 44 rather than in the Specifications. This would also solve the proposal put forth by the Cannabis Task Group making the minimum loads for cannabis products required minimum loads. Cheryl Ayer (NH) commented that she agrees with NY. Scott Dolan (VT) questioned if it should appear as a user requirement, not a specification. Steve Timar stated that the intent was to mirror OIML R76 specification table and a recommendation cannot be enforced.

After hearing comments from the floor, the Committee recommended a Voting status, with the changes recommended by Ross Anderson and the body concurred.

Central Weights and Measures Association

During the 2026 CWMA Annual Meeting, the Committee recommends this item remain as Voting.

During the 2025 CWMA Interim Meeting, the committee recommends this item remain Informational to address comments made during open hearing.

During the 2025 CWMA Annual Meeting, no comments were heard. The committee recommended the item remain Informational.

During the 2024 CWMA Interim Meeting, Loren Minnich (NIST OWM) commented that as Table 8. appears, if you have a scale where d and e are not equal then rounding will need to occur and that will cause an error. It was also stated that even though Table 8. is being moved to the Specification section as a marking requirement, it is still guidance. The commentor welcomes comments on ways to improve this item.

Greg Vander Plaats (MN) commented that there are no problems with moving the information from Table 8. to the specifications portion of the Scales Code because there will still be a User Requirement reference to the newly created Specifications Table. It was also stated that the minimum load should be in "e" not "d" and that the minimum recommended load for class II scales be changed from 20e to 50e. The NIST OWM representative was not opposed to this suggestion and appreciates the consideration.

Dick Suiter (Richard Suiter Consulting) commented that the issue of recommended minimum load has been in front of the conference numerous times and that they still have a problem with a recommended minimum load and the Handbook should do away with the word 'recommended'.

The committee recommends this item as developing so that the submitter can gather input and address concerns from the body.

Scale Manufacturers Association

At the 2026 SMA Spring Meeting, the SMA's position is that they believe the recommended minimum load should be based on "e", not "d". If this change is made, the SMA supports this and would recommend it as a voting item.

Their rationale is as follows: Using d for the minimum capacity allows a much smaller minimum load, which results in a much larger relative error.

At the 2025 SMA Fall Meeting, the SMA's position is that they believe the recommended minimum load should be based on "e", not "d". If this change is made, the SMA supports this and would recommend it as a voting item.

Their rationale is as follows: Using d for the minimum capacity allows a much smaller minimum load, which results in a much larger relative error.

At the 2025 SMA Spring Meeting, the SMA opposed this item as written and reiterated its rationale.

At the 2024 SMA Fall Meeting, the SMA opposed this item as written. Their rationale is as follows:

- Using d for the minimum capacity allows a much smaller minimum load, which results in a much larger relative error.
- Marking requirements would result in a burden on manufacturers with limited benefit to the end user.

SCL-25.3 W UR.3.14. Zero-Balance Recorded Weight for Forklift Scales

(This Item was Withdrawn at the 2026 NCWM Interim Meeting.)

HGV – HYDROCARBON GAS VAPOR-MEASURING DEVICES

HGV-25.1 D S.1.1.4. Advancement of Indicating and Recording Elements., S.11.5. Proving Indicator., S.2.2. Provision for Sealing., S.4.3. Temperature Compensation., S.4.4. ~~Badge~~Identification., N.3. Test Drafts., N.4.1. Normal Tests., and Appendix D. Definitions register

Source: California Department of Food and Agriculture – Division of Measurement Standards

Submitter's Purpose and Justification:

The proposed changes are to recognize new technologies in hydrocarbon gas vapor-measuring devices.

Original Justification:

The proposed changes are to recognize new technologies in hydrocarbon gas vapor-measuring devices.

Traditionally, Hydrocarbon Gas Vapor-Measuring Devices have been mechanical positive-displacement meters, however new technologies are available which are electronic in design.

Currently, the NIST Handbook 44 Section 3.33. Hydrocarbon Gas Vapor-Measuring Devices Code requires a badge ("badge" is defined in Appendix D in association with the 3.33. code to be "A metal plate…") which has specified markings and is to be affixed to the meter.

Additionally, the Section 3.33. Hydrocarbon Gas Vapor-Measuring Devices Code identifies that temperature compensation markings must appear on the register of the device. New technologies are available for which the body of the meter is plastic or another material which is able to be permanently marked with required identification information.

Mechanical registers can be removed and replaced necessitating temperature compensation information (if applicable) to be marked on the register. New technologies are available whereby electronic registers incorporated into the body of the meter and would not need this information on the register.

Proving indications have traditionally been used to allow for testing as the mechanical registers used in the past have had a limited resolution. Newer meters both mechanical and electronic are capable of displaying to the resolution necessary for testing.

Currently the only sealing provision identified by the 3.33. Hydrocarbon Gas Vapor-Measuring Devices Code is a security seal, the proposed language incorporates categories of sealing applicable to other device types.

The term "register" is not currently defined.

The submitter requested that this be a Voting Item in 2024.

NIST OWM Executive Summary

HGV-25.1 D S.1.1.4. Advancement of Indicating and Recording Elements., S.11.5. Proving Indicator., S.2.2. Provision for Sealing., S.4.3. Temperature Compensation., S.4.4. ~~Badge~~Identification., N.3. Test Drafts., N.4.1. Normal Tests., and Appendix D. Definitions register

NIST OWM Recommendation: Developing

- There is currently a paragraph numbered UR.1.1. in Section 3.33. This item proposes a new paragraph UR.1.1. which must be renumbered.
- Within the justification of this item, there is a recommendation to add "register" to the Definitions in NIST HB 44, but no definition for "register" is included in the proposal. See Detailed Analysis.
- Although the National Propane Gas Association supported these items at the Interim meeting, the submitter requested that the item be given a developing status so that formatting issues can be corrected and to allow the corrected proposal additional time for review. NIST OWM supports a developing status.

Table 2. Summary of Recommendations

HGV-25.1 D S.1.1.4. Advancement of Indicating and Recording Elements., S.11.5. Proving Indicator., S.2.2. Provision for Sealing., S.4.3. Temperature Compensation., S.4.4. ~~Badge~~Identification., N.3. Test Drafts., N.4.1. Normal Tests., and Appendix D. Definitions register

	Status Recommendation	Note*	Comments
Submitter	Developing		
OWM	Developing		
WWMA	Developing		
NEWMA	Developing		
SWMA		5	
CWMA	Developing		
NCWM	Developing		

	Number of Support Letters	Number of Opposition Letters	Comments
Industry			
Manufacturers			
Retailers and Consumers			
Trade Association			

***Notes Key:**

1. Submitted modified language
2. Item not discussed or not considered
3. No meeting held
4. Not submitted on agenda
5. No recommendation

Item Under Consideration:

NOTE: This item has been edited to properly identify the section of the handbook affected and to correct formatting errors. The Items Under Consideration now reflect the structure required by NIST Handbook 44.

Amend NIST Handbook 44, Section 3.33. Hydrocarbon Gas Vapor-Measuring Devices Code as follows:

NOTE: This item was modified for 2026 by the developer. Changes are highlighted.

S.1.1.4. Advancement of Indicating and Recording Elements. – Primary indicating and recording elements **~~shall advance digitally or continuously and be susceptible to advancement only by the mechanical operation of the device.~~ shall advance only by the designed operation of the device. (Amended 20XX)**

S.1.1.5. Proving Indicator. – **All Hydrocarbon Gas Vapor-Measuring Devices shall be equipped with a proving indicator as described below or an indication which satisfies the resolution requirements identified below applicable to a proving indicator.**

(a) For mechanical (analog) proving indicators the following applies:

(1) Devices rated less than 280 m^3/h (10 000 ft^3/h) gas capacity shall be equipped with a proving indicator measuring 0.025 m^3, 0.05 m^3, 0.1 m^3, 0.2 m^3, or 0.25 m^3 per revolution, (1 ft^3, 2 ft^3, 5 ft^3, or 10 ft^3 per revolution) for testing the meter. **~~Devices with larger capacities shall be equipped as follows:~~**

(2) **~~(a)~~** Devices rated 280 m^3 (10 000 ft^3) up to but not including 1700 m^3/h (60 000 ft^3/h) gas capacity shall be equipped with a proving indicator measuring not greater than 1 m^3 (100 ft^3) per revolution.

(3) **~~(b)~~** Devices rated 1700 m^3/h (60 000 ft^3/h) gas capacity or more shall be equipped with a proving indicator measuring not more than 10 m^3 (1000 ft^3) per revolution.

~~The t~~Test circle **~~of the~~** proving indicator**s** shall be divided into ten equal parts. Additional subdivisions of one or more of such equal parts may be made.

(b) For electronic (digital) proving indications, the smallest unit of volume displayed shall be no larger than 1/1000 of the value of the smallest unit of indicated delivery required in S.1.1.3. Value of Smallest Unit. The meter shall be capable of displaying the proving indication continuously while testing the meter.

(Amended 1973**, ~~and~~** 1988**, and 20XX**)

…

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

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

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

(a) any measuring or indicating element;

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

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

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

Audit trails shall use the format set forth in Table S.2.2. Categories of Device and Methods of Sealing.* [*Nonretroactive as of January 1, 20XX]
(Amended 2019 **and 20XX**)

Table S.2.2. Categories of Device and Methods of Sealing	
Categories of Device	***Method of Sealing***
Category 1: No remote configuration capability.	***Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.***
Category 2: Remote configuration capability, but access is controlled by physical hardware. The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.	***The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.***
Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password). 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.	***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 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, 20XX]
(Table Added 20XX)

S.2.5. Adjustments and Corrections for Measuring Elements and Measuring Systems. – Other than devices with mechanical meters, Hydrocarbon Gas Vapor-Measuring Devices shall be equipped with automatic means to determine and correct for changes in the product's properties or variations in other parameters having a significant metrological effect that results in a measured quantity in excess of allowable error limits when compared with the delivered quantity. The device shall provide a means to identify when these features are not operating properly. [Nonretroactive as of January 1, 20XX]

(Added 202X)

S.4. Marking Requirements. - In addition to all the marking requirements of Section 1.10. General Code, paragraph G-S.1. Identification, each Hydrocarbon Gas Vapor-Measuring Device shall have the following information conspicuously, legibly, and permanently marked:
(Amended 20XX)

S.4.1. Limitations of Use. – If a device is intended to measure accurately only products having particular properties, or to measure accurately only under specific installation or operating conditions, or to measure accurately only when used in conjunction with specific accessory equipment, these limitations shall be clearly and permanently stated on the device.

S.4.2. Discharge Rates. – ~~**A device shall be marked to show it's**~~ **The** rated gas capacity in cubic meters per hour or cubic feet per hour~~.~~ **for the particular products that the device was designed to meter as identified by the manufacturer.**
(Amended 20XX)

S.4.3. Temperature Compensation. – If a device is equipped with an automatic temperature compensator, this shall be **marked on the front of the** ~~**indicated on the badge or immediately adjacent to the badge of the**~~ device**. If the device is equipped with a removable indicating and/or recording element, this information shall also appear** ~~and~~ on the ~~**register**~~ **indicating/recording element**.
(Amended 20XX)

~~**S.4.4. Badge. – A badge affixed in a prominent position on the front of the device shall show the manufacturer's name, serial number and model number of the device, and capacity rate of the device for the particular products that it was designed to meter as recommended by the manufacturer.**~~

…

N.3. Test Drafts. – Except for low-flame tests, test drafts shall be at least equal to**:**

(a) For devices equipped with a mechanical indicating and/or recording elements:

(1) Meters equipped with test circles - one complete revolution of the largest capacity proving indicator and shall in no case be less than 0.05 m^3 or 2 ft^3.

(2) Meters not equipped with test circles - ten times the smallest proving indicator division and shall in no case be less than 0.05 m^3 or 2 ft^3.

(b) For devices equipped with an electronic register - at least ten times the smallest proving indicator division and in no case less than 0.05 m^3 or 2 ft^3.

All flow rates shall be controlled by suitable outlet orifices.
(Amended 1973**,** ~~and~~ 1991 **and 20XX**)

…

N.4.1. Normal Tests. – The normal test of a device shall be made at a rate not to exceed the capacity rate ~~given on the badge~~ **marked on** ~~of~~ the meter.
(Amended 1988**, and 20XX**)

…

N.4.2.4. Leak Test. – The device shall be tested for leaks up to a pressure not to exceed the manufacturer's maximum rated pressure. The device shall not leak. Meters which are not intended to be leak tested by submersion under water are to be leak tested as described on the type approval certificate.
(Added 20XX)

…

UR.1.3. Customer Indicating Element, Accessibility. – For systems in which the primary indicating element is not reasonably accessible to the customer, one of the following shall be provided.

(a) Console display which is accessible to the customer on which the customer can clearly identify and then select the device's reading information,

(b) A remote display which is provided to the customer as part of the system, or

(c) At the option of the customer, an application that provides readings in real time.
[Nonretroactive as of January 1, 20XX]
(Added 20XX)

UR.2.6. Tenant Premise Identification. – Tenant premise identification shall be clearly and permanently shown on or at the device, and on all separate components of a device. Remote indications and all recorded indications shall be readily identifiable and readily associated with the customer's premises. Recorded indications shall also include time and date information.
[Nonretroactive as of January 1, 20XX]
(Added 20XX)

…

NIST HB 44 – Appendix D. Definitions

~~**badge. – A metal plate affixed to the meter by the manufacturer showing the manufacturer's name, serial number and model number of the meter, and its rated capacity. [3.33]**~~

NIST OWM Detailed Technical Analysis:

NIST OWM acknowledges that measurement technology has advanced, and this section must be updated to ensure that any meter is capable of accurately measuring hydrocarbon gas vapor. The submitter has updated this item to address those concerns identified by our office in previous analysis, including:

- Amending
  - S.1.1.4. Advancement of Indicating and Recording Elements.
  - S.1.1.5. Proving Indicator.
  - S.2.2. Provision for Sealing.
  - S.4. Marking Requirements and sub-paragraphs
    - S.4.2. Discharge Rates.
    - S.4.3. Temperature Compensation.
    - S.4.4. Badge. (removed)
  - N.3. Test Drafts.
  - N.4.1. Normal Tests.
  - The definition of badge (removed)
- Adding
  - Table S.2.2. Categories of Device and Methods of Sealing to S.2.2. Provision for Sealing.

- S.2.5. Adjustments and Corrections for Measuring Elements and Measuring Systems.
- N.4.2.4. Leak Test.
- UR.1.1. Customer Indicating Element, Accessibility.
- UR.2.4.6. Tenant Premise Identification.

There is currently a paragraph numbered UR.1.1. in Section 3.33. This item proposes a new paragraph UR.1.1. which must be renumbered, possibly UR.1.3. as the language in the new UR.1.1. relates to installation or UR.2.6., as this new language also relates to how the device is used.

Within the justification of this item, there is a recommendation to add "register" to the Definitions in NIST HB 44, but no definition for "register" is included in the proposal. Currently, NIST Handbook 44 has a definition for "meter register" that is applicable to this section (3.33.). In this section, "register" is only referred to in S.4.3., and it means the indicating element. The submitter may want to review the definition of "meter register" to determine if it needs amendment to correctly apply to newer technology and may also consider adding "meter" before the term "register" in paragraph S.4.3.

There are also several formatting issues that need to be resolved. For example, S.2.5. is an entirely new paragraph which has a nonretroactive date, but the paragraph is in upright roman type and is neither bold nor underlined. These same issues apply to UR.2.4.6. The submitter should thoroughly review each paragraph in this item as there are other issues in this regard that need to be addressed.

Summary of Discussions and Actions:

At the NCWM 2026 Interim Meeting, Matt Douglas (CDA DMS) indicated that through working with OWM, the item has been further developed, but there are formatting issues and a numbering issue that need to be resolved. Matt requested a Developing status to allow more time to work on the item. Chris Wagner (NPGA) commented that the NPGA supports further development of this item. Loren Minnich (NIST OWM) stated that OWM has worked with the submitter to develop the item, and the version in the agenda is the result of this collaboration. With corrected formatting and numbering, the item is ready for Voting status.

The Committee retained the Developing status of the item based on comments received during Open Hearings. The Committee encouraged the submitter to continue developing the item.

At the 2025 NCWM Annual Meeting, Matt Douglas (CA), the item's submitter, stated that he appreciated the feedback he received and will send an updated version to the NCWM for review by the regions during the next cycle.

At the 2025 NCWM Interim Meeting, Matt Douglas (CA DMS), the submitter, indicated that this proposal recognizes new technology used with hydrocarbon gas vapor-measuring devices, that he appreciated the feedback from OWM, and requested a Developing status to allow for more feedback and development. Matt added that the word "intended" is used in the Water Code in a specification very similar to S.1.1.4. in this Section (3.33.). Loren Minnich (NIST OWM) supported a Developing status, referencing the OWM analysis, and said OWM is looking forward to the further development of the item.

This item was introduced during the 2025 meeting cycle and has not been considered during an NCWM Interim or Annual Meeting.

Regional Association Reporting:

Western Weights and Measures Association

At the 2025 WWMA Annual Meeting, the following comments were received:

Mr. Matthew Douglas (State of California, Division of Measurement Standards): Submitter of the item, worked with NIST to develop this item, this is the first time he has introduced an item with substantial changes, supports a voting status, font changes S&T page 50 lines 7-9 and 20: larger font is an error.

The 2025 WWMA S&T Committee recommends this item remain Developing. The committee encourages the submitter to seek feedback from stakeholders and allow NIST OWM time to review the changes made by the submitter.

The committee recognizes the submitter's intention to highlight changes to the item; however, the committee encourages the submitter to consider proper editorial notations and remove the highlighted sections from the proposed item.

During the WWMA 2024 Annual Meeting Matthew Douglas (California Division of Measurement Standards) the Submitter explained the need to update HB 44 to keep up with this industry's newer electronic technologies regarding this device type. These devices are currently available. The submitter welcomes any feedback and supports a voting status.

The 2024 WWMA S&T Committee recommends a Developing status. The Committee encourages the submitter to seek feedback from stakeholders and NIST OWM to determine whether the item is fully developed and ready for a vote.

Southern Weights and Measures Association

At the 2025 SWMA Annual Meeting, no comments were heard.

The committee had no recommended status for this item.

At the 2024 SWMA Annual Meeting, the S&T Committee heard no comments on this item. This item was posted on the website but was not printed in the SWMA S&T Committee's agenda. The Committee recommends the item be assigned developing status to allow the submitter to obtain feedback from stakeholders and from NIST.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, a representative from the National Propane Gas Association supports this item and is looking forward to further technological development related to this item.

The Committee recommended a Developing status.

At the 2025 NEWMA Interim Meeting, no comments were heard.

The committee had no recommended status for this item.

At the 2025 NEWMA Annual Meeting, a regulator from the California Division of Measurement Standards, the submitter of the item, commented they are currently review feedback on this item from various regions and stakeholders.

The Committee recommended retaining Developing status and the body concurred.

At the 2024 NEWMA Interim Meeting, no comments were heard from the floor. NEWMA does not have a recommendation for this item.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommends this item remain as Developing.

At the 2025 CWMA Interim Meeting, no comments were heard.

The committee recommends this item be given a Voting status.

At the 2025 CWMA Annual Meeting, a representative from CA, the submitter of this item, provided an update and expects this item to be ready for Voting status for the next cycle through collaboration with NIST OWM.

The Committee recommends this item remain Developing.

At the 2024 CWMA Interim Meeting, no comments were heard during open hearing. The Committee recommends this item be numbered HGV-25.1 and be assigned developing status.

LMD – LIQUID MEASURING DEVICES

LMD-24.2 V N.4.1. Normal Tests

Source: New Hampshire Department of Agriculture, Markets, and Food

Submitter's Purpose and Justification:

Provide clarity to 3.30. Liquid—Measuring Devices, N.4.1. Normal Tests.

Original Justification:

The existing code requirement is very wordy and difficult to understand without an example and a formula. This proposal adds an example and formula that will give clarity to N.4.1. Normal Tests.

The additional language will be one of several other NIST HB 44 codes that give clarifying examples.

NIST has indicated that in the near future the handbooks will not be printed but will be digitally produced. Therefore, we are no longer constrained by the size of the handbook if the information adds value.

The problem can be resolved through more thorough training. We were informed that a formula can be added, however, an example will make the handbook longer and it sets a precedence for adding examples in the future.

The submitter requested Voting status in 2024.

NIST OWM Executive Summary

LMD-24.2 V N.4.1. Normal Tests

NIST OWM Recommendation: Voting

- OWM worked with the submitter to develop the current language, which has been vetted through each region and by other stakeholders such as the Meter Manufacturers Association. This item is fully developed and is recommended for adoption.

Table 2. Summary of Recommendations

LMD-24.2 V N.4.1. Normal Tests

	Status Recommendation	Note*	Comments
Submitter	Voting		
OWM	Voting		
WWMA	Voting		
NEWMA	Voting		
SWMA	Voting	1	
CWMA	Voting		
NCWM	Voting		

	Number of Support Letters	Number of Opposition Letters	Comments
Industry			
Manufacturers			
Retailers and Consumers			
Trade Association			

***Notes Key:**

1. Submitted modified language
2. Item not discussed or not considered
3. No meeting held
4. Not submitted on agenda
5. No recommendation

Item Under Consideration:

Amend NIST Handbook 44, Section 3.30. Liquid Measuring Devices Code as follows:

N.4.1. Normal Tests. – The "normal" test of a device shall be made at the maximum discharge flow rate developed under the conditions of installation. Any ~~**additional**~~ test~~s~~ conducted at **the maximum discharge flow rate developed under the conditions of installation** ~~**flow rates**~~ down to and including one-half of the sum of the maximum discharge flow rate ~~**(MDFR)**~~ **developed under the conditions of installation** and the rated minimum discharge flow rate ~~**(RMDFR)**~~ shall be considered **a** normal test~~s~~. ~~**As a formula, this is stated as**~~**To determine the minimum flow rate at or above which a "normal" test is conducted, the following equation is provided**:

$$\frac{(\sim\!\sim MDFR\ maximum\ discharge\ flow\ rate + \sim\!\sim RMDFR\ rated\ minimum\ discharge\ flow\ rate)}{2} = \sim\!\sim minimum\ discharge\ flow\ rate\ for\ additional\ tests\sim\!\sim$$

Where:

The maximum discharge flow rate is the maximum rate of flow developed under the conditions of installation.

The rated minimum discharge flow rate is the marked minimum discharge rate or the minimum flow rate specified by the manufacturer.

At a minimum, one "normal" test shall be conducted on each meter at the maximum discharge flow rate developed under the conditions of installation.
(Amended 1991, ~~and~~ 2023, and 20XX)

NIST OWM Detailed Technical Analysis:

See the NIST OWM Executive Summary.

Summary of Discussions and Actions:

During the 2026 NCWM Interim Meeting, John McGuire (NIST OWM) supported Voting status and identified that NIST OWM worked with the submitter of the item to develop the language currently in the item, which has been vetted and by each region and other stakeholders such as the MMA.

Cheryl Ayer (NH), Jason Flint (NJ), and Brent Price (Gilbarco) each commented in support of a Voting status.

Matt Douglas (CDA DMS) supported Voting status, but suggested that the formula may not be needed, as the proposed language provides sufficient clarification of the requirement. Matt also suggested that paragraphs for Normal Tests in other sections be reviewed to determine if they would benefit from similar amendments.

Michael Kielty (Endress-Hauser) and Jim Willis (NY) both agreed with the comments from CDA DMS.

The NCWM S&T Committee retained the Voting status of this item.

During the 2025 NCWM Annual Meeting, Dmitri Karimov (Meter Manufacturers Association) stated the MMA appreciates the changes made to the item and they support it. Matt Douglas (CA DMS) stated CA supports the Informational status and suggested that there are other codes that may need similar language changes. Brent Price (Gilbarco) commented that they also support the Informational status.

During the 2025 NCWM Interim Meeting, the item's submitter, Cheryl Ayer (NH), provided the Committee with new language to consider and requested a Voting status. Loren Minnich (NIST OWM) spoke in support of the new language, clarifying that it doesn't change the application of the paragraph; it only expands on the language currently in NIST Handbook 44 (HB 44), emphasizing it is the maximum discharge flow rate developed under the conditions of installation along with the rated minimum discharge flow rate that is used in the calculation to determine the minimum flow rate at or above which a "normal" test is conducted. Speaking to the item as presented in the Interim Meeting Agenda, Matt Curran (FL) expressed concern with including examples in NIST Handbook 44. In reference to the new language provided by the submitter, Matt indicated that a Voting status was inappropriate, as this language has not been through any of the regional weights and measures associations for vetting and expressed support for an Informational or Developing status to allow for further consideration. Scott Wagner (CO), agreed that the paragraph in the current version of NIST Handbook 44 (HB 44) needs clarification and suggested the use of a formula instead of an example, recommending a Developing status for the new language proposed to allow vetting by the regional weights and measures associations. Alison Wilkerson (MD) agreed with the previous commenters and supported a Developing status. Steve Harrington (OR) expressed support for examples if they provide clarification and suggested a Developing status. Jose Arriaga (Orange County, CA) agreed that the new language needs further vetting and supported a Developing status. Brent Price (Gilbarco) agreed with FL, MD, and other previous commenters and suggested a Developing status. Matt Douglas (CA DMS) indicated opposition to the current item but supported the language recommended in the Western Weights and Measures Association Annual Meeting report and suggested a Developing status. Dmitri Karimov (Liquid Controls) said that the new language was close to providing the needed clarification and indicated support for a Developing status. Cheryl Ayer (NH) expressed thanks for everyone's comments and recommendations and asked that anyone who has additional suggestions please share them. They just want to get this correct.

The S&T Committee replaced the Item Under Consideration with the new language provided by the submitter, Cheryl Ayer (NH), and assigned it an Informational status.

During the 2024 NCWM Annual Meeting, the submitter of the item, Cheryl Ayer (NH), provided the Committee with additional language to consider and expressed support for moving the item forward.

The NCWM S&T Committee recommended that the submitter work with NIST OWM to harmonize the item under consideration with what currently appears in NIST Handbook 44.

At the 2024 NCWM Interim meeting, Cheryl Ayer (NH) spoke in support of the item while noting the formula was added to this paragraph editorially by OWM and suggested adding the word "normal" to the formula between the words "additional" and "tests" to read "= minimum discharge flow rate for additional normal tests". Loren Minnich (NIST OWM) suggested reformatting the example as indicated in the NIST OWM Analysis to align with other examples included in NIST Handbook 44 and referenced additional edits to the language in the formula as identified during the Meter Manufacturers Association meeting held during the Interim Meeting. Matt Douglas (CA DMS) indicated that this item was not available for review at the 2023 Western Weights & Measures Association Interim Meeting and commented that the term "maximum flow rate" may need additional clarification. Mike Peeler (NJ) spoke in support of the item. Michael Keilty (Endress + Hauser) expressed concern that the addition of the formula went beyond an editorial change, and this should have gone through the NCWM process. Michael also took issue with the term "minimum discharge flow rate" in the 3rd bullet of the proposed example. Dmitri Karimov (Liquid Controls) also was surprised that the addition of a formula made by OWM to this paragraph was considered "editorial". Dmitri also expressed concern with the term "rated minimum discharge flow rate" in the formula and language in N.4.1. and indicated this term may be the cause of confusion when applying the paragraph. Brent Price (Gilbarco) expressed surprise at the editorial change made by OWM and supported the addition of "normal" as suggested by Cheryl Ayer (NH). Matt Curran (FL) indicated support for an example but had concern with its inclusion in NIST Handbook 44, as it would be part of regulations. Matt suggested that the example may be more appropriately included in an EPO or other guidance document instead of the handbook. Cheryl Ayers (NH) reiterated that, as written, the paragraph is difficult to interpret but understood the concerns expressed by others regarding the terms in the item and noted that the handbook already includes examples and that helps with interpretation. Cheryl indicated that if the example isn't part of the paragraph, a reference to it should be included so it easier to find. John Hathaway (Total Control Systems, Murray Equipment) indicated support for the example but agrees that the language in the paragraph is unclear and supports a developing status. Michael Keilty (Endress + Hauser) commented that the handbook has different "normal tests" and the language in these paragraphs should be reviewed for consistency and supports developing status.

The NCWM S&T Committee assigned this item a Developing status to allow the submitter to work with OWM to harmonize the differences in the item with the language in NIST Handbook 44 and to address the concerns stated during the meeting.

Regional Association Reporting:

Western Weights and Measures Association

At the 2025 Annual Meeting, Mr. Matthew Douglas (State of California, Division of Measurement Standards) asked if other sections might benefit from this language and supports Voting status.

The 2025 WWMA S&T Committee recommends a Voting status. The committee believes the item is fully developed and ready for a vote

During the 2024 WWMA Annual Meeting, Steven Harrington (Oregon Department of Agriculture, Weights and Measures Program) stated that the formula in the handbook is effective and not opposed to examples in HB44. Noted an error in HB44, the abbreviations are not correct (editorial). Supports a voting status on this item.

Scott Wagner (Colorado Division of Oil and Public Safety) supports the intent of the item. However, the item would benefit from different wording to emphasize clarity. He also supports a mathematical formula vs an example.

Loren Minnich (NIST OWM) commented that NIST is working to clarify the language in N.4.1. OWM does not support examples in HB44. prefers an equation. If an example is used an alternate example should be used such as a load racks or something similar with special test tolerances but would prefer to not add example.

Matthew Douglas (State of California, Division of Measurement Standards), expressed the same stance as last year opposing an example in HB44. Clarity in the wording can be achieved by specifying maximum discharge flow rate "developed under the conditions of the installation" in the third sentence.

Steven Harrington (Oregon Department of Agriculture, Weights and Measures Program) believes no action is needed to clarify, and that the formula clears up this issue.

Michael Brooks (Arizona Department of Agriculture Weights and Measures Services Division), describes the wording as clunky and agrees with California. For those reasons Michael recommended a developing status.

Mahesh Albuquerque (Colorado Division of Oil and Public Safety), believes this item belongs in an EPO.

Brent Price (Gilbarco), agrees with California

The 2024 WWMA S&T Committee recommends this item remain Developing. The Committee suggests that the submitter work with NIST OWM based on comments heard during open hearings and consider the following editorial changes:

- Adding the language "developed under the conditions of the installation"
- Striking the proposed example. The Committee feels that an example may be more appropriately included in an EPO.

N.4. Testing Procedures.

N.4.1. Normal Tests. – The "normal" test of a device shall be made at the maximum discharge flow rate developed under the conditions of installation. Any additional tests conducted at flow rates down to and including one-half of the sum of the maximum discharge flow rate **developed under the conditions of the installation** and the rated minimum discharge flow rate shall be considered normal tests.
(Amended 1991)

~~**Example:**~~

- ~~**Maximum rated flow rate is 12 gpm / Minimum rated flow rate is 0.5 gpm.**~~
- ~~**Maximum discharge flow rate developed under conditions of installation is 9 gpm = normal test**~~
- ~~**Additional normal tests are determined using the following formula:**~~

~~**In this example Therefore, flow rates of 9 gpm down to and including 4.75 gpm are considered normal tests.**~~

Southern Weights and Measures Association

At the 2025 SWMA Annual Meeting, Alison Wilkinson, Maryland, stated the proposal causes confusion with example formula. Recommendation is to remove formula and move forward with just the wording.

It was intended to be added as editorial but believes the formula doesn't belong in handbook. Remove formula and move forward with voting.

The committee recommends Voting status on this item with editorial changes.

or above which a "normal" test is conducted~~, the following equation is provided~~:

$$\frac{(\textit{MDFRmaximum discharge flow rate} + \textit{RMDFRrated minimum discharge flow rate})}{2} = \textit{minimum discharge flow rate for additional tests}$$

During the 2024 SWMA Annual Meeting, Alison Wilkinson (MD) – Opposes item, examples should not be in handbooks, leaves it open for interpretation.

Matt Curran (FL) – Opposes item, suggested EPOs or guidance documents would be a better place for examples.

Brent Price (Gilbarco) – Agrees with previous commenters, examples don't belong in handbooks.

The committee recommends the item be withdrawn.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, a Representative from the State of New Hampshire states that the intent of this item is to add clarity to the handbook code requirement. New Hampshire has worked with NIST and believes that the item is fully developed and ready for a vote. A Representative from the NIST OWM has worked with submitter and believes the item is ready for voting. Representatives from the State of New Jersey and the State of New York believe the item is fully developed and support a voting status.

The Committee recommended the item remain Voting.

At the 2025 NEWMA Interim Meeting, a representative from NH said they are trying to add clarity to determining what is a normal test. NIST advised to change this code first then change other codes.

Representative from NJ recommends voting status.

Representative from NY questions if the definition of "Normal Test" could be changed, and an example be provided.

Representative from VT questioned the word "developed" means as used, and proposes it would be clearer to use a "percentage of the maximum flow rate as installed" instead of the current equation.

At the 2025 NEWMA Annual Meeting, a regulator from New Hampshire, the submitter of the item, commented they are working in conjunction with NIST-OWM to identify other instances in the handbook where the language should also be changed so all codes are consistent.

The Committee recommended retaining Informational status and the body concurred.

At the 2024 NEWMA Interim Meeting, Cheryl Ayer (NH) spoke as the submitter of this item. Cheryl is not only looking at the LMD code, but also other codes with Normal Tests so there is uniformity between the codes and requested that this item remain developing. Michael Peeler (NJ) recommended a developing status for this item.

After hearing comments from the floor, the Committee recommended a Developing status for this item and the body concurred.

During the 2024 NEWMA Annual Meeting, Cheryl Ayer (NH) commented that the purpose of this item is to give an example of the formula to provide clarification for readers, both regulators and service personnel. She pointed out that the formula was added editorially in the 2024 version of the handbook, but the acronym for maximum discharge flow rate (MDFR), was printed as MDRF and should be corrected if the formula appears in the handbook.

The Committee recommended maintaining a Voting status, but with the edits suggested by the submitter, and the body concurred.

At the 2023 NEWMA Interim Meeting, a regulator from New Hampshire commented that the test procedure, as currently written, is difficult to understand, specifically in the second sentence. The purpose of the proposal is to add an equation and give an example of the equation, adding a value and clarity to the handbook. The State of New York commented that other codes, such as LPG, has the same language and may also need to be updated in the future but agrees the proposal has merit. The Commonwealth of Pennsylvania commented that clarity is an added advantage in the field and makes a difference to help regulators and industry understand the testing methods. It was also suggested that if this does not appear in the handbook, then it could possibly be worked into the NCWM field testing manual. The State of New Jersey concurs.

Upon consensus of the body, the Committee recommends this item as a Voting item.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommends this item remain as Voting.

At the 2025 CWMA Interim Meeting, the committee recommended this item be given a Voting status based on comments heard during open hearings.

At the 2025 CWMA Annual Meeting, no comments were heard.

The Committee recommends this item remain Informational.

During the 2024 CWMA Interim Meeting, Greg Vander Plaat (Minnesota) spoke against having examples listed in Handbook 44.

Loren Minnich (NIST OWM) supported the comments from Minnesota and yet pointed out that examples are rare and are specific. It was said that jurisdictions adopt the Handbook through different means thus examples may inadvertently become law in some states. NIST OWM is working on improving the language of the referenced paragraph to address the concerns of the submitter.

A regulator from Wisconsin agreed with comments from Minnesota and NIST OWM.

A regulator from Iowa stated that this is not necessary.

The committee recommends this item as withdrawn.

During the 2024 CWMA Annual Meeting, a representative from NIST OWM commented that they do not support adoption of this item and recommend either withdrawal or developing status. They discourage the use of examples in NIST Handbook 44 for a number of reasons. Currently, there are only two examples, in

Section 2.21., paragraph N.2.2. and Section 3.30., paragraph S.4.4., in NIST Handbook 44. The handbook is adopted as law and any additional information must be carefully considered as it can affect the application of the paragraph sometimes in unintended ways. Paragraphs that include unclear language should be amended to provide clarification to allow for uniform interpretation without the need for this type of information. Additional guidance regarding the interpretation and application of the handbook is typically provided in documents NIST Handbook 112, Examination Procedure Outlines. Tina Butcher is currently updating this document and OWM intends to have the updated version available soon. If the weights & measures community chooses to move forward with this item, to be consistent with other examples currently in NIST Handbook 44, OWM suggests amending it to follow the format suggested in our Interim Analysis.

The Committee recommends this item be withdrawn

LMD-26.1 A S.2. Measuring Elements, S.4. Marking Requirements, N.4. Testing Procedures, U.R.6. ~~Temperature~~ Volume Compensation and Correction Wholesale, and T.5. Density Correction Systems

Source: American Petroleum Institute

Submitter's Purpose and Justification:

Clarify the acceptable use of specific density correction methods that allow for the accurate determination of volume growth that occurs when gasoline is blended with ethanol to make a finished motor fuel.

Original Justification:

The volume of gasoline and ethanol when blended is more than the volume of the two liquids measured separately. Due to the way terminal load racks are configured, some measure the blended product using the custody meter and therefore capture the volume gain at the custody transfer meter (side stream blending), while others use multiple custody transfer meters to measure the gasoline and ethanol components separately (ratio blending) and do not capture the volume gain. The proposed changes will codify that a calculation can be applied at the Ratio-Blend terminal such that the two terminals have a comparable PTD.

The difference in terminal operations can cause inequity between the two types of terminals. The solution is for terminals that don't directly measure the volume growth in the final blended product to apply an industry standard (API Chapter 11.3.4) that calculates that volume expansion. Correcting the volume for this growth is known as Density Correction. The calculation used for density correction would use the same API gravities used by the automatic temperature compensation system to calculate the net volume of the gasoline-ethanol blend at 60 ºF.

Variable	Temperature Compensation (GST)	Density Correction (Net Volume)
Reference Density of Gasoline (BOB) in API gravity units	✓ (API MPMS 11.1)	✓ (API MPMS 11.1)
Reference Density of Ethanol	✓	✓

in API gravity units	(API MPMS 11.3.3)	(API MPMS 11.3.3)
Gross Meter Readings	✓ (API MPMS 12.2)	✓ (API MPMS 12.2)
Product Temperature (load average)	✓ (API MPMS 7.4)	✓ (API MPMS 7.4)
Net Meter Readings for ethanol and BOB	*(output from Temp Comp)*	
Ideal Fraction Ethanol (i.e., ethanol blend percentage)		✓ (API MPMS 11.3.4)

The proposed changes to Handbook 44 identify the sections that should be updated to codify the use of the API standard without replumbing the terminal. [Note there is also a separate but related proposal to change Handbook 130, Method of Sale.]

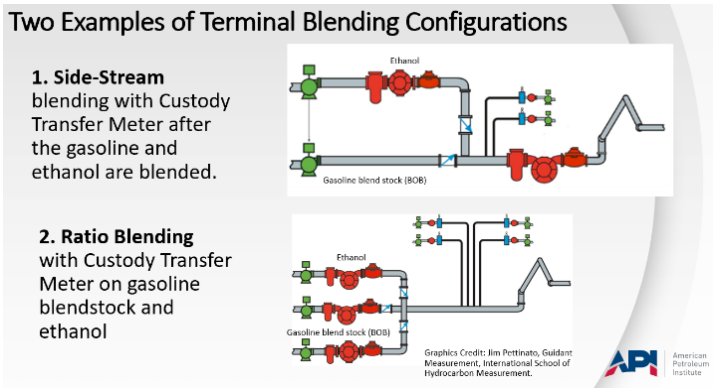
The proposed changes to HB 44 are the result of nine task force meetings where the group reviewed the science of the expanded volume, raised and discussed concerns, and discussed the proposed language incorporated in this proposal. The task force was led by API with participation from five states, NIST staff, retailer representatives, meter manufacturers, terminal operators, ethanol representatives, and consultants.

Background:

When gasoline and ethanol are blended the volume of the finished fuel increases by about 0.2% (range 0.08% to 0.4%) that is dependent on the density of the gasoline blend stock and the percentage of ethanol blended into the finished gasoline-ethanol fuel.

Some terminal configurations capture the volume expansion in the overall net calculation, while others do not, resulting in an inequity between the two configurations. To understand the inequity at the terminals, it is helpful to consider two of the terminal configurations that blend gasoline and ethanol (e.g., 10% ethanol, 15% ethanol, 85% ethanol). For simplicity, when we refer to a fuel it will be E10 as that fuel is more than 95% of the consumed gasoline in the U.S.

The first configuration is a **Side-Stream terminal.** It measures the ethanol which is then added to the gasoline blend stock ahead of the custody transfer meter. This configuration captures the volume growth that takes place when the net volume of the blended product is calculated.



The second is a **Ratio-Blending terminal.** The ethanol is measured through a custody transfer meter and the gasoline blend stock is measured through a separate custody transfer meter. The two components are blended in the terminal piping or in the tank truck where the volume growth takes place. Since the component net volumes are

calculated separately, the volume growth of the blended product is not captured.

In a Ratio-Blending terminal a calculation can be applied using the process identified in API MPMS Ch. 11.3.4. that corrects for the change in the density of the combined products and the additional volume gain that will occur.

Additional questions and answers:

Q1. If the API standard is used at a Ratio-Blending Terminal, how does an inspector prove that the density correction has been appropriately applied?

A1. An inspector would use a process similar to proving a terminal with an automatic temperature compensation system. The EPO No. 25, Loading Rack Meters, would be updated.

Q2. What are the Density Correction System requirements?

A2. API believes that HB 44 allows for a system to correct for a density shift in a gasoline-ethanol blend and recognizes that some NTEP devices are currently approved for that use. However, to ensure that the use of this correction is clearly permissible, we identify language in Handbook 44 that would be clarifying for devices that provide density correction algorithms per API standards.

A metering system uses the same data to determine the excess volume as it uses for the correction for temperature (the reference density, the meter gross volume reading and the live temperature measurement). The device then will apply the density of the finished product or of the base components (e.g., gasoline or ethanol) to determine the correction for excess volume. The BOB reference density is typically quite stable. Only the observed (live) density varies from batch to batch, depending on temperature. As such a density correction system can accept, calculate, or measure the density of the finished product or of each base component (i.e., gasoline or ethanol) using these inputs. This would apply to HB 44 Section 3.30 Liquid Measuring Devices paragraphs S.2.9., S.4., N.4., UR.3.6.1., and T.5.

Q3. How is the density of the gasoline blend stock measured?

A3. Terminals measure the density (as an API Gravity) of gasoline in the aboveground storage tank by using a handheld density meter, an in-tank densitometer, or sending it to the lab. The sample that is tested using the handheld device or the lab uses the procedures identified in API MPMS Ch. 8 which details how to grab a sample from the bottom, middle, and top of tank. The API Gravity of the gasoline blend stock must be brought to a reference temperature of 60ºF or 15ºC. The API gravity is entered into the terminal automation system either manually or through a connected system. The API Gravity, corrected to 60ºF of the individual products (i.e., BOB) does not change between the tank and the meter.

Q4. How is the API Gravity of ethanol determined?

A4. Ethanol is a single-molecule fuel that is denatured with 2-5% petroleum fuel. The small percentage of denaturant does not meaningfully affect the API Gravity of the ethanol between batches. Thus when calculating denatured ethanol net volumes, for any ethanol with 1 to 5% denaturant (regardless of whether the denaturant is natural gasoline or gasoline), the calculation should use API Table 6C with an alpha coefficient of 0.000603 ºF or use API Table 6B with 50.61 ºAPI.

API MPMS Chapter 11.3.3, paragraph 4.2 Denatured 95 % to 99 % Fuel Ethanol

> For volume or density correction from observed temperature to 60 °F, the implementation procedure given in API MPMS Ch. 11.1-2004 shall be used for ethanol denatured with 1 % to 5 % by volume of either natural gasoline or gasoline (Annex B). Such denatured ethanol is classified a "special application" (formerly known as Table 6C or Table 54C) with an alpha coefficient of 0.000603 °F or 0.001085 °C (Annex C). For more information on denaturant choice, see Annex B. For more information on the applicability of these alpha coefficients to other denaturants, see Annex C and Annex D.

Q5: With the possibility of the density of the BOB changing each time the terminal receives a batch from the pipeline, and given that the density impacts the calculated net temperature correction and the density correction, is the density traceable within the terminal metering system? If not when new density values are entered, should they be traceable and verifiable?

A5: The answer to both questions is, yes. Some, if not all systems have an audit log, and if it is properly configured, it will log the changes to the reference density. Each system will be different, but as an example, an inspector could look at the log to see the old densities that were entered. To determine if the system is properly configured, an inspector could perhaps change the reference density value temporarily to determine if it is properly logged in the system.

Q6. What is the relationship between specific gravity and API gravity of a fuel?

A6. According to Pennsylvania State University, "Density is defined as mass per unit volume of a fluid. The density of crude oil and liquid hydrocarbons is usually reported in terms of specific gravity (SG) or relative density, defined as the density of the liquid material at 60 °F (15.6 °C) divided by the density of liquid water at 60 °F. At a reference temperature of 15.6 °C, the density of liquid water is 0.999 g/cm^3 (999 kg/m^3), which is equivalent to 8.337 lb/gal (U.S.). Therefore, for a hydrocarbon or a petroleum fraction, the SG is defined as:

$$\text{SG } (60^{O}\text{F}/60^{O}\text{F}) = (\text{Density of liquid at } 60^{O}\text{F in g/cm3})/(0.999\text{g/cm3})\text{"}$$

In the early years of the petroleum industry, the American Petroleum Institute (API) adopted the API gravity (°API) as a measure of the crude oil density. The API gravity is calculated from the following equation:

$$API = 141.5/(SG15.6\,°C/15.6°C) - 131.5$$

Source: https://www.e-education.psu.edu/fsc432/content/api-gravity

Q7. At what temperature should API gravity be observed?

A. API gravity and specific gravity must always be observed at 60 °F or 15 °C.

Q8. How will an invoice or product transfer document (PTD) be affected?

A8. The major requirement would be that the invoice/PTD reflects either the metered components or the finished product. All the appropriate information to provide a transparent invoice would be included on the invoice/PTD for an Automatic Density Correction system and Nonautomatic system. Specifically, it would include API gravity, temperature, gross readings, excess volume, and the net volume including the calculated growth. A statement would be required stating, "Volume delivered has been adjusted to the volume at 15 °C (60 °F) and for changes in density".

Q9. What API standards are used in a terminal to ensure an accurate measurement?

A9. There are at least 12 different API Manual of Petroleum Measurement Standards (MPMS) that form the basis of an accurate measurement at a terminal.[1]

- Ch. 8.1 Manual Sampling of Petroleum Products (ASTM D4057)
- Ch. 5.x Metering (5.1 General Considerations for Measurement by Meters, with specific chapters that address for displacement meters, turbine meters, Coriolis meters, ultrasonic flow meters, Fidelity and Security of Flow Measurement Pulsed-Data Transmissions Systems)
- Ch. 6.x – Metering Systems (6.1 Metering Assemblies- General Considerations, with specific chapters for - Truck and Rail Loading and Unloading Measurement Systems; - Pipeline and Marine Loading/Unloading Measurement Systems; and Lease Automatic Custody Transfer Systems)
- Ch. 4.x Proving Systems (Displacement Provers, Master-Meter Provers, Field Standard Test Measures, Methods of Calibration for Displacement and Volumetric Tank Provers, Part 1—Introduction to the Determination of the Volume of Displacement and Tank Provers)
- Ch. 7.4 Dynamic Temperature Measurement
- Ch. 11 Physical Properties Data (ASTM D1250, Adjunct)
    - Chapter 11.1 - Temperature and Pressure Volume Correction Factors for Generalized Crude Oils, Refined Products, and Lubricating Oils
    - Ch. 11.3.3 Miscellaneous Hydrocarbon Product Properties—Denatured Ethanol Density and Volume Correction Factors
    - Ch. 11.3.4 Miscellaneous Hydrocarbon Properties - Denatured Ethanol and Gasoline Component Blend Densities and Volume Correction Factors
    - Ch. 11.4.1 Density of Water and Water Volumetric Correction Factors for Water Calibration of Volumetric Provers
- Ch. 12.2 Calculation of Petroleum Quantities using Dynamic Measurement Methods and Volumetric Correction Factors
- Ch. 21.2 Electronic Liquid Measurement Using Positive Displacement and Turbine Meters

Q10. How are API standards used in terminals today?

A10. Terminals require the implementation of multiple API standards including all the standards identified in A9 above to ensure there is an accurate and transparent measurement for the customer receiving the product into the tank and the customer receiving the product from the terminal into a tank truck for delivery to a retail gasoline station. Further, sales agreements may state that where temperature compensation is used, those calculations incorporate the methods and procedures specified in API MPMS Chapter 11.

[1] https://www.api.org/-/media/files/publications/2024-catalog/2024-publication-catalog.pdf.

Q11. How is an automatic temperature compensation system proven today?

A11. Regulators may use spreadsheets, lookup tables or commercial software to compare the calculated temperature compensated volume to the net volume that is printed on the Bill of Lading, Invoice or on the ticket from the terminal system.

Q12. How would an inspector prove the calculated volume expansion at a terminal?

A12. The volume expansion that occurs due to physical chemistry can be proven in the same manner as an automatic temperature compensation system that calculates the net volume of gasoline. The volume expansion that occurs when the components are blended can be demonstrated using a spreadsheet, look-up table or commercial software. Additionally, the Examination Procedure Outline (EPO) No. 25 for Loading Rack Meters would be updated to incorporate the appropriate procedures.

Q13. Is there a specific API standard that should be used to calculate the volume expansion?

A13. Yes. API MPMS Ch. 11.3.4 which is a subchapter of Ch. 11.1 should be used. The volume change calculated using Ch. 11.3.4 is needed to reconcile the fact that the volume of gasoline and ethanol when blended is slightly greater than the volume of the two liquids measured separately. In equation form,

$$\text{Gasoline BOB}_{\text{(net volume)}} + \text{Ethanol}_{\text{(net volume)}} \neq \text{Gasoline-Ethanol Blend}_{\text{(net volume)}}$$

Q14. In the context of NCWM, why should the API standards be accepted?

A.14. Handbook 130, Uniform Weights and Measures Law, Section 16, recognizes "firmly established trade custom and practice" that dictate how liquid fuels are sold. Specifically, it states,

> **Section 16. Method of Sale**
>
> Except as otherwise provided by the Director or by firmly established trade custom and practice,
>
> (a) commodities in liquid form shall be sold by liquid measure or by weight; and
>
> (b) commodities not in liquid form shall be sold by weight, by measure, or by count.
>
> The method of sale shall provide accurate and adequate quantity information that permits the buyer to make price and quantity comparisons.
> (Amended 1989)

In 2024, the U.S. customers consumed 137 billion gallons of gasoline (most of which was 10% ethanol) and 63 billion gallons of diesel fuel. Another 24 billion gallons of jet fuel were consumed in the U.S. At each stage of the process from producing the crude oil to selling the finished fuel to a retail gasoline station the product is measured. So, while there is over 224 billion gallons of finished product consumed in the U.S., those molecules have likely been measured many times over. These measurements are so important that the API Committee on Petroleum Measurement (COPM) meets twice a year, with over 700 people in attendance, at each meeting to review the standards that are used in the U.S. and around the world. By definition, the petroleum industry uses the API standards which are firmly established trade custom and practice.

- **Possible Opposing Arguments:** Demonstrate that you are aware and have considered possible opposition.

Some have suggested that the terminal should be replumbed to allow the finished fuel to flow through a custody meter. However, this is often not possible due to the footprint and design of the terminal. Regardless, it should not be required as there is accurate technology available and approved NTEP equipment already available.

Some have raised concerns that metering systems should not modify the volume of the product after it has gone through the custody meter. This concern appears to be premised on the belief that the gross volume **and** the net volume are measured. In practice, the only measured volume is the gross volume and that is measured by counting pulses from the meter in accordance with an API standard. The gross volume is then used by the custody transfer system or the automatic terminal management system to calculate the net volume using another set of API standards including Chapters 5x, 6x, 7.4, 11.1, 11.3.3, 11.3.4, 12.2, and 21.2. Please see above for the names of these standards.

Some have shared concerns that only standards approved by NCWM or by NIST and referenced in the Handbooks or in Publications can be used to determine volumes. As stated in the previous paragraph, this is simply not possible. None of the API standards that are needed to calculate the temperature corrected volume of fuels is listed in the NIST/NCWM publications or Handbooks. With this logic, it would be impossible to determine the net volume of fuels and other chemicals.

The submitter requested Voting status in 2026.

NIST OWM Executive Summary

LMD-26.1 A S.2. Measuring Elements, S.4. Marking Requirements, N.4. Testing Procedures, U.R.6. ~~Temperature~~ Volume Compensation and Correction Wholesale, and T.5. Density Correction Systems

NIST OWM Recommendation: Assigned

- OWM recognizes that blending ethanol and petroleum products results in a greater volume of the blended product than the sum of the volume of the separate products when corrected to the reference temperature of 15 °C (60 °F).
- This phenomenon has been recognized for some time, as evidenced by a presentation given during the 2007 CWMA Annual Meeting by Ron Hayes (MO Retired).
- The question before the weights and measures community is how best to quantify this phenomenon. This item was submitted in response to an issue a state had with a wholesale device that currently utilizes a system that corrects for density/excess volume.
- This item has been assigned to an NCWM Task Group. NIST OWM looks forward to the work the task group will perform.
- OWM notes that the Item Under Consideration includes the previous version of this proposal, which is stricken through, and that the most recent language provided by the submitter is not formatted to conform to the style of NIST Handbook 44.

Table 2. Summary of Recommendations

LMD-26.1 A S.2. Measuring Elements, S.4. Marking Requirements, N.4. Testing Procedures, U.R.6. ~~Temperature~~ Volume Compensation and Correction Wholesale, and T.5. Density Correction Systems

	Status Recommendation		Note*	Comments
Submitter	Voting			
OWM	Assigned			
WWMA	Voting			Based on previous version
NEWMA	Assigned			
SWMA	Developing			Based on previous version
CWMA	Assigned			
NCWM	Assigned			
	Number of Support Letters	**Number of Opposition Letters**	**Comments**	
Industry				
Manufacturers				
Retailers and Consumers				
Trade Association				

***Notes Key:**

1. Submitted modified language
2. Item not discussed or not considered
3. No meeting held
4. Not submitted on agenda
5. No recommendation

Item Under Consideration:

NOTE: This item has been edited to properly identify the section of the handbook affected and to correct formatting errors. The Items Under Consideration now reflect the structure required by NIST Handbook 44.

Amend NIST Handbook 44, Section 3.30. Liquid Measuring Devices Code as follows:

S.2. Measuring Elements

...

S.2.9. Wholesale Devices Equipped with Electronic Automatic Density-Correction Systems.

S.2.9.1. Automatic Density Correction. – If a wholesale device such as a register, used for blending gasoline and ethanol, is equipped with an automatic means for adjusting the indication and registration of measured volume of product to correct for the expansion of volume when blending separately metered components (e.g., ratio-blending, sequential blending) to create a new product with altered properties then the device must also be equipped with an electronic automatic temperature compensating system.

S.2.9.2. Provision for Deactivating. – On a device equipped with an automatic density-correction system, provision shall be made for deactivating the automatic density-correction system so that the meter can indicate and record in terms of the uncorrected volume.

(Added 202X)

…

S.4 Marking Requirements

…

S.4.3. Wholesale Devices.

…

S.4.3.3. Automatic Density Correction for Changes in Product Composition. – If a device is displaying density-corrected volumes, then the volumes must be labeled clearly and conspicuously on the primary indicating elements, recording elements, and recorded representation that the adjustment has been made.

(Added 202X)

N.4. Testing Procedures

…

N.4.1.2. Wholesale Devices Equipped with Automatic Density Correction. – On wholesale devices equipped with automatic density correction for changes in product composition due to blending, normal tests shall be conducted:

(a) by comparing the density corrected volume indicated by the device to the actual delivered volume corrected to 15 °C (60 °F) using the current version of ASTM D1250, Standard Guide for the Use of the Joint API and ASTM Adjunct for Temperature and Pressure Volume Correction Factors for Generalized Crude Oils, Refined Products, and Lubricating Oils: API MPMS Chapter 11.1.

(b) with the density correction system deactivated, comparing the uncompensated volume indicated or recorded to the actual delivered volume. The first test shall be performed with the automatic density-correction system operating in the "as found" condition. On devices that indicate or record the density-corrected volume, temperature compensated volume, and uncompensated volume for each delivery, the tests in N.4.1.1.(a), N.4.1.1.(b), and N.4.1.2., may be performed as a single test.

(Added 202X)

…

T. Tolerances

T.4. Automatic Temperature-Compensating Systems. – The difference between the meter errors (expressed as a percentage) determined with and without the automatic temperaturecompensating system activated shall not exceed:

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

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

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

[Nonretroactive as of January 1, 1988]
(Added 1987) (Amended 1992, 1996, and 2002)

T.5. Density Correction Systems. - The difference between the calculated volume of the net final blended product inclusive of growth and the volume calculated using ASTM D1250, Standard Guide for the Use of the Joint API and ASTM Adjunct for Temperature and Pressure Volume Correction Factors for Generalized Crude Oils, Refined Products, and Lubricating Oils: API MPMS Chapter 11.1, shall not exceed 0.1% for nonautomatic or automatic density correction system for the total delivered volume. The delivered quantities for each test shall be approximately the same size. The results of each test shall be within the applicable acceptance or maintenance tolerance.

(Added 202X)

...

UR.3.6. Temperature Compensation and Volume Correction, Wholesale

UR.3.6.1. Automatic.

UR.3.6.1.1. When to be Used. – If a device is equipped with a mechanical automatic temperature compensator, it shall be connected, operable, and in use at all times. An electronic or mechanical automatic temperature-compensating system may not be removed, nor may a compensated device be replaced with an uncompensated device, without the written approval of the responsible weights and measures jurisdiction.

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

(Amended 1989)

UR.3.6.1.2. Invoices.

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

(b) The invoice issued from an electronic wholesale device equipped with an automatic temperature-compensating system shall also indicate for each metered component or the finished product:

(1) the API gravity, specific gravity, or coefficient of expansion for the product;

(2) product temperature(s); and

(3) gross reading.

(c) For gasoline-ethanol blends, the invoice issued from a wholesale system equipped with an automatic density correction system, in addition to the requirements in (b) above, shall indicate:

(1) the additional volume due to density correction for the finished product; and

(2) the net volume inclusive of the additional volume due to density correction.

Note: Shall include the statement, "Volume delivered has been adjusted to the volume at 15 °C (60 °F) and for changes in density."

(Added 202X)

UR.3.6.2. Nonautomatic.

UR.3.6.2.1. Temperature Determination. – If the volume of the product delivered is adjusted to the volume at 15 °C (60 °F), the product temperature shall be taken during the delivery in:

(a) the liquid chamber of the meter; or

(b) the meter inlet or discharge line adjacent to the meter; or

(c) the compartment of the receiving vehicle at the time it is loaded.

UR.3.6.2.2. Density Determination. – If the volume of the product delivered is adjusted for changes in the density of the finished product, then the product density shall be measured, or the product density at base conditions shall be determined in accordance with the current version of ASTM D1250, Standard Guide for the Use of the Joint API and ASTM Adjunct for Temperature and Pressure Volume Correction Factors for Generalized Crude Oils, Refined Products, and Lubricating Oils: API MPMS Chapter 11.1, and applied in the calculation via analysis of each of the base components.

(Added 202X)

UR.3.6.2.3. Invoices. The accompanying invoice for a nonautomatic density corrected finished product shall indicate that the net volume of the product delivered has been adjusted for temperature variations to a volume at 15 °C (60 °F). Further, for gasoline-ethanol blends, the invoice shall also indicate for each metered component or the finished product:

(1) the API gravity, specific gravity, or coefficient of expansion;

(2) temperature(s);

(3) gross reading;

(4) additional volume due to density correction for the finished product; and

(5) the net volume inclusive of the additional volume due to density correction.

Note: Shall include the statement, "Volume delivered has been adjusted to the volume at 15 °C (60 °F) and for changes in density".

(Added 202X)

NIST OWM Detailed Technical Analysis:

NIST OWM recognizes that when blending ethanol and petroleum products, due to the physical characteristics of these products, a chemical change occurs, which results in a greater volume of the blended product than the sum of the volume of the separate products when corrected to the reference temperature of 15 °C (60 °F). This phenomenon has been recognized for some time, as evidenced by a presentation given during the 2007 CWMA Annual Meeting by Ron Hayes (MO Retired). The question before the weights and measures community is how best to quantify this phenomenon. There is a companion item on the L&R Interim Agenda, MOS-26.3, that would amend the method of sale for gasoline and gasoline oxygenate blends. OWM would suggest these items proceed together, as they are interrelated.

The justification included in the proposal provides a lot of useful information, but there are a few questions that remain:

1. How many facilities have Ratio-Blending Systems that only measure the separate components (petroleum and ethanol)? How many facilities have Side-Stream systems that measure the blend of gasoline and ethanol?

2. How many gallons of product are subject to the correction, if adopted?

3. What is the financial impact on these facilities of utilizing a system that corrects for density/expanded volume (i.e., selling on a net instead of gross basis)? And, what is the cost of reconfiguring these facilities to convert them to Side-Stream terminals?

4. When determining the net volume, do Ratio-Blending Systems that incorporate means to correct for density have the same accuracy as Side-Stream systems that correct for temperature only?

Before OWM can determine the merit of these proposals, these questions should be answered. Our office participated in a workgroup organized by API to develop the language submitted in August of 2025, which

became item LMD-26.1. That workgroup is no longer active, but since its introduction, OWM has continued to work with representatives of the petroleum industry to further develop this item which is reflected in the NCWM S&T Agenda. Significant changes have been made to this item since the 2026 NCWM Interim Meeting by the submitter and this updated language will be submitted to the newly formed NCWM LMD Density Correction Task Group. Because the language in this item continues to evolve, any analysis would be outdated. Loren Minnich and John McGuire from NIST OWM will serve as Technical Advisors to the LMD Density Correction Task Group and we look forward to the work ahead for this group.

Summary of Discussions and Actions:

At the 2026 NCWM Interim Meeting, Steve Carter (IL) and Prentiss Searles (API) both gave presentations, both of which are available on the NCWM website here: 2026 NCWM Interim Meeting Documents Archive

Loren Minnich (NIST OWM) supported a Developing status, noting that OWM recognizes that blending ethanol and petroleum products results in a greater volume of the blended product than the sum of the volume of the separate products when corrected to the reference temperature of 15 °C (60 °F) and that this phenomenon has been recognized for some time, as evidenced by a presentation given by Ron Hayes (MO Retired) during the 2007 CWMA Annual Meeting. The question before the weights and measures community is how best to quantify this phenomenon. This item was submitted in response to an issue a state had with a wholesale device that currently utilizes a system that corrects for density/excess volume. Loren then stated that if the weights and measures community determines that these proposed amendments have merit, there are several concerns, as referred to in the 2026 NCWM Interim Detailed Analysis for this item, that the community should consider. Alison Wilkison (MD) expressed concerns with this item, including that, based on the language, it seemed that it would apply to a new device, but upon further review, it was apparent that the correction for density was accomplished by software (a metrological function) that hasn't been evaluated. Reviewing the information available, it appears that the data for this correction is based on certain ethanol-gasoline blends, and for other blends, most concerning is E85, the correction is estimated based on the limited data from the blends included. More data needs to be collected to ensure the correction factor is accurate. Alison supports an Assigned or Developing status. Matt Douglas (CDA DMS) agreed with the comments from OWM and MD, specifically that the item seemed to be written towards a device, not software; more vetting is needed and suggested Developing or Assigned status. Sherry Turvey (KS) suggested that, because this is a software function, a means to determine the density of the separate products would need to be part of the metering system, and that testing procedures need to be addressed as well. Jim Pettinato (Guidant Measurement) stated that Guidant Measurement was involved in developing the API standard and was an early adopter of it in their products, which have been certified by OIML. Jim noted that API is an accredited standards body and that other standards organizations (ASTM) have evaluated the API standard. In reply to comments that were concerned with the use of the word "estimate" in the API standard, Jim said that while "estimate" may not be the best word to describe the density correction, ATC is also an estimate, as the actual volume isn't measured at 15 °C/60 °F; the volume is compensated for using the API standard. The transactions affected are between businesses and don't involve the end consumer. Facilities that are configured with side-stream blending, where the blended product is metered, may not be as accurate as facilities with ratio-blending configurations, where the separate products are metered, and the API standard is used to calculate the excess volume. Jeff Gibson (NTEP) confirmed that systems that incorporate this calculation would have had a metrological change and would need to be re-evaluated by NTEP. Matt Sheehan (Chevron U.S.A., Inc.) agreed with the comments from API and Guidant Measurement and supports Voting status. Matt indicated that Chevron is a vertically integrated company, so this issue has less effect on them, but supports everyone operating using the same calculation. With facilities that have both side-stream and ration-blending configurations, not all facilities have the real estate to reconfigure to side-stream blending. Most of the feedback can be worked into the item and if not assigned Voting status, would like to participate in a workgroup or task group, if created. John Hathaway (Murray Equipment, Inc) supports Developing status suggesting that real world data needs

to be gathered to compare to lab data, not aware of real-world data. Russ Lewis (Marathon Petroleum Company) stated that they are both producers and buyers of the product (ethanol-gasoline blends) subject to these corrections and they are looking for equity. The company has more than 1300 locations, and many were built before ethanol blending was common. Russ identified that the API standard is part of an ASTM standard and has been vetted by experts outside of API, and this standard has been adopted in Europe. Russ supported a Voting status. Gerret Scott (ExxonMobil) commented that there are real-world examples of this growth, referencing a roughly 0.2% effect on inventories when blending ethanol and gasoline, indicating that this can be verified in the field, and recommended a Voting status. Scott Miller (IL) said that this correction was found to have been in use in IL since 2019, but the basis for the correction wasn't disclosed until questions were asked. IL supported withdrawal. Loren Minnich (NIST OWM), in reference to comments from ExxonMobil regarding field verification, asked for clarification. As a participant in the workgroup organized by API, it was OWM's understanding that a prover couldn't be used to verify the growth due to expansion of the blended product, but it seemed ExxonMobil suggested that it was possible. Gerret Scott (ExxonMobil) replied that a 1000 gal prover could be used if the proper procedure was followed. Michael Keilty (Endress+Hauser) commented that he has learned a lot through attending the regional meetings, but had concerns with the proposed language related to "Automatic" density correction because the proposal doesn't require a density meter (similar to the requirements for thermometers in the measuring system) which would seem to a "nonautomatic" correction. Michael recommended an Assigned status. Mauricio Mejia (FL) agreed with the comments from OWM, MD, and other regulatory officials regarding concerns with the proposal and recommended a Developing status. Jim Pettinato (Guidant Measurement) noted that API Chapter 11.3.4. applies to all ethanol blends and is used to correct for expansion and for inventory control. Prentiss Searles (API) replied to OWM's question related to using provers, indicating that there are significant concerns with using a 1000-gal prover to measure expansion.

The S&T Committee gave the item an Assigned status and created a task group to further develop the proposal.

Regional Association Reporting:

Western Weights and Measures Association

At the 2025 WWMA Annual Meeting, Mr. Matthew Shein (Chevron) gave a presentation which is available on the WWMA website.

Mr. Rusty Lewis (Marathon) stated was part of the work group and requests the item be Voting.

Mr. Matthew Douglas (State of California, Division of Measurement Standards) supports a Voting status.

Mr. Mahesh Albuquerque (Colorado Division of Oil & Public Safety) questions if the expansions are over tolerance but supports Voting status.

Mr. Matthew Shein (Chevron) admits that tolerance could be over the expansion.

Mr. Steve Benjamin (API Consulting) states expansion happens in transit; expansion cannot occur twice.

Mr. Matthew Shein (Chevron) supports Voting status.

The 2025 WWMA S&T Committee recommends a Voting status. The committee believes this item is fully developed and ready for a vote.

Southern Weights and Measures Association

At the SWMA 2025 Annual Meeting, Prentiss Searles (American Petroleum Institute) gave a presentation, which is available on the SWMA website.

Jason Glass, Kentucky – Presented a question; while not arguing the science, he is curious how to look at meters/provers and questions if this has shown up to be an error often.

Prentiss Searles, API– issue initiated in Illinois – a bill of lading didn't identify how additional gallons "got there". This proposal can add language to the bill of lading, net and "new" gallons, to better understand how it comes together. There is an L&R recommendation that accompanies this proposal.

Tory Brewer, West Virginia – Presented a question. Is this a new device or more a software in S.2.9.3. Are inspectors to be looking for an actual seal or an audit log?

Prentiss Searles, API – Confirms it is not a device and may not need the section regarding sealing. Software must be sealable and auditable (per other sections) so that is why it was included.

Mauricio Mejia, Florida – What is the impact of the 0.2 % ? This could be very impactful economically – comparing that value to the cost to replace the pipes at the terminal.

Prentiss Searles, API– He doesn't have a specific cost, the terminal may not have the ability to have the additional meters installed due to lack of real estate.

Michael Keilty, Endress+Hauser – There is no NTEP test procedure but there is a policy added. In recent discussions, because there is no reference in HB44, they removed that policy. No device has been tested for this mechanism. It is simply an adjustment factor in the existing device – not compared at each individual location. Number of companies that have this type of ratio blending system is approx. 20, nationwide per Jim Pettinato. Diagram of testing system and asked about the timing, given that it takes time for the readjustment. What happens when ethanol is added to just before the custody meter – blend must happen significantly upstream. If it isn't blended at time of testing, this changes how it would be applied. How would a WM official know which system is eligible for this density correction? How will the mechanism be tested for type approval?

Prentiss Searles, API – To clarify, density is calculated each time you get a new batch at the terminal and is not a fixed correction. Density of the blend stock side stream takes 6 feet to completely blend the product.

Michael Keilty, Endress+Hauser – The correction value is not "behind the seal" and would require a readjustment each delivery. What are the limits of adjustability?

Prentiss Searles, API – It is not being adjusted, density is measured for net also and comes as each batch of new fuel comes into the terminal. When they receive a batch they have a grab sample from bottom, middle and top checking for density.

Alison Wilkinson, Maryland – reading the proposal is misleading that it is portrayed as a device and not a software. She would like to see the software submitted as a system with an NTEP approved meter for evaluation and receive a certificate of conformance as a whole system. If it goes into the handbook, as written, it leads to confusion for inspectors. They'll be looking for a device. Using software in confusion with already approved devices (temperature probe). Recommends Withdrawn or Developing, as it isn't ready for handbook.

Russell Lewis, Marathon Petroleum – Regarding comments to if it is a device or not – devices are in place – a study in 2019 was done to create 11.3.4 – it went through D0202 ASTM – as a peer review during that study gathering roughly 6,000 data points and then pared down to under 2,000 to meet the criteria for test conditions. 11.3.4 is cited in an ASTM document. The difference is getting factors off existing factors – applying a formula from that 2019 study (spreadsheet or software). Using temperature corrections and density already – this is an additional step based on different hydrocarbon densities. Work Group had state regulators and NIST who collectively came up with this language. There have been suggestions for consideration, but the item doesn't change the technical approach. In support of this being a Voting Item

Alison Wilkinson, S&T Committee – Software vs charts. Inquired whether to use the correction factors for density with software or by hand using charts.

Russel Lewis, Marathon Petroleum– Answered previous question that it could be both. The working group decided these were the parts of the HB that needed to be addressed (it is also affecting HB130 with L&R)

Matt Sheehan, Chevron –in support of Prentiss' and Russ' comments. They prefer to use this calculation. In support of this item.

Jared Scott, Exxon – in support of this item. Believes this is a way to ensure fair and equitable trade. We want accuracy, both as a consumer and business.

Alison Wilkinson, Maryland – Proposal uses existing technology with addition of correction factors – feels this proposal is misleading the way it's currently written. Recommends Developing for further development, for clarification.

The committee recommends Developing status on this item.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, a representative from the American Petroleum Institute gave a presentation in support of this item. A representative from the State of New Jersey asked how long does the chemical reaction take? The American Petroleum Institute answered that the reaction is almost instantaneous in about six feet of pipe. A representative from the State of New York supports the work from the task group and would like to see a non-retroactive requirement for new terminal installations and major construction, so a custody or side stream meter would be required to account for the volume growth. A representative from Marathon Petroleum agreed with New York and stated the ratio blending infrastructure was installed prior to ethanol blending. Future infrastructure will need to be installed with consideration for ethanol blending.

The NEWMA S&T Committee recommended retaining the Assigned status.

At the 2025 NEWMA Interim Meeting, a representative from API gave a presentation on the science and reasons this proposal is warranted. Recommends voting status. Responded to the Representative from NJ that "densimeter" is the best term. The presentation is available on the NEWMA website.

Representative from NY – Questions whether there should be a UR disallowing Density Corrections for side stream blending since the custody meter already accounts for the volume growth. Recommends developing status.

Representative from NJ – "Densimeter" should it be that word or not. Should this be defined in Appendix D. In UR.3.6 the word "temperature" should be kept when adding "volume" and "correction". Suggested

keeping temperature in the title and adding a separate line requirement for volume correction. Recommends developing status.

Representative from Marathon Petroleum – Supports this proposal.

Representative from Growth Energy – No position but has question about implementation for blending and retailers.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the CWMA S&T Committee recommended retaining the Assigned status.

At the 2025 CWMA Interim Meeting, the committee recommends this item be given a Developing Status based on comments received during open hearing.

WTR – WATER METERS CODE

WTR-26.2 V S.1.1.4. Advancement of Indicating and Recording Elements

Source: NIST Office of Weights and Measures

Submitter's Purpose and Justification:

Clarify that a meter shall advance only by the designed operation of the device in accordance with General Code requirements, specifically G-S.3. Permanence.

Original Justification:

The phrase "as intended by the manufacturer" may be interpreted as allowing a device to be designed to operate in a manner that is contrary to the principles of NIST Handbook 44. By removing this phrase, this implication is removed. While manufacturers may intend to make a device that complies with the parameters of NIST Handbook 44, there are times when, inadvertently, a device is developed that does not comply.

It should be recognized that very few jurisdictions evaluate or regulate water meters. In this context, this paragraph has been in the handbook since 2021, and no concerns have been raised since then.

The submitter requested Voting Status.

NIST OWM Executive Summary

WTR-26.2 V S.1.1.4. Advancement of Indicating and Recording Elements
NIST OWM Recommendation: Voting • This amendment removes language that could lead to misinterpretation of this requirement (see Original Justification). • OWM supports adoption of this item.

Table 2. Summary of Recommendations
WTR-26.2 V S.1.1.4. Advancement of Indicating and Recording Elements

	Status Recommendation	Note*	Comments
Submitter	Voting		
OWM	Voting		
WWMA	Voting		
NEWMA	Voting		
SWMA	No Recommendation		
CWMA	Voting		
NCWM	Voting		

	Number of Support Letters	Number of Opposition Letters	Comments
Industry			
Manufacturers			
Retailers and Consumers			
Trade Association			

***Notes Key:**

1. Submitted modified language
2. Item not discussed or not considered
3. No meeting held
4. Not submitted on agenda
5. No recommendation

Item Under Consideration:

Amend NIST Handbook 44, Section 3.36. Water Meters Code as follows:

> **S.1.1.4. - Advancement of Indicating and Recording Elements.** – Primary indicating and recording elements shall advance only by the designed operation of the device~~**, as intended by the manufacturer**~~. (Amended 2021 **and 20XX**)

NIST OWM Detailed Technical Analysis:

See Executive Summary.

Summary of Discussions and Actions:

At the 2026 NCWM Interim Meeting, Loren Minnich (NIST OWM) explained that this item removes language that could lead to misinterpretation of this requirement and supported a Voting status.

Regional Association Reporting:

Western Weights and Measures Association

At the 2025 WWMA Annual Meeting, Mr. Loren Minnich (NIST Office of Weights and Measures) stated this item removes the term “as intended by the manufacturer” and is an editorial change. The item is ready for a vote.

Mr. Matthew Douglas (State of California, Division of Measurement Standards): Supports Voting status.

The 2025 WWMA S&T Committee recommends a Voting status. The committee believes the item is fully developed and ready for a vote.

Southern Weights and Measures Association

At the 2025 SWMA Annual Meeting, no comments were provided on this item.

The committee has no recommended status for this item.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, a Representative from the NIST OWM states this item removed language that could cause misinterpretation of this item. NIST feels the item is fully developed and ready for a vote.

The Committee recommends this item remain as Voting.

At the 2025 NEWMA Annual Meeting, no comments were provided on this item.

The committee has no recommended status for this item.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommends this item remain as Voting.

At the 2025 CWMA Interim Meeting, the committee recommends this item be given a Voting status based on comments received during the open hearing.

EVF – ELECTRIC VEHICLE FUELING SYSTEMS

EVF-26.2 A Section 3.40 Electric Vehicle Fueling System A.2. Exemptions, S.1 Primary Indicating and Recording Element, S.1.2. EVSE Indication Elements, S.1.3.2 EVSE Values of Smallest Units, S.2.3. EVSE Provision for Power Loss, S.2.4.2. Equipment Capacity and Type of Voltage, S.2.4.4. Agreement Between Indications, S.2.5.1. Money-Value Divisions Digital, S.7 Totalizer for EVSE Systems, N.3.2. Type Evaluation of a DC EVSE

Source: Vermont Division of Food Safety & Consumer Protection Weights and Measures

Submitter's Purpose and Justification:

The intent of the proposed changes is to add clarity, uniformity, and consistency to NIST Handbook 44, Section 3.40. Electric Fueling Systems. The proposal adds language and removes exemptions, which will be beneficial to compliance programs, consumers, and the EVSE industry.

Original Justification:

The EVSE industry, consumers, and regulators can benefit from increased clarity, uniformity, and consistent expectations. These proposed changes will enhance consumer confidence, leading to increased use and support of the electric vehicle charging network. Many consumers desire more clarity and understanding when using EVSEs. As one consumer stated, "using EVSE should be the same experience as using a gas pump."

Several of the proposed changes clarify legally ambiguous and inconsistent statements within the Electric Vehicle Fueling Systems code. As weights and measures compliance programs are implemented around the country, it is crucial to establish clear standards where everyone agrees on the meaning of each requirement. Standards that are unclear, confusing or susceptible to multiple interpretations promote misunderstanding and a lack of confidence in the industry and enforcement programs. One manufacturer might be trying to comply with interpretation "y," while another operates under assumption "x," and compliance jurisdictions take actions based on interpretation "z." This last type of misunderstanding leads to added costs to manufacturers and installers, as well as wastes time of compliance programs.

A.2. Exemptions (a)

In Vermont, public utilities own between 15% and 20% of EVSEs commercially available to the public and in direct competition with EVSEs owned by the government and other private companies. This exemption, as is currently written, creates varying standards within the industry. To ensure uniformity, all commercial EVSEs available to the public should comply with a single standard. Therefore, EVSEs owned by public utilities and accessible to the public should not be exempt from these regulations, as they are in direct competition with those EVSEs that are subject to these requirements.

The word "used" is ambiguous and lends itself to multiple interpretations. "Used" could mean the person who plugs in to charge their personal vehicle, but it could also mean the entity who is "using" the EVSE to sell power, or both. The added language aims to provide a clear interpretation of this exemption.

Public utilities and private companies should be permitted to own and operate EVSEs for internal use and which are not open to the public, without having to comply with Handbook 44 requirements for these chargers. Example 1 shows a set of EVSEs inside a fence in the yard of a public utility which are not open

to the public and are only used to charge company vehicles. These devices should remain exempt from this regulation.

Example 2 shows EVSEs owned by the same public utility and located in the same town as those shown in Example 1. However, these Example 2 devices are in a public parking lot, open to the general public, and charge a fee to anyone who uses them, just like another set of privately owned EVSEs across the street.

Example 1: EVSE behind a fence owned by a public utility for their exclusive use.

Example 2: EVSE is a public parking lot owned by a public utility open to anyone who would like to use it and charging the general public by kWh and time.

A.2 Exemptions (b)

This exemption is inconsistent with other parts of the standard and potentially creates a loophole for anyone wanting to be exempt from these requirements. With this exemption in place, any device charging $0.00 per kWh could be considered exempt from NIST Handbook 44 Section 3.40. Although Handbook 130 specifies electrical energy kept, offered, or exposed for sale and sold as vehicle fuel must be in terms of kWh (section 2.33.2 of the Uniform Regulation for the Method of Sale of Commodities). This does not prohibit charging $0.00 per kWh to circumvent these requirements.

Presently, consumers encounter various methods of sale from one EVSE to another. Some EVSEs bill by the kilowatt-hour, others by the hour, and some employ both methods of sale. For consumers to make accurate value comparisons between EVSEs with these different billing criteria, the consumer must be informed of the total kilowatt-hours received following all transactions.

Exception A.2 (b) exempts devices charging by time alone (or $0.00 per kWh) from the requirements of Section 3.40. Removing Exemption (b) would explicitly mandate all EVSEs to adhere to the same standards if they charge fees, whether by time, or energy, or any other method. For instance, Section 2.2.6. EVSE Recorded Representation requires the receipt to provide the total quantity of energy delivered, regardless of the cost per kWh, which would allow all consumers to make value comparisons between EVSEs.

S.1

The requirement for an indicating element which is part of the EVSE itself is implied throughout the 3.40 Electric Vehicle Fueling Systems standard, but it isn't explicitly stated as in the NIST HB 44 3.30 Liquid-Measuring Devices code. This proposal would explicitly require an indicating element to be part of the device, using language nearly identical to the LMD code.

This proposal would enhance clarity for both manufacturers and state officials alike, enabling consistent enforcement across all weights and measure jurisdictions. Most EVSE models currently have some form of

display, so requiring all devices to have them would not increase the cost of most EVSE devices. Moreover, it would be a non-retroactive requirement, taking effect with its adoption into the handbook. Consequently, existing devices would not need to be updated until they require replacement or significant upgrades to their measuring systems.

S.1.2

Vermont Weights & Measures has identified numerous cases where the information on the receipt regarding the energy dispensed differs from the information provided on the primary indicating element of a device. Most of these discrepancies arise from rounding or truncation, but other times are simply different numbers. While these inconsistencies have been minor and have not affected monetary calculations based on what we have seen thus far, they may be confusing to the consumer.

This change aims to provide a more consistent experience for the consumer while preserving manufacturers' flexibility. Unlike gas pumps or deli scales, the consumer may not be present watching the fueling process. The updated language would require the important transaction-related information (total quantity of energy dispensed, total price, unit price, sales tax, etc.) to be displayed on the primary indicating element after the transaction but also when the purchaser is present. Currently, many EVSEs display his information immediately following the completion of power delivery, typically without the consumer present. Additionally, the new language extends the time available to read and comprehend this information (to 1 minute from 15 seconds) before the primary indicating element resets to the default screen.

The revised language empowers manufacturers to display pertinent information during the charging process, so long as the consumer can access all the necessary information on the primary indicating element at their leisure during the fueling process.

S.1.3.2. & S.2.5.1

The number of decimal places required should be simplified because it will make it easier for manufacturers to comply with the requirements. Moreover, the fourth decimal place does not affect the final dollar amount charged to the consumer or the measurement integrity for most minimum measured quantity (MMQ) used during testing.

Numerous EVSE brands currently do not comply with the existing requirements in S.1.3.2. The quantities displayed on the primary indicating element and information on the primary recording element (i.e. receipt, statement, etc.) can be inconsistent in relation to energy delivered by a device. These errors are usually due to rounding or truncation. While these discrepancies have been small and have not impacted monetary computation based on what we have seen, they may be confusing to the consumer.

The proposed change to S.2.5.1. is put forth because this section is inconsistent with section S.1.3.2 EVSE Value of Smallest Unit. If the devices need to measure in finer units, then the computation of money-value should be displayed and be based on those units. As the cost increases, this discrepancy could lead to unnecessary computational errors.

In this case, presenting consistent information to the consumer will benefit the industry by increasing consumer confidence.

S.2.3.

Many, if not all, EVSEs require a network connection to complete and finalize transactions, and do not automatically time out when the plug is returned to the holster/port. Vermont Weights & Measures has

encountered one case where an EVSE lost its network connection during our testing and did not time out when the plug was returned to the holster/port. Figure 1 shows the charging timeline of a transaction where the inspector tested the device a little before 3:00 pm and received a network lost message and did not time out, as indicated with the sharp spike on the left-hand side of the graph. Later that same day just before 6:30 pm, someone else plugged their vehicle into the EVSE and charged their vehicle for roughly 2 hours on our account, as shown by the blue shaded block to the right of the graph.

This language would make the requirements which currently apply to power loss also apply to network loss.

Figure 1: EVSE did not time out following a network loss during test and another consumer commenced charging on the Vermont account 2.5 hour after we had left the site.

S.2.4.2.

Vermont Weights & Measures has found that about 30% of DC EVSE are not supplying the maximum kW amount stated on the device and/or the app used to advertise and activate the EVSE when we test them with the Tesco PL4150 load emulator. Consumers rely on this information to select which EVSE they will use when multiple units are available, so the information presented to the potential purchaser must be accurate and correct. These changes will allow the consumer to make informed purchasing decisions, regardless of their preferences.

In some instances, a single app shows different maximum kW ratings at different times. Figure 2 shows charger AUK-00516 advertised as up to 25 kW at 10:49 am while at 10:55 am the same charger was advertised on the app as a maximum output of 75 kW. The inspector was on site this entire time, and nothing about the state of the EVSE had changed.

This proposed language would expand the labeling requirement that apply to the device itself to the apps used to locate and sometimes operate those same EVSEs, so the consumer knows what to expect in advance of arriving on site. It would also require the device to be labeled with the maximum power output the consumer can realistically expect at that time.

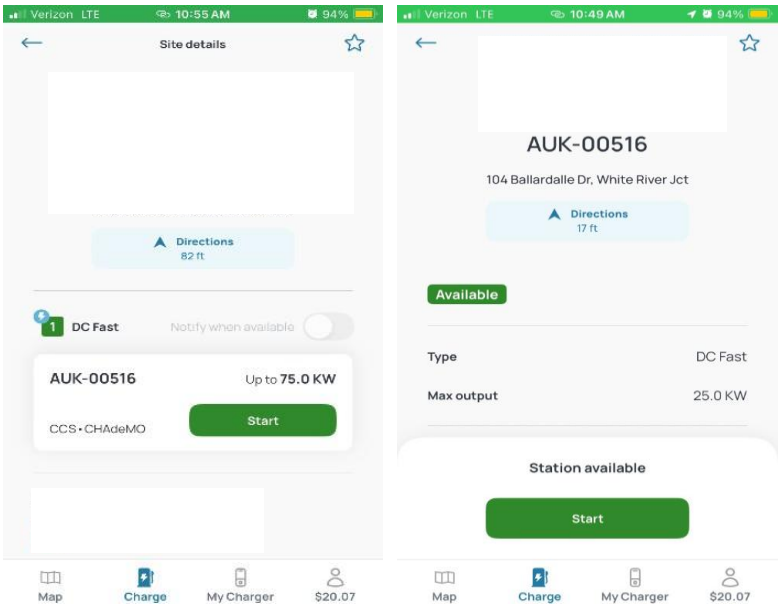


Figure 2: Two screen shot of the same EVSE taken 6 minutes apart on the same app

S.2.4.4

This language is put forward because we have discovered discrepancies between information displayed on the EVSE and information recorded in apps providing receipt or billing information or both for transactions. See the justification for S.1.2, S.1.3.2, and S.2.5.1 above.

S.7

The new language simplifies complicated wording. The proposed language requires the totalizer information to be available on the face of the device, regardless of whether the face is built into the device, or it is a remote display such as the vehicle, or a phone based app.

N.3.2

Type evaluations information belongs in the NCWM Publication 14 EVSE Devices not in Handbook 44. No other device type has type evaluation information in Handbook 44.

Possible Opposing Arguments:

The EVSE industry has argued and presumably will continue to argue that consumers don't use EVSE's like gas pumps or scales and are not present during the bulk of the transaction, so a display and consistency doesn't matter if the consumer ultimately gets what they paid for. The EVSE industry will likely advocate that the maintenance of screens adds significant cost to the operation of the device and creates an unnecessary financial burden on the industry.

Opposition may argue that all EVSE's operated by public utilities should not come under weights & measures jurisdiction because they are already regulated by public utility commissions and the like throughout the country.

Another opposing argument might be that if the power is free then the transaction is not commercial, and the standard should not apply.

The possible argument against standardizing the number of decimal places measuring the power dispensed does not make a difference in the end price, then they shouldn't have to include it in the recorded information.

A possible argument about the totalizer wording is that if it is available, why does it matter where and how it is available. The industry will argue that type evaluation criteria need to be somewhere, so Handbook 44 is where it should be.

The submitter requested Voting Status.

NIST OWM Executive Summary

EVF-26.2 A Section 3.40 Electric Vehicle Fueling System A.2. Exemptions, S.1 Primary Indicating and Recording Element, S.1.2. EVSE Indication Elements, S.1.3.2 EVSE Values of Smallest Units, S.2.3. EVSE Provision for Power Loss, S.2.4.2. Equipment Capacity and Type of Voltage, S.2.4.4. Agreement Between Indications, S.2.5.1. Money-Value Divisions Digital, S.7 Totalizer for EVSE Systems, N.3.2. Type Evaluation of a DC EVSE

NIST OWM Recommendation: Assigned

- NIST OWM is supportive of the intent of this item, "to add clarity, uniformity, and consistency" to Section 3.40. and looks forward to the work of the EVSE Task Group.
- Proposed amendments to A.2. (a) would bring devices owned and operated by a Public Utility under the jurisdiction of Weights and Measures officials, which may conflict with state laws or regulations.
  - This change may lead to further confusion and should be carefully considered.
- The removal of A.2. (b) may also have unintended consequences.
  - This sub-paragraph exempts devices that dispense electrical energy for "free" from compliance with this section.
  - NIST HB 44 requirements are intended to be applied to transactions that involve a commercial or law enforcement measurement. When there is no fee for EV fuel, there's no commercial transaction.
  - Most of these devices have no measuring element and would be made obsolete by the removal of A.2. (b).
  - This change must also be carefully considered, as it may have a significant impact on those who own or operate these devices.
- The proposed language in S.1.X, specifically the phrase "as part of the device," is vague and could be interpreted as requiring the primary indicating element to be included as a component of the EVSE system, as the term "device" is also interpreted as the combination of the components that are required to facilitate a transaction.
  - A vehicle scale is a weighing device, but typically the primary indicating element is a separate component from the weighing element.
  - A VTM, which is a measuring device, typically has a meter and a separate primary indicating element.

EVF-26.2 A Section 3.40 Electric Vehicle Fueling System A.2. Exemptions, S.1 Primary Indicating and Recording Element, S.1.2. EVSE Indication Elements, S.1.3.2 EVSE Values of Smallest Units, S.2.3. EVSE Provision for Power Loss, S.2.4.2. Equipment Capacity and Type of Voltage, S.2.4.4. Agreement Between Indications, S.2.5.1. Money-Value Divisions Digital, S.7 Totalizer for EVSE Systems, N.3.2. Type Evaluation of a DC EVSE

- The proposed retroactive language in S.1.2. could make those EVSE that currently comply with this paragraph obsolete. OWM supports this change, but as a nonretroactive requirement, see suggested language in the Detailed Analysis.
- The proposed amendment to S.1.3.2., changing the number of decimal places for AC EVSE from four (0.0000 kWh) to three (0.000 kWh), will have an effect on measurement accuracy, see detailed analysis.
- The proposed changes to S.2.3.1, S.2.3.2, and S.2.3.3 are formatted in a way that makes it difficult to know what the intended effect will be.
  - In the 2025 version of NIST HB 44, each of these paragraphs is retroactive.
  - In this item, the titles are in italics, which is representative of a nonretroactive requirement, but the remaining language is in upright type, and there are no dates associated with the paragraphs.
  - Adopting these changes as retroactive would affect all EVSE, possibly causing them to be out of compliance
- OWM agrees that the language in S.2.4.2. could be improved, but we have several concerns with the proposed amendments
  - The phrase “and any app used to advertise, or activate, or both” is too broad and would apply to any application that is associated with an EVSE, such as an app that “advertises” the location of an EVSE, but isn’t involved in the commercial transaction
  - Requiring the maximum rate of energy transfer possible and the maximum rate of energy transfer currently available to be displayed may result in providing less clarity and uniformity in the information consumers are provided.
  - See Detailed Analysis for alternatives to the proposed changes.
- The proposed amendments to S.2.4.4. are redundant as this paragraph and G-S.5.2.2. (a) both require agreement of all values in a system.
- OWN supports consistency between the values in S.1.3.2. and S.2.5.1.
  - We are concerned with the amendments proposed to S.1.3.2. and suggest amending S.2.5.1. with language in the Detailed Analysis.
- If the weights and measures community supports the changes proposed to S.7., the new requirement should be nonretroactive, see Detailed Analysis.
- OWM agrees that type evaluation requirements are most appropriately identified in NCWM Pub 14 or other type evaluation procedures (CTEP) and supports the removal of N.3.2. Type Evaluation Testing of a DC EVSE.

EVF-26.2 A Section 3.40 Electric Vehicle Fueling System A.2. Exemptions, S.1 Primary Indicating and Recording Element, S.1.2. EVSE Indication Elements, S.1.3.2 EVSE Values of Smallest Units, S.2.3. EVSE Provision for Power Loss, S.2.4.2. Equipment Capacity and Type of Voltage, S.2.4.4. Agreement Between Indications, S.2.5.1. Money-Value Divisions Digital, S.7 Totalizer for EVSE Systems, N.3.2. Type Evaluation of a DC EVSE

- In the case of EVSE, there is no sector or work group that actively meets to update/amend the EVSE section of Pub 14.
- The most qualified opinion on whether this proposed change is appropriate or necessary would be from the NTEP. OWM will defer to their opinion.

Table 2. Summary of Recommendations

EVF-26.2 A Section 3.40 Electric Vehicle Fueling System A.2. Exemptions, S.1 Primary Indicating and Recording Element, S.1.2. EVSE Indication Elements, S.1.3.2 EVSE Values of Smallest Units, S.2.3. EVSE Provision for Power Loss, S.2.4.2. Equipment Capacity and Type of Voltage, S.2.4.4. Agreement Between Indications, S.2.5.1. Money-Value Divisions Digital, S.7 Totalizer for EVSE Systems, N.3.2. Type Evaluation of a DC EVSE

	Status Recommendation	Note*	Comments
Submitter	Voting		
OWM	Assigned		
WWMA	Developing		
NEWMA	Assigned		
SWMA	Developing		
CWMA	Assigned		
NCWM	Assigned		

	Number of Support Letters	Number of Opposition Letters	Comments
Industry			
Manufacturers			
Retailers and Consumers			
Trade Association			

***Notes Key:**

1. Submitted modified language
2. Item not discussed or not considered
3. No meeting held
4. Not submitted on agenda
5. No recommendation

Item Under Consideration:

NOTE: This item has been edited to properly identify the section of the handbook affected and to correct formatting errors. The Items Under Consideration now reflect the structure required by NIST Handbook 44.

Amend NIST Handbook 44, Section 3.40. Electric Vehicle Fueling Systems Code 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.2. Exceptions. – This code does not apply to:

(a) The use of any measure or measuring device owned, maintained, and **only used to charge equipment owned by that** public utility or municipality **operating in a public utility system and** only in connection with measuring electricity subject to the authority having jurisdiction such as the Public Utilities Commission.

~~**(b) Electric Vehicle Supply Equipment (EVSEs) used solely for dispensing electrical energy in connection with operations in which the amount dispensed does not affect customer charges or compensation.**~~

~~**(c)**~~**(b)** The wholesale delivery of electricity.

(Amended 20XX)

A.3. Additional Code Requirements. – In addition to the requirements of this code, Electric Fueling Systems shall meet the requirements of Section 1.10. General Code.

A.3.1. Electric Vehicle Supply Equipment (EVSE) with Integral Time-Measuring Devices. – An EVSE that is used for both the sale of electricity as vehicle fuel and used to measure time during which services (e.g., vehicle parking) are received. These devices shall also meet the requirements of Section 5.55. Timing Devices.

A.4. Type Evaluation. – The National Type Evaluation Program (NTEP) will accept for type evaluation only those EVSEs that comply with all requirements of this code and have received safety certification by a nationally recognized testing laboratory (NRTL).

S. Specifications

S.1. Primary Indicating and Recording Elements.

S.1.X. General. – Electric Vehicle Supply Equipment (EVSE) shall be equipped with a primary indicating element as part of the device; and may be equipped with a primary recording element
[Nonretroactive as of January 1, 20XX]
(Added 20XX)

S.1.~~1~~2. Electric Vehicle Supply Equipment (EVSE). – An EVSE used to charge electric vehicles shall be of the computing type and shall indicate the electrical energy, the unit price, and the total price of each transaction.

(a) EVSEs capable of applying multiple unit prices over the course of a single transaction shall also be capable of indicating the start and stop time, the total quantity of energy delivered, the unit price, and the total price for the quantity of energy delivered during each discrete phase corresponding to one of the multiple unit prices.

(b) EVSEs capable of applying additional fees for time-based and other services shall also be capable of indicating the total time measured; the unit price(s) for the additional time-based service(s); the total computed price(s) for the time measured; and the total transaction price, including the total price for the energy and all additional fees.

S.1.~~2~~3. EVSE Indicating Elements. – An EVSE used to charge electric vehicles shall include an indicating element that accumulates continuously and **can** display, for a minimum of 15 seconds upon activation by the user and at the start and end of the required information throughout the transaction at the consumer's **request. Following the completion of a charge and transaction, the correct measurement results relative to quantity, unit price, total price, and any other fees shall be displayed for a minimum of 1 minute following the charger being unplugged from the vehicle.** Indications shall be clear, definite, accurate, and easily read under normal conditions of operation of the device. All indications and representations of electricity sold shall be clearly identified and separate from other time-based fees indicated by an EVSE that is used for both the sale of electricity as vehicle fuel and the sale of other separate time-based services (e.g., vehicle parking).
(Amended 20XX)

S.1.~~2~~3.1. Multiple EVSEs Associated with a Single Indicating Element. – A system with a single indicating element for two or more EVSEs shall be provided with means to display information from the individual EVSE(s) selected or displayed, and shall be provided with an automatic means to indicate clearly and definitely which EVSE is associated with the displayed information.

S.1.~~3~~4. EVSE Units.

S.1.~~3~~4.1. EVSE Units of Measurement. – EVSE units used to charge electric vehicles shall be indicated and recorded in kilowatt-hours (kWh) and decimal subdivisions thereof.
(Amended 2022)

S.1.~~3~~4.2. 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~~:**

~~a) for AC systems shall not exceed 0.0001 kWh;~~

b) **~~for DC systems~~** shall not exceed 0.001 kW and kWh; and

c) the value of the kWh shall be expressed only as a decimal submultiple of 1 **~~that satisfy (a) and (b).~~**
(Amended 2022 **and 20XX**)

S.1.~~3~~4.3. Values Defined. – Indicated values shall be adequately defined by a sufficient number of figures, words, symbols, or combinations thereof. An indication of "zero" shall be a zero digit for all displayed digits to the right of the decimal mark and at least one to the left.

S.2. EVSE Operating Requirements.

S.2.1. EVSE Return to Zero.

a) The primary indicating and the primary recording elements of an EVSE used to charge electric vehicles, if the EVSE is equipped to record, shall be provided with a means for readily returning the indication to zero either automatically or manually.

b) It shall not be possible to return primary indicating elements, or primary recording elements, beyond the correct zero position.

S.2.2. EVSE Indicator Zero Reset Mechanism. – The reset mechanism for the indicating element of an EVSE used to charge electric vehicles shall not be operable during a transaction. Once the zeroing operation has begun, it shall not be possible to indicate a value other than: the latest measurement; "all zeros;" blank the indication; or provide other indications that cannot be interpreted as a measurement during the zeroing operation.

S.2.3. EVSE Provision for Power or Network Loss.

S.2.3.1. Transaction Information. – In the event of a power loss or network loss, the information needed to complete any transaction (i.e., delivery is complete and payment is settled) in progress at the time of the power loss (such as the quantity and unit price, or sales price) shall be determinable through one of the means listed below or the transaction shall be terminated without any charge for the electrical energy transfer to the vehicle:

a) at the EVSE;

b) at the console, if the console is accessible to the customer;

c) via on site internet access; or

d) through toll-free phone access.

For EVSEs in parking areas where vehicles are commonly left for extended periods, the information needed to complete any transaction in progress at the time of the power loss shall be determinable through one of the above means for at least eight hours.

S.2.3.2. Transaction Termination. – In the event of a power loss or network loss, either:

a) the transaction shall terminate at the time of the power loss or network loss; or

b) the EVSE may continue charging without additional authorization if the EVSE is able to determine it is connected to the same vehicle before and after the supply power outage.

In either case, there must be a clear indication on the receipt provided to the customer of the interruption, including the date and time of the interruption along with other information required under S.2.6. EVSE Recorded Representations.

S.2.3.3. User Information. – The EVSE memory, or equipment on the network supporting the EVSE, shall retain information on the quantity of fuel dispensed and the sales price totals during power loss.

S.2.4. EVSE Indication of Unit Price and Equipment Capacity and Type of Voltage.

S.2.4.1. Unit Price. – An EVSE shall be able to indicate on each face the unit price at which the EVSE is set to compute or to dispense at any point in time during a transaction.

S.2.4.2. Equipment Capacity and Type of Voltage. – An EVSE **and any app used to advertise, or activate, or both shall ~~be able to~~** conspicuously indicate **~~on each face~~** the maximum rate of energy transfer **possible and the maximum rate of energy transfer currently** available (i.e., maximum power) and the type of current associated with each unit price offered (e.g., 7 kW AC, 25 kW DC, etc.).

S.2.4.3. Selection of Unit Price. – When electrical energy is offered for sale at more than one unit price through an EVSE, the selection of the unit price shall be made prior to delivery through a deliberate action of the purchaser to select the unit price for the fuel delivery. Except when the conditions for variable price structure have been approved by the customer prior to the sale, a system shall not permit a change to the unit price during delivery of electrical energy.

Note: When electrical energy is offered at more than one unit price, selection of the unit price may be through the deliberate action of the purchaser: 1) using controls on the EVSE; 2) through the purchaser's use of personal or vehicle-mounted electronic equipment communicating with the system; or 3) verbal instructions by the customer.

S.2.4.4. Agreement Between Indications. – All quantity, unit price, and total price indications within a measuring and billing system shall agree for each transaction.

S.2.5. EVSE Money-Value Computations. – An EVSE shall compute the total sales price at any single-purchase unit price for which the electrical energy being measured is offered for sale at any delivery possible within either the measurement range of the EVSE or the range of the computing elements, whichever is less.

S.2.5.1. Money-Value Divisions Digital. – An EVSE with digital indications shall comply with the requirements of paragraph G-S.5.5. Money-Values, Mathematical Agreement, and the total price computation at the end of the transaction shall be based on ~~**quantities not exceeding 0.01 kWh**~~ **the minimum value of the smallest unit as defined in S.1.3.2.**

(Amended 2023 and 20XX)

S.2.5.2. Auxiliary Elements. – If a system is equipped with auxiliary indications, all indicated money value and quantity divisions of the auxiliary element shall be identical to those of the primary element.

…

S.7. Totalizers for EVSE Systems. – EVSE systems shall be designed with a nonresettable totalizer for the quantity delivered through each separate measuring device. Totalizer information shall be adequately protected and unalterable. The system shall provide totalizer information and readily available on **the face of the device**~~**site or via on site internet access.**~~
(Amended 20XX)

…

N.3. Test of an EVSE System. – The testing methodology compares the total energy delivered in a transaction and the total cost charged as displayed/reported by the EVSE with that measured by the measurement standard. Each test shall be performed for at least the minimum measured quantity (MMQ).

N.3.1. Testing of an AC EVSE. – Accuracy tests shall be performed at the following current levels:

a) A point between 4 A and 10 A;

b) A point between 40 % and 60 % of the MDA; and

c) A point between 70 % and 100 % of the MDA.

(Amended 2024)

~~**N.3.2. Type Evaluation Testing of a DC EVSE. – Tests shall be performed at the following voltage points one between 350 VDC and 450 VDC and if supported by the EVSE a second at between 700 VDC and 900 VDC:**~~

~~**Accuracy tests shall be performed at the following current levels:**~~

~~**a) A point between 10 % and 20 % of the MDA, but not less than 30 A;**~~

~~**b) A point between 40 % and 60 % of the MDA; and**~~

~~**c) A point between 70 % and 100 % of the MDA.**~~
~~**(Amended 2024)**~~

N.3.~~3~~2. Performance Verification in the Field Testing of a DC EVSE. – Accuracy tests shall be performed at any voltage and the following current levels:

a) A point between 10 % and 20 % of the MDA, but not less than 30 A; and

b) A point between 25 % and 100 % of the MDA, with the recommendation to test at the maximum power level within that range that is possible using the test load and test standard available.

Note: The test points (a) and (b) above must not be at the same current level. It is recommended that the current levels should be separated to the extent that the test load and test standard will allow.

For DC systems it is anticipated that an electric vehicle may be used as the test load. Under that circumstance, testing at the load presented by the vehicle shall be sufficient for field verification provided that it is greater than 40 % of the MDA and no less than 30 A.

All DC EVSE placed into service prior to January 1, 2025 are exempt from this requirement until January 1, 2028. (Amended 2022 and 2024)

N.4. Repeatability Tests. – Tests for repeatability shall include a minimum of three consecutive tests at the same load, similar time period, etc., and be conducted under conditions where variations in factors are reduced to minimize the effect on the results obtained.

NIST OWM Detailed Technical Analysis:

NIST OWM is supportive of the intent of this item, "to add clarity, uniformity, and consistency" to Section 3.40. Due to the extent of the proposed changes, OWM supports the Assigned status to allow the EVSE Task Group to further develop this proposal. There are several areas to specifically consider.

A.2. parts (a) and (b)

It should be noted that the sub-paragraph designations (a), (b), and (c) in A.2. do not appear in the Item Under Consideration in EVF-26.1. The proposed amendments to A.2. (a) would bring devices owned and operated by a Public Utility under the jurisdiction of Weights and Measures officials, which may conflict with state laws or regulations. This change may lead to further confusion and should be carefully considered. The removal of A.2. (b) may also have unintended consequences. This sub-paragraph exempts devices that dispense electrical energy for "free" from compliance with this section. If these types of devices have no element to measure electrical energy, they would be made obsolete by the removal of A.2. (b). If that is the intent of the submitter, this change must also be carefully considered, as it may have a significant impact on those who own or operate these devices. The removal of A.2. (b) would also be contrary to the intent of NIST Handbook 44 as described in the Abstract:

> "NIST Handbook 44 is adopted by many state, local, and some federal weights and measures authorities to apply to **commercial weighing and measuring equipment** (bold and underlined for emphasis) and associated equipment and for use in applications for law enforcement and the collection of statistical information by government agencies."

Providing electrical energy as a vehicle fuel at no charge is not a commercial application. OWM agrees that when a device assesses fees for other services in association with providing "free" electrical energy as a vehicle fuel, it is difficult to make a value comparison to other devices that offer the same services but do not provide "free" electrical energy as a vehicle fuel. This issue may need further consideration.

S.1.X. General

This proposed amendment specifies that an EVSE "*shall be equipped with a primary indicating element as part of the device"*. OWM understands the intent of this paragraph is to require an indicating element to be incorporated into the EVSE "cabinet", similar to retail motor-fuel devices, but the terms "part of" aren't definitive and could be interpreted as requiring the primary indicating element to be included as a

component of the EVSE system, as the term "device" is also interpreted as the combination of the components that are required to facilitate a transaction, for example, a vehicle scale is a weighing device, but typically the primary indicating element is a separate component from the weighing element. A VTM, which is a measuring device, typically has a meter and a separate primary indicating element.

S.1.2. EVSE Indicating Elements

If the changes proposed to this paragraph were adopted as shown in the Item Under Consideration, they would be retroactive, and the effect would be to make many EVSE obsolete. OWM is very supportive of changes to this paragraph, as the current requirement provides a very short time interval for the consumer to view the relevant transaction information. However, our office suggests that the current S.1.2. be amended to apply to EVSE manufactured through a specified date, e.g., January 1, 20XX, and that an additional paragraph be added that is nonretroactive as of January 1, 20XX, with suggested edits. Requiring the information to be displayed for one minute after the EVSE is disconnected from the EV may inhibit the device's use for a prolonged period, especially when other customers are waiting to utilize it. Our suggested language would require the information to be displayed for a minimum of 15 seconds and be available for display until another charging session is initiated. Here is the suggested language:

S.1.2. EVSE Indicating Elements.

(a) An EVSE **manufactured prior to January 1, 20XX that is** used to charge electric vehicles shall include an indicating element that accumulates continuously and displays, for a minimum of 15 seconds at the activation by the user and at the start and end of the transaction, the correct measurement results relative to quantity and total price.

(Amended 20XX)

(b) An EVSE used to charge electric vehicles shall include an indicating element that accumulates continuously and can display the required information throughout the transaction at the consumer's request. Following the completion of a transaction, the correct measurement results relative to quantity, unit price, total price, and any other fees shall be displayed for a minimum of 15 seconds and at the consumer's request following the charger being disconnected from the vehicle. The required information shall be available for display until the EVSE is activated for the next transaction.

[Nonretroactive as of January 1, 20XX]

(Added 20XX)

Indications shall be clear, definite, accurate, and easily read under normal conditions of operation of the device. All indications and representations of electricity sold shall be clearly identified and separate from other time-based fees indicated by an EVSE that is used for both the sale of electricity as vehicle fuel and the sale of other separate time-based services (e.g., vehicle parking).

(Amended 20XX)

S.1.3.2. EVSE Value of Smallest Unit

In the justification for this proposed change, the submitter states, "the fourth decimal place [for AC EVSE] does not affect the final dollar amount charged to the consumer or the measurement integrity for most minimum measured quantity (MMQ) used during testing." OWM has concerns with the statement that for most transactions, the "measurement integrity" would not be affected by reducing the number of decimal places for AC EVSE. That implies that the measurement integrity for some AC EVSE would be affected. OWM cautions the weights and measures community to consider how this change may affect tolerance application on test results. Reducing the number of decimal places from three to four reduces the precision of the measurement by a factor of 10. This example illustrates how this may affect test results:

	Indicated Quantity	Measured Quantity	% error	AC Maint. Tol
Result to four decimals	0.1004	0.1026	1.170	2%
Result to three decimals	0.101	0.103	1.942	

S.2.3.1. Transaction Information, S.2.3.2. Transaction Termination, and S.2.3.3. User Information

OWM supports adding requirements addressing the loss of communication with the network. But, due to the way these items are formatted in the regional agendas, it's difficult to determine if or what portions of the proposed changes are nonretroactive. The title of each paragraph is in italics, but none of the language in the paragraphs is in italics, and there is no nonretroactive date associated with the paragraphs. The proposed change to add the loss of network connection (network loss) to these paragraphs, if retroactive, would affect all EVSE, possibly causing them to be out of compliance. The submitter needs to clarify whether these paragraphs are intended to be retroactive or nonretroactive. OWM would strongly recommend adding a new requirement, which is nonretroactive, addressing loss of network connection.

S.2.4.2. Equipment Capacity and Type of Voltage

This item proposes to strike the terms "on each face" and add the phrase "and any app used to advertise, or activate, or both". The addition of the phrase "and any app used to advertise, or activate, or both" is quite broad and may be interpreted as applying to any app associated with an EVSE. If an application only advertised the availability of a charger or only activated it, with no unit price, no ability to compute, and no indication of the quantity, NIST Handbook 44 would not be applicable to the application because it wouldn't be involved in the commercial transaction.

Because the definition of face in NIST Handbook 44 Appendix D applies to any part of "a computing-type pump or dispenser which displays the actual computation of price per unit, delivered quantity, and total sale price", and notes that definition notes that "In the case of some electronic displays, this may not be an integral part of the pump or dispenser", an application that includes this functionality and is used to facilitate a transaction through an EVSE is considered a "face" of the EVSE.

The other proposed change to this paragraph is to amend it to require the display of the "maximum rate of energy transfer **possible and the maximum rate of energy transfer currently available**". OWM agrees that the phrase "maximum rate of energy transfer" needs further clarification, but requiring the "maximum rate of energy transfer currently available" would potentially create less clarity, as the rate of energy transfer fluctuates due to various factors, such as the number of EVSE connected to the same energy source, the number of EV connected to the bank of EVSE, the condition of the EV battery, etc.. In addition, "currently available" could be interpreted as requiring an instantaneous measure of the rate of energy transfer, resulting in a constantly fluctuating number, which is of relatively little value to the consumer. When S.2.4.2. was developed by the USNWG, the initial draft referred to charging levels (Level 1, Level 2, etc.). There was concern within the work group that these terms didn't provide enough information to be useful to the consumer, as each level included EVSE with a range of charging capabilities. The phrase "maximum rate of energy transfer" replaced the "Levels" because the work group thought it would be more appropriate for this purpose, as it is a more meaningful and verifiable way to communicate the **potential** charging speed of an EVSE for value comparison. To ensure that this term is understood and is not confused with other labeling requirements (see below), it should be defined in NIST HB 44 Appendix A. OWM suggests this language as a starting point:

maximum rate of energy transfer (MRET) - The maximum power at which the EVSE can operate, displayed in kW (e.g., MRET 120 kW), based on the conditions of installation and intended operation.

It should be noted that the method of sale for Retail Sales of Electricity Sold as a Vehicle Fuel in NIST HB 130 requires Nominal Power to be labeled on the face of an EVSE that operates as a fixed service application and for all EVSE the Labeling Requirements for Alternative Fuels and Alternative Fueled Vehicles, **16 C.F.R. § 309,** requires the manufacturer of an EVSE to determine the "fuel rating" of an EVSE which includes the kilowatt ("kW") capacity (analogous to Nominal Power). For a fixed service EVSE, there could be three numbers that represent the rate of energy transfer. The Nominal Power and kilowatt capacity are based on the marked or labeled voltage and amperage and should be consistent with each other. The maximum rate of energy transfer may differ from the Nominal Power and kilowatt capacity, so each needs to be properly identified to reduce confusion.

S.2.4.3. Selection of Unit Price (included in IUC as a placeholder)

S.2.4.4. Agreement Between Indications

OWM views this proposed amendment as redundant. The EVSE is the measuring system, and per S.1.1. it determines the quantity, unit price, and total price of the transaction. If there are other parts of the system that facilitate payment processing, such as a "billing system", it would be considered part of the measuring system, similar to a Point-of-Sale system, and the values indicated or recorded must agree per this specification in Section 3.40. and per G-S.5.2.2. (a) in Section 1.10. S.1.4.2. Recorded Representations would also apply to a "billing system".

S.2.5.1. Money-Value Divisions Digital

OWN agrees that there should be consistency between the values in S.1.3.2. and this paragraph. As indicated above, we have concerns with the amendments proposed to S.1.3.2. We suggest replacing the value "0.01 kWh" with the following suggested language:

> **S.2.5.1. Money-Value Divisions Digital. –** An EVSE with digital indications shall comply with the requirements of paragraph G-S.5.5. Money-Values, Mathematical Agreement, and the total price computation at the end of the transaction shall be based on ~~**quantities not exceeding 0.01 kWh**~~ **the quantity indicated when the value of the smallest indicated unit is equal to or less than the values specified in S.1.3.2. EVSE Value of Smallest Unit.**

This suggestion is based on language in S.1.4.3. Money-Value Computations in Section 3.31. Vehicle-Tank Meters**.**

S.2.5.2. Auxiliary Elements (included in IUC as a placeholder)

S.7. Totalizers for EVSE Systems

If the weights and measures community agrees that this is a necessary change, OWM would again suggest separate requirements for devices manufactured prior to a specified date and a nonretroactive requirement for the proposed amendment. Here's suggested language:

> **S.7. Totalizers for EVSE Systems.** – EVSE systems shall be designed with a nonresettable totalizer for the quantity delivered through each separate measuring device. Totalizer information shall be adequately protected and unalterable.

(a) ~~**The s**~~**EVSE S**ystem**s manufactured prior to January 1, 20XX** shall provide totalizer information ~~**and**~~**which is** readily available on site or via on site internet access.

(b) ***EVSE Systems shall provide totalizer information on the face of the device. [Nonretroactive as of January 1, 20XX]***

N.3. Test of an EVSE System (included in IUC as a placeholder)

N.3.1. Testing of an AC EVSE (included in IUC as a placeholder)

N.3.2. Type Evaluation Testing of a DC EVSE

This sub-paragraph is proposed to be removed. OWM agrees that type evaluation requirements are most appropriately identified in NCWM Pub 14 or other type evaluation procedures (CTEP).

N.3.3. ~~Performance Verification in the Field~~ Testing of a DC EVSE

If N.3.2. is removed, OWM supports the change to the title of N.3.3., but it would also need to be renumbered to N.3.2.

Summary of Discussions and Actions:

At the 2026 NCWM Interim Meeting, Scott Dolan (VT) gave a presentation on the proposed changes and the background that necessitated the proposal. Loren Minnich (NIST OWM) summarized the OWM analysis, indicating support for a Developing status given the extent of the proposed changes. Mal Skowron (Tesla) recommended a Developing status and thanked Scott for soliciting input from stakeholders. There are concerns with several items in the proposal, specifically the amendments to S.2.4.2., which would require ”the maximum rate of energy transfer currently available”, which is more complex than it sounds, S.1.X., which seems to require a display on the EVSE, and while Tesla supports transparency, the most effective way to provide information is through “apps” because the customer is rarely in view of the EVSE while the charging session is active and requiring a display on the EVSE would contribute to maintenance costs and reliability issues. Tesla supports the current language in NIST HB 44 that allows NTEP approval of systems with mobile applications or vehicle displays. Cheryl Ayer (NH) supported the item, and thanked VT for their work developing it. Steve Griffith (NEMA) recommended Developing status. Mahesh Albuquerque (CO) agreed with some of the concerns expressed by OWM, as NIST HB 44 is a national document, and the proposed changes to the exceptions need to be carefully considered. CO supported a Developing or Assigned status. Dave Rodrigues (MA) expressed concerns with the proposed amendments to the exceptions and supported a Developing status. Alison Wilkinson (MD) supports the work by VT, as they are actively inspecting EVSE, and agreed that there are gray areas in NIST HB 44 that are interpreted differently, and these need to be addressed. MD supported a Voting status with some changes to the proposed language. Jose Arriaga (Orange County, CA) supported a Developing or Assigned status and doesn’t support changes to the exceptions section. Jason Flint (NJ) supported a Developing or Assigned status. Anthony Willingham (Electrify America) S.2.4.2. understands intent, but requiring these numbers won’t reflect the capability of the device. Many factors affect power transfer. As proposed, it wouldn’t help understanding of device capabilities. Matt Douglas (CDA DMS) recommended Developing or Assigned status noting that “app” indicators are NTEP currently, but only the app listed on the evaluation can be used with that device. Network loss language may be helpful but some evaluations include removing the cable and if a shutdown does not occur then the device is rejected. Type evaluation of load cells have similarities to type evaluation of EVSEs. Steve Timar (NY) supported Developing status and agreed with OWM regarding devices subject to Public Utility Commissions. Josh Cohen (SWTCH) supported Developing status, more uniformity is welcome by industry, the challenge is there isn’t a uniform business model. Users

want a similar experience to RMFD, the focus should on fairness and accuracy without being prescriptive. Justin Wilson (Chargepoint) supported Developing or Assigned status. A task group could select certain pieces that are fully developed and move to Voting and further develop other pieces. Paul Floyd (LA) suggested separating items to move some forward and keep others developing. Michael Krauthamer (EV Advisors, LLC) supported Developing status. Regarding proposed paragraph S.1.X., it's important that indicators can be non-integrated and for EVSE, an indicating element is most functional as an app and not a vehicle or screen due to concerns with vandalism and maintenance, and prefers making an external screen optional. Dashboards are most familiar to drivers. Kurt Floren (LA County CA) agreed with CA comments, supports removal of exemption sections, states have jurisdictional issues, supports Assigned or Developing status. Mike Harrington (IA) supported Developing status, exceptions may need to be addressed through regulations.

The Committee agreed to update the item with the most current language and give the item an Assigned status. They will request it be assigned to the EVSE Task Group with an updated mission.

Regional Association Reporting:

Western Weights and Measures Association

During the WWMA 2025 Annual Conference, Matthew Douglas (State of California, Division of Measurement Standards) recommends a Developing status, disagrees with changing the smallest indicated unit, feels the change should be to make the DC requirement match the AC value, will provide references in writing.

Mal Scalron [sic] (Tesla) recommends a Developing status, including many minor changes to 3.40 that require stakeholder input, S.1. requires indicating element to be part of the device, EV charging is different than gas pumps, it takes 25 minutes or more to charge in that time a consumer may step away, the remote is more transparent and allows users to monitor the charging, S.1. needs a revision, S.2.4.2. agrees with the premise but the language is too broad, language should be limited, S.7 is not wording clarification but substantive change, no longer web based.

Mr. Mahesh Albuquerque (Colorado Division of Oil & Public Safety) supports this item, this item has good intent, and recommends a Developing status.

The 2025 WWMA S&T Committee recommends a Developing status. The committee encourages the submitter to consider comments made during Open Hearings and seek feedback from stakeholders to continue developing this item.

Southern Weights and Measures Association

At the 2025 SWMA Annual Meeting, Robert Huff, Delaware said that S.1.2 states indication will remain on device 1 minute. Recommends 5 minutes to align with gas pumps. Recommends Voting status.

Alison Wilkinson, Maryland recommends Voting status as this item will help states and regulators clarify EV code and defines gray area.

Steve Griffith, NEMA, recommends Developing Status. He believes it to have merit but needs more development.

Mauricio Mejia, Florida, supports item as Developing. As it is proposed, it removes the verbiage that it does not apply to Non-Commercial Devices, by hour / time, and would like to have that added. Believes the primary indicator for all devices is a good idea.

The committee recommends Developing status on this item.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, a representative from the State of Vermont representing the EVSE Task group gave an update on the EVSE Task Group and the item. The EVSE Task Group has 24 members and is meeting monthly to discuss EVF 26.2. The group has divided the proposal into 11 sections and has already reached consensus language for three of those sections. We hope to have agreement on the entire proposal by the next NCWM Interim Meeting. Additionally, the task group has created four smaller focus groups to examine specific areas of need with EVSE regulation. These groups are looking into and will report out on data sharing between jurisdictions (national survey), creating a director's groups of state regulators, creating a database of industry contacts/state regulations, and modernizing the EVSE code at an in-person meeting at the NCWM Annual Meeting in July.

The Committee recommended retaining the Assigned status.

At the 2025 NEWMA Interim Meeting a representative from VT gave a presentation explaining what is trying to be accomplished with each change. The presentation is available on the NEWMA Website.

A representative from ChargePoint recommends developing status. Revisions of small words but big practical changes. Support public utility exemption. We should develop language around how a device operates with network loss. S.2.4.2. Any app language.

A representative from NEMA stated the display requirement encourages that a remote display should be allowed. EVSE are used differently than gas pumps. Oppose as currently written.

A representative from NJ stated that in S.2.4.4. the words "and billing" should be bolded. Billing system needs a definition. Recommends developing status.

A representative from SWTCH supports ChargePoint's comments. Supports Developing status.

A representative from MN8 Energy supports ChargePoint's comments.

A representative from NY recommends developing status.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommended the item remain Assigned.

At the 2025 CWMA Interim Meeting, the committee recommends that this item be given a Developing status based on comments received during the open hearing.

FMT – FARM MILK TANKS

FMT-26.1 V S.1.4. General

Source: USDA

Submitter's Purpose and Justification:

To add a physical address requirement to the conversion charts of on farm milk bulk tanks.

Original Justification:

The calibrations that are performed on farm bulk tanks are specific for that location. If a bulk tank is moved it needs to be calibrated again. Without the address requirement on the chart it is harder to know at what location the calibration was perform at and if it is still valid.

The submitter acknowledges that milk bulk tank calibration agencies may have to update conversion chart templates.

NIST OWM Executive Summary

FMT-26.1 V S.1.4. General

NIST OWM Recommendation: Voting

- At the 2026 NCWM Interim meeting USDA supported language suggested by NY Weights and Measures and recommended by the NEWMA S&T Committee at the 2025 NEWMA Interim Meeting to change the term "address" to "physical address" and to make the new language nonretroactive.
- There are some formating issues that must be corrected before this item is considered for a vote (see detailed analysis).
- With the formatting corrections and the addition of the term "physical" to change "address" to "physical address", NIST OWM supports this as a Voting Item.

Table 2. Summary of Recommendations

FMT-26.1 V S.1.4. General

	Status Recommendation	Note*	Comments
Submitter	Voting		
OWM	Voting		With changes identified
WWMA	Developing		Based on previous version
NEWMA	Voting		1
SWMA	Developing		Based on previous version
CWMA	Voting		
NCWM	Voting		

	Number of Support Letters	Number of Opposition Letters	Comments
Industry			
Manufacturers			
Retailers and Consumers			
Trade Association			

***Notes Key:**

1. Submitted modified language
2. Item not discussed or not considered
3. No meeting held
4. Not submitted on agenda
5. No recommendation

Item Under Consideration:

NOTE: This item has been edited to properly identify the section of the handbook affected and to correct formatting errors. The Items Under Consideration now reflect the structure required by NIST Handbook 44.

Amend NIST Handbook 44, Section 4.42. Farm Milk Tanks Code as follows:

S.4.1. General. – A volume chart shall show volume values only, *over the entire range of the volume of the tank from 5% of capacity or 2m3 (500 gal) whichever is less, to its maximum capacity.** All letters and figures on the chart shall be distinct and easily readable. The chart shall be substantially constructed, and the face of the chart shall be so protected that its lettering and figures will not tend easily to become obliterated or illegible. ***The volume chart shall also include the address where the tank was most recently gauged.***** *[*Nonretroactive as of January 1, 1986]* ***[**Nonretroactive as of January 1, 20XX]***

NIST OWM Detailed Technical Analysis:

NIST OWM recognizes the intent of requiring this additional information on the volume chart. The justification states "…calibrations that are performed on farm bulk tanks are specific for that location. If a bulk tank is moved it needs to be calibrated again." There is concern that, as proposed, this would require all charts to be updated, regardless of whether the tank associated with it has been moved or calibrated since the chart was created. There is also a concern that a tank can still be moved, not regauged, and the information could be updated to comply with this paragraph, as it doesn't require the address where the previous gauging was performed. In previous comments, it was identified that part of the issue is that tanks are moved, and the proper authority is not notified, and the tanks are not regauged to ensure accuracy at the new location. As proposed, this item would not resolve this issue and could result in creating a false sense of security if the chart displays the address where the tank is currently located without additional safeguards.

It should be noted that in the 2026 version of NIST Handbook 44, this paragraph currently has a portion that is nonretroactive, which is not reflected in the Item Under Consideration in the NCWM S&T Agenda. It should also include an amended date. Here is the paragraph properly formatted with the newly proposed language included:

S.4.1. General. – A volume chart shall show volume values only, *over the entire range of the volume of the tank from 5 % of capacity or 2 m^3 (500 gal) whichever is less, to its maximum capacity.** All letters and figures on the chart shall be distinct and easily readable. The chart shall be substantially constructed, and the face of the chart shall be so protected that its lettering and figures will not tend

easily to become obliterated or illegible. ***The volume chart shall also include the address where the tank was most recently gauged**.***

*[*Nonretroactive as of January 1, 1986]* ***[**Nonretroactive as of January 1, 20XX]***
(Amended 1985 **and 20XX**)

At the 2025 NEWMA Interim Meeting, a representative from NY suggested changing the word "address" to "physical location" or adding the word "physical" to address. NIST supports adding the term "physical" to the term "address". To further develop this item, OWM asks whether it may be appropriate to require the address of each location at which the tanks were gauged to be identified on the Volume Chart or some other paragraph, e.g., S.6. Identification.

Summary of Discussions and Actions:

During the NCWM 2026 Interim, Joel Northrop (USDA) supported the recommendation from the NEWMA S&T Committee to add the term "physical" to the term "address" and identified that the new language should be nonretroactive, sharing that the Milk Meter Task Group assisted in developing this item. John McGuire (NIST OWM) supported USDA's recommendation to make the new language nonretroactive, and suggested the submitter consider if it is appropriate to "require the address of each location at which the tanks were gauged to be identified on the Volume Chart or some other paragraph", e.g., S.6. Identification. Steve Timar (NY) supported a Voting status with the changes suggested by the submitter and the NEWMA S&T Committee.

The NCWM S&T Committee made the newly proposed language in the item nonretroactive based on the comments heard and assigned Voting status.

Regional Association Reporting:

Western Weights and Measures Association

At the 2025 WWMA Annual Meeting, the following comments were received:

Mr. Matthew Douglas (State of California, Division of Measurement Standards): Questioned how often milk tanks are calibrated as associated with the corresponding volume chart and gauge on the tank.

Mr. Loren Minich (NIST Office of Weights and Measures): Addressed the question posed by Mr. Matt Douglas regarding certain locations often moves milk tanks. He stated that the USDA is finding tanks in a location that was moved from another location and cannot verify if it is accurate in the new location. He clarified that the tank is gauged in the new location after being transported.

Mr. Matthew Douglas (State of California, Division of Measurement Standards): Appreciated the clarification from Mr. Minich and questioned if the item should be a Retroactive requirement. He stated consideration should be given to the implication for locations that don't have addresses already marked on the volume chart and the potential burden to put the address on the chart. He stated he has no position on the item.

The 2025 WWMA S&T committee recommends that this item be assigned a Developing Status and recommends the submitter consider the comments heard during open hearings. Furthermore, the WWMA S&T Committee recommends the submitter work with the NCWM S&T Milk Meter Tolerance Task Group to further develop this item.

Southern Weights and Measures Association

At the 2025 SWMA Annual Meeting, the following comments were heard:

Matthew Curran, Florida – We recommend this item moving forward with a Developing status. The intent appears to capture when tanks are moved so regulators can ensure they are recalibrated, which we can appreciate. However, the proposal does not capture on-farm movement (i.e., same address), which should arguably require the same.

The committee recommends Developing status on this item.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, a representative from the USDA states there is a missing word in Publication 16. The language should be changed to "physical address" instead of just "address". Representatives from the State of New Jersey and the State of New York believe the item is fully developed and support a voting status with the addition of the word “physical”.

The Committee recommended a Voting status with the following amended language:

S.4.1. General. – A volume chart shall show volume values only, *over the entire range of the volume of the tank from 5% of capacity or 2m^3 (500 gal) whichever is less, to its maximum capacity.* ***** All letters and figures on the chart shall be distinct and easily readable. The chart shall be substantially constructed, and the face of the chart shall be so protected that its lettering and figures will not tend easily to become obliterated or illegible. ***The volume chart shall also include the physical address where the tank was most recently gauged.*****
*[*Nonretroactive as of January 1, 1986]*
[**Nonretroactive as of January 1, 20XX]
(Amended 1985 **and 20XX**)

At the 2025 NEWMA Interim Meeting, the following comments were provided:

A representative from NY recommended that instead of using the word “address” change it to “physical location”, or add the word “physical” to address. “recently gauged” should be changed to calibrated, certified or some other common weights & measure term.

A representative from USDA stated that gauged is not a term used by USDA but is consistent with the rest of the section. These were words that OWM suggested.

A representative from NJ recommended a Voting status with language changes proposed by NY.

A representative from VT recommended a Voting status.

The committee recommended a Voting status with the following language change:

S.4.1. General. – A volume chart shall show volume values only, over the entire range of the volume of the tank from 5% of capacity or 2m3 (500 gal) whichever is less, to its maximum capacity. All letters and figures on the chart shall be distinct and easily readable. The chart shall be substantially constructed, and the face of the chart shall be so protected that its lettering and figures will not tend easily to become obliterated or illegible. **The volume chart shall also include the physical address where the tank was most recently gauged.**

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommended this item remain as Voting.

At the 2025 CWMA Interim Meeting, no comments were heard.

The committee recommends this item given a Voting status.

FMT-25.1 V UR.1. Installation

Source: USDA-AMS-Dairy Programs

Submitter's Purpose and Justification:

To create more robust installation requirements for on Farm Milk Bulk Tanks.

Original Justification:

In many states in the Northeastern region such as NY, PA and VT this change is of little importance because the States already have a cement requirement on the books. However, in states with no such cement requirement such as CT or ME I find significantly higher rates of failed recertification in my capacity as a dairy regulator.

This will increase costs associated with the installation of on-farm milk bulk tanks and increase the time associated with the installation of on-farm milk bulk tanks.

The submitter recommended that this be a Retroactive requirement.

NIST OWM Executive Summary

FMT-25.1 V UR.1. Installation

NIST OWM Recommendation: Voting

- The item under consideration was revised after the 2026 NCWM Interim meeting and includes this new language:

  "A permenant means shall be in place to prevent any readjustment or shifting out of level after the equipment's calibration.. A stationary tank shall not move during the loading or unloading process. * "

- The word "permenant" should be spelled "permanent", the extra period after "calibration" should be removed, and an asterisk should be added to precede the nonretroactive date.

- With these revisions, OWM supports this as a Voting item.

Table 2. Summary of Recommendations
FMT-25.1 V UR.1. Installation

	Status Recommendation	Note*	Comments
Submitter	Voting		
OWM	Voting		
WWMA	Developing		Based on the previous version
NEWMA	RegionalRegional		
SWMA	Voting		Based on the previous version
CWMA	Voting	1	
NCWM	Voting		

	Number of Support Letters	Number of Opposition Letters	Comments
Industry			
Manufacturers			
Retailers and Consumers			
Trade Association			
Regulator		1	NOTE: Matt Curran submitted a letter in opposition. Did not see Regulator. Added a row for regulator

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

Item Under Consideration:

Amend NIST Handbook 44, Section 4.42. Farm Milk Tanks Code as follows:

UR.1. Installation – A stationary tank shall be rigidly installed in level without the use of removable blocks or shims under the legs. ***A permanent means shall be in place to prevent any readjustment or shifting out of level after the equipment's calibration. A stationary tank shall not move during the loading or unloading process.**** If such tank is not mounted permanently in position, the current position on the floor for each leg shall be clearly and permanently defined.
[*Nonretroactive as of January 1, 20XX]
(Amended 20XX)

NIST OWM Detailed Technical Analysis:

NIST OWM supports the amendments to the language in this item made by the NCWM S&T Committee after the 2026 NCWM Interim Meeting, but there are still three areas that need to be addressed. The word "permenant" should be spelled "permanent", there's an extra period after the term "calibration" in the new language, and the nonretroactive date should have an asterisk preceding it to associate it with the nonretroactive language in the paragraph. A corrected version is included below:

> **UR.1. Installation** – A stationary tank shall be rigidly installed in level without the use of removable blocks or shims under the legs. ***A permanent means shall be in place to prevent any readjustment or shifting out of level after the equipment's calibration. A stationary tank shall not move during the loading or unloading process.**** If such tank is not mounted permanently in position, the current position on the floor for each leg shall be clearly and permanently defined.
> ***[*Nonretroactive as of January 1, 20XX]***
> **(Amended 20XX)**

NIST OWM, along with some states, believed the original language submitted was too prescriptive and offered alternative language for consideration:

> **UR.1. Installation.** – A stationary tank shall be rigidly installed in level without the use of removable blocks or shims under the legs**. A means shall be in place to prevent any readjustment or shifting out of the level after the equipment's calibration.** If such tank is not mounted permanently in position, the correct position on the floor for each leg shall be clearly and permanently defined**. A stationary tank shall not move during the loading or unloading process.**

NIST OWM acknowledges that flooring in the equipment area must be of suitable construction to withstand heavy loads, cleansing solutions, and hot water. This is in addition to safety issues that arise in a wet environment, the possibility of leaking equipment, and the controls needed to mitigate biological contaminants. All these scenarios impact the longevity of flooring materials and necessitate proper maintenance of any flooring surfaces.

Joel Northrop, USDA, offered additional language after the 2025 interim meeting. While less prescriptive, the new item under consideration includes the following new language: "The means used shall be constructed of impervious material, maintained free of breaks, depressions, and surface peelings." OWM is unsure what this addition would require and is concerned it may allow for misinterpretation and reintroduce prescriptive means to achieve the stated purpose.

Summary of Discussions and Actions:

During the 2026 Interim Meeting, NIST OWM noted the item was revised after the 2025 NCWM Annual Meeting with language that may leave it open to misinterpretation, including the lack of clarity regarding the term "impervious material".

Joel Northrop (USDA), the submitter of the item, further developed the item working with NIST OWM and the Milk Meter Task Group, and requested Voting status. Joel stated that the new language submitted is fully developed as it was taken verbatim from existing state law and the changes were made to satisfy previous concerns communicated by a regulator from the state of Florida, adding that this new language is not overly prescriptive.

Jason Flint (NJ), Jim Willis (NY), and Shane Ireland (ME) supported the item as written, recommending a Voting status. Jim Willis mentioned that the current language closely resembles existing New York requirements, which are fully vetted with the dairy industry.

The NCWM S&T Committee updated the item to reflect the need for permanent unshifting installation and made the newly proposed language nonretroactive, removing the portion related to maintenance, which is covered in the general code, and believes this language is less prescriptive while still maintaining the original intent of the item. The Committee assigned the item a Voting status.

During the 2025 Annual Meeting, the submitter, Joel Northrop (USDA), was not in attendance, and no comments were taken on the item.

During the 2025 Interim Meeting, the submitter, Joel Northrop (USDA), provided a presentation and provided additional changes to the original proposal. Several States provided comments on this item: Matt Curran (FL) appreciated the presentation and noted that the presentation alleviated some concerns. Matt Curran noted concerns with permanently cementing the legs to the floor and pitting in the floor, caused by chemicals used to clean the floor, and it leading to problems with sanitation. After reviewing the NIST analysis and USDA presentation, Matt Curran supports a Developing status. Joel Northrop mentioned that he has had no issues regarding health and noted that some legs are housed in plastic to prevent pitting, and when pitting occurs the legs are replaced. Steve Timar (NY) expressed support and stated that New York has the requirement of permanently cemented and has had no sanitary complaints.

Mike Brook (AZ) was pleased with the presentation and, based on other comments from states, agreed with a Developing status. Aaron Yankers (CO) cited an issue with the permanently installed system not allowing for future calibrations. Aaron recommended a Developing status.

Loren Minnich (NIST OWM) provided the NIST Analysis and noted that NIST supports the intent but believes the language is too prescriptive. Loren noted alternative language in the NIST Analysis and that there are other requirements that address tank leveling.

During the S&T committee work session, the S&T committee corrected the item under consideration on the interim meeting report to correctly reflect NIST HB 44 language to include “mounted” permanently. The committee agreed to changes to the language for this item and this item was given a developing status based on the comments received.

Regional Association Reporting:

Western Weights and Measures Association

At the 2025 WWMA Annual Meeting, no comments were received during open hearings.

The 2025 WWMA S&T committee recommends that this item be assigned a Developing Status. The WWMA S&T Committee recommends the submitter work with the NCWM S&T Milk Meter Tolerance Task Group to further develop this item.

At the 2024 WWMA Annual Meeting, the S&T Committee recommended a Developing status for this item based on comments received during the open hearings.

Loren Minnich (NIST OWM) stated that the item needs to be corrected on the Form 15 section “Item under Consideration,” which references the Milk Meters Code, but should reference the Farm Milk Tanks Code. Loren agreed with the intent of the item but expressed concern that the language may be too prescriptive.

Matthew Douglas (California Division of Measurement Standards) agreed with Loren Minnich’s comment that the language is too prescriptive and questioned the intent of the item. Matthew recommended this item be withdrawn.

Aaron Yanker (Colorado Department of Agriculture, Weights and Measures) agreed with the comments from the two previous speakers. The language is too prescriptive. He expressed concern that the language “permanently cemented” is only one way of accomplishing the intent of the item. Aaron recommended this item be assigned developing status and that the submitter work with industry and the NCWM Milk Meter Task Group to further develop this item.

Christopher Greer (Tulare County, California) agreed with the comments from Matthew Douglas.

Michael Brooks (Arizona Department of Agriculture Weights and Measures Services Division) agreed with Aaron Yanker's comments and recommended this item be assigned developing status.

Southern Weights and Measures Association

At the 2025 SWMA Annual Meeting, the 2025 SWMA S&T Committee heard the following comments:

Matthew Curran, Florida – We recommend this item moving forward with a Voting status. We appreciate the submitter acknowledging our previous concerns and believe the changes now allow for compliance without receiving debits during IMS rating inspections.

The committee recommends Voting status on this item.

At the 2024 SWMA Annual Meeting, the S&T Committee recommended a Developing status for this item based on comments heard during their meeting. Matt Curran (FL) opposed the item, as is, and believes it will have unintended consequences, related to the cleaning and maintenance of the floor, having adverse effects due to the permanent attachment. Further stating that it would increase the chance of Interstate Milk Shippers List (IMS) rating failures and selling across state lines would be difficult. Then Matt Curran recommended developing status for this item.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, representatives from the NIST OWM, State of New Jersey, and the State of New York believe the item is fully developed and support a voting status with the editorial fix.

The Committee recommends the item should read as follows:

> **UR.1. Installation** – A stationary tank shall be rigidly installed in level without the use of removable blocks or shims under the legs. ***A permeant means shall be in place to prevent any readjustment or shifting out of level after the equipment's calibration. A stationary tank shall not move during the loading or unloading process.**** If such tank is not mounted permanently in position, the current position on the floor for each leg shall be clearly and permanently defined.
> ***[*Nonretroactive as of January 1, 20XX]***
> **(Amended 20XX)**

With this change, the Committee recommends a Voting status.

At the 2025 NEWMA Interim Meeting, the following comments were provided:

Representative from NY – Recommends voting status with the recent updated changes.

Representative from NJ – Recommends voting status.

Representative from VT – Recommends voting status.

Representative from ME – Recommends voting status.

Representative from CT - Recommends voting status.

Representative from NH - Recommends voting status.

The Committee recommended voting status.

At the 2025 NEWMA Annual Meeting, a representative from USDA, the submitter of the item, commented that the current language under consideration was a result of receiving feedback from the regions and he believes the current language will alleviate concerns.

The Committee recommended retaining Developing status and the body concurred.

At the 2024 NEWMA Interim Meeting, Joel Northrop (USDA-AMS-Dairy Programs) gave a presentation as the submitter. Joel Northrop commented that some milk tanks are blocked up under the tank itself and not the leveling legs. Stationary tanks should not be able to move and some tanks are shifting and moving while loading/unloading because they are not installed correctly. Cheryl Ayer (NH), Michael Peeler (NJ), Jim Willis (NY), and Michel Picard (ME) recommended a voting status.

After hearing comments from the floor, the Committee recommended voting status for this item and the body concurred.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommended this item remain as Voting with the following editorial update which adds an asterisk to the nonretroactive date:

UR.1. - Installation – A stationary tank shall be rigidly installed in level without the use of removable blocks or shims under the legs. ***A permenant means shall be in place to prevent any readjustment or shifting out of level after the equipment's calibration.. A stationary tank shall not move during the loading or unloading process.**** If such tank is not mounted permanently in position, the current position on the floor for each leg shall be clearly and permanently defined.
[*Nonretroactive as of January 1, 20XX]
(Amended 20XX)

At the 2025 CWMA Interim Meeting, the committee recommends this item be given a Voting status based on comments received during open hearing.

At the 2025 Annual CWMA Meeting, no comments were heard.

The Committee recommends this item remain Developing.

At the CWMA 2024 Interim Meeting no comments were heard during open hearings. The Committee recommends this item as developing and recommends the submitter gather more input from stakeholders.

TIM – TIMING DEVICES

TIM-26.1 V S.1.1.3. Value of Smallest Division

Source: NIST Office of Weights and Measures

Submitter's Purpose and Justification:

To provide clarification that the maximum interval of time specified for Electric Vehicle Supply Equipment (EVSE) that have an integral time-based feature is one minute.

Original Justification:

When S.1.1.3. Value of Smallest Unit was amended in 2021, the intent was to specify an interval of no more than one minute for EVSE that have an integral time-based feature. While S.1.1.3.(b)(1) is very clear in regard to requiring an interval of no more than one minute for EVSE that accesses a time-based fee of 60 minutes or less, S.1.1.3.(b)(2) only references "hours and minutes" but does not specify a maximum interval for an EVSE that accesses a time-based fee of more than 60 minutes.

The application of paragraph S.1.1.3 (b)(2) in the current version of NIST Handbook 44 is unclear for devices measuring time-related services of more than 60 minutes. Some devices may be designed with an interval that exceeds a one-minute interval, as was intended when this item was amended in 2021 to incorporate EVSE that access time-related fees.

NIST OWM Executive Summary

TIM-26.1 V S.1.1.3. Value of Smallest Division

NIST OWM Recommendation: Voting

- This item clarifies that EVSE offering time-related services must have a unit of time not greater than 1 minute.
- Based on comments made during the regional meetings, OWM is proposing an updated version with simplified language (Note, PUB 16 has the updated version but has incorrect formatting; a summary of these issues has been provided to the NCWM S&T Committee.). See Detailed Analysis.

Table 2. Summary of Recommendations
TIM-26.1 V S.1.1.3. Value of Smallest Division

	Status Recommendation	Note*	Comments
Submitter	Voting		
OWM	Voting		
WWMA	Voting		
NEWMA	Developing		
SWMA	No Recommendation		
CWMA	Voting		
NCWM	Voting		

	Number of Support Letters	Number of Opposition Letters	Comments
Industry			
Manufacturers			
Retailers and Consumers			
Trade Association			

***Notes Key:**

1. Submitted modified language
2. Item not discussed or not considered
3. No meeting held
4. Not submitted on agenda
5. No recommendation

Item Under Consideration:

Amend NIST Handbook 44, Section 5.55. Timing Devices Code as follows:

S.1.1.3. Value of Smallest Unit. – The value of the smallest unit of indicated time and recorded time, if the device is equipped to record, shall not exceed the following.

(a) For parking meters:

(1) one-half hour on parking meters indicating time in excess of two hours; or

(2) six minutes on parking meters indicating time in excess of one but not greater than two hours.

(b) For an EVSE equipped with an integral time-based feature~~:~~ **, one minute for each separate service related to a delivery of electrical energy**~~:~~**.**

(1) ~~**One**~~minute~~s~~ ~~on an EVSE~~ **when** ~~indicating~~ **quantities of** ~~time not greater than or~~ **that are** ~~equal to 60 minutes; or~~

(2) ~~**a combination of** hours and minutes on an EVSE indicating time intervals in excess of 60 minutes.~~

(c) For all other devices five minutes, except those equipped with an in-service light.

(Amended 1975~~ **and,**~~ 2021**, and 20XX**)

NIST OWM Detailed Technical Analysis:

Based on comments made during the regional meetings, at the 2026 NCWM Interim Meeting, OWM proposed an updated version of this item with simplified language. The updated language was shared with the NCWM S&T Committee and is a supporting document on the NCWM website, and is shown below:

S.1.1.3. Value of Smallest Unit. – The value of the smallest unit of indicated time and recorded time, if the device is equipped to record, shall not exceed the following.

(a) For parking meters:

(1) one-half hour on parking meters indicating time in excess of two hours; or

(2) six minutes on parking meters indicating time in excess of one but not greater than two hours.

(b) For an EVSE equipped with an integral time-based feature~~:~~**, one minute for each separate service related to a delivery of electrical energy.**

~~**(1) one minute on an EVSE indicating time not greater than or equal to 60 minutes; or**~~

~~**(2) hours and minutes on an EVSE indicating time intervals in excess of 60 minutes.**~~

(c) For all other devices five minutes, except those equipped with an in-service light.

(Amended 1975~~ **and,**~~ 2021**, and 20XX**)

It should be noted that the Item Under Consideration in the 2026 NCWM S&T Agenda has some formatting issues and includes language that is stricken and in bold font, indicating it is currently part of the requirement in NIST Handbook 44 (HB 44) and is proposed to be removed, but portions of this language are not included in the current version of HB 44. Parts of the previous version of the Item Under Consideration were inadvertently included in the updated Item Under Consideration. A summary of these issues has been provided to the NCWM S&T Committee.

Summary of Discussions and Actions:

At the 2026 NCWM Interim Meeting, Loren Minnich (NIST OWM) provided updated language and requested that the committee replace the Item Under Consideration with the updated language and assign it a Voting Status. Matt Doulgas (CDA DMS) suggested a Developing status based on comments made at the regional meeting, indicating that consideration should be given to EVSE that assess time-related fees while charging an EV and after the charging session is complete. Jason Flint (NJ) voiced support for the new language proposed by OWM and suggested a Voting status. Justin Wilson (ChargePoint) supported a Developing status if OWM needed to consider Matt Douglas's comments or Voting if the new language addressed his concerns. Matt Doulgas (CDA DMS) clarified that his comments were directed to the language in the 2026 Interim Agenda, not the new language proposed by OWM.

The NCWM S&T Committee replaced the Item Under Consideration with the new language proposed by OWM and assigned it a Voting Status.

Regional Association Reporting:

Western Weights and Measures Association

At the 2025 WWMA Annual Meeting, the following comments were received:

Mr. Loren Minich (NIST Office of Weights and Measures): After reviewing the time code specifications of what is required, the item is intended to clarify the intervals should not exceed 1 minute. If it is over 60 minutes, then it can display hours and minutes.

Mr. Matthew Douglas (State of California, Division of Measurement Standards): Recommended the item be assigned a Voting Status.

The 2025 WWMA S&T Committee recommends a Voting status. The committee believes the item is fully developed and ready for a vote.

Southern Weights and Measures Association

At the 2025 SWMA Annual Meeting, no comments were heard.

The committee has no recommended status for this item.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, no comments were heard.

The Committee recommends this item remain as Voting.

At the 2025 NEWMA Interim Meeting, a representative from NJ said the item has merit, but the language needs work. In the future, the device could be used as both a parking meter and/or EV charging. The code should separate analog and digital parking meters due to potential large tolerance or have EVSE fall under digital. Recommends developing status.

The committee recommended Developing status.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommends this item remain as Voting.

At the 2025 CWMA Interim Meeting, the committee recommended this item be given a Voting status based on comments received during the open hearing.

MDM – MULTIPLE DIMENSION MEASURING DEVICES

MDM-25.1 V Multiple Sections Regarding Adding Volumetric Measuring Devices to Section 5.58

Source: Multiple Dimension Measuring Devices Work Group

Submitter's Purpose and Justification:

Rename and amend Section 5.58. Multiple Dimension Measuring Devices to incorporate devices that measure volume directly rather than measuring three dimensions to calculate a volume. These devices measure, either statically or in-motion, the volume of a commodity, such as sand, gravel, rock, and dirt, etc., which is transported in a truck or other conveyance. The proposal will amend the application paragraphs and add or amend the specifications, test notes, tolerances and user requirements in this section to ensure these devices are designed to operate correctly and to facilitate their proper operation and evaluation.

Original Justification:

These devices are already in the marketplace and two manufacturers have a Provisional NTEP Certificate of Conformance. The changes to NIST Handbook 44 will permit the certificates to be accepted in all states. The MDMD Work Group voted to support this proposal with no opposing votes.

Some may believe that the tolerance are rather large. Currently in the marketplace methods being used include front end loaders with the bucket being an approximation of X cubic yard. Scales are also being used with a conversion from weight to cubic yards. The conversion from weight to cubic yards using a conversion number for the commodity being weighed. Weighing fails to take into account the moisture content of the commodity or the accuracy of the conversion number for the actual commodity being weighed. The MDMD direct volume devices accurately measure the actual volume of the commodity being sold.

To arrive at the proposed tolerance for these devices the current MDMD tolerance was used as a starting point. The current MDMD maintenance and acceptance tolerance is 1d for the entire measurement range of each of the 3 axes. Looking at the many NTEP Certificates for devices making 3 measurements to determine a volume the tolerance at the largest dimension in terms of percent was consistently 0.2% for each axis. This means the effective tolerance for the measurement of volume is plus or minus 0.6%. The maintenance tolerance proposed for devices directly measuring volume is slightly tighter at 0.5% at the break points in the proposed tolerance table with acceptance tolerance being one half of maintenance tolerance and a minimum tolerance of 1d.

The submitter recommends that this be a Retroactive Voting item in 2025.

NIST OWM Executive Summary

MDM-25.1 V Multiple Sections Regarding Adding Volumetric Measuring Devices to Section 5.58

NIST OWM Recommendation: Voting

- Each region had the opportunity to review this item, and while only one region recommended Voting status, the other regions didn't provide specific areas that needed further development.
- OWM believes this item is fully developed and supports adoption.

Table 2. Summary of Recommendations
MDM-25.1 V Multiple Sections Regarding Adding Volumetric Measuring Devices to Section 5.58

	Status Recommendation	Note*	Comments
Submitter	Voting		
OWM	Voting		
WWMA	Informational		
NEWMA	Voting		
SWMA	Developing		
CWMA	Voting		
NCWM	Voting		

	Number of Support Letters	Number of Opposition Letters	Comments
Industry			
Manufacturers			
Retailers and Consumers			
Trade Association	1		Supports Developing

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

Item Under Consideration:

NOTE: This item has been edited to correct formatting errors. The Item Under Consideration now reflects the structure required by NIST Handbook 44.

Amend NIST Handbook 44, Section 5.58. Multiple Dimension Measuring Devices Code as follows:

Section 5.58. Multiple Dimension and Volumetric Measuring Devices

A. Application

A.1. General. – This code applies to**:** ~~**dimension and volume measuring devices used for determining the dimensions and/or volume of objects for the purpose of calculating freight, storage, or postal charges based on the dimensions and/or volume occupied by the object. A multiple dimension measuring device:**~~

(a) **Multiple Dimension Measuring Devices used for determining the dimensions and/or dimensional volume of objects which are generally hexahedron-shaped but may be irregularly-shaped for the purpose of calculating freight, storage, or postal charges based on the dimensions and/or volume occupied by the object.**~~**is generally used to measure hexahedron-shaped objects; and**~~

(Added 2008) **(Amended 20XX)**

(b) **Volumetric Measuring Devices that make multiple measurements to determine the volume of a bulk commodity**~~**may be used to measure irregularly-shaped objects.**~~

(Added 2008) **(Amended 20XX)**

(Amended 2008 **and 20XX**)

~~**A.2. Other Devices Designed to Make Multiple Measurements Automatically to Determine a Volume** – **Insofar as they are clearly applicable, the provisions of this code apply also to devices designed to make multiple measurements automatically to determine a volume for other applications as defined by Section 1.10. General Code Paragraph G-A.1. Commercial and Law Enforcement Equipment.**~~

A.2~~**3**~~**. Additional Code Requirements.** – In addition to the requirements of this code, Multiple Dimension **and Volumetric** Measuring Devices shall meet the requirements of Section 1.10. General Code.

(Amended 20XX)

A.3~~**4**~~**. Exceptions.** – This code does not apply to:

(a) devices designed to indicate automatically (with or without value-computing capabilities) the length of fabric passed through the measuring elements (also see Section 5.50. for Fabric-Measuring Devices);

(b) devices designed to indicate automatically the length of cordage, rope, wire, cable, or similar flexible material passed through the measuring elements (also see Section 5.51. for Wire- and Cordage-Measuring Devices); or

(c) any linear measure, measure of length, or devices used to measure individual dimensions for the purpose of assessing a charge per unit of measurement of the individual dimension (also see Section 5.52. for Linear Measures).

~~**A.5. Type Evaluation. The National Type Evaluation Program (NTEP) will accept for type evaluation only those devices that comply with all requirements of this code.**~~

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S.1.4. Dimensions Indication, Multiple Dimension Measuring Device. – If ~~**in**~~**during** normal operation the device indicates or records only volume, a testing mode shall be provided to indicate dimensions for all objects measured.

(Amended 20XX)

S.1.5. Value of ~~**Dimension/Volume**~~**Measuring Division Units.** – The value of a ~~**device**~~**measuring** division "d" expressed in a unit of dimension **or volume** shall be ~~**presented in a decimal format. The value of "d" for each measurement axis shall be in the same unit of measure and**~~ expressed as:

(a) 1, 2, or 5;

(b) a decimal multiple or submultiple of 1, 2, or 5; or

(c) a **decimal** binary submultiple of a specific U.S. customary unit of measure.

Examples: device divisions may be 0.01, 0.02, 0.05; 0.1, 0.2, or 0.5; 1, 2, or 5; 10, 20, 50, or 100; 0.5, 0.25, 0.125, 0.0625, etc.

(Amended 20XX)

S.1.5.1. Value of Measuring Division Units, Multiple Dimension Measuring Device.

(a) The value of "d" for each measurement axis shall be in the same unit of measure.
(Added 20XX)

~~S.1.5.1~~**(b)** For Indirect Sales~~. If~~ in addition to the values specified in S.1.5. Value of ~~Dimension/Volume~~**Measuring** Division Units, the value of the division may be 0.3 inch and 0.4 inch.
(Amended 20XX)

~~S.1.5.2.(c) Devices Capable of Measuring Irregularly Shaped Objects.~~ – For devices capable of measuring irregularly shaped objects, the value of the **measuring** division size (d) shall be the same for the length axis (x) and the width axis (y) and may be different for the height axis (z), provided that electronic rotation of the object to determine the smallest hexahedron is calculated in only a two-dimension horizontal plane, retaining the stable side plane as the bottom of the hexahedron.

(Added 2008) **(Amended 20XX)**

S.1.6. Customer Indications and Recorded Representations.

S.1.6.1. Multiple Dimension Measuring Devices. – Multiple dimension measuring devices or systems must provide information as specified in Table S.1.6.**1.** Required Information to be Provided by Multiple Dimension Measuring Systems. As a minimum, all devices or systems must be able to meet either column I or column II in Table S.1.6.**1.** Required Information to be Provided by Multiple Dimension Measuring Systems.

(Amended 2004 **and 20XX**)

Table S.1.6.1.
Required Information to be Provided by Multiple Dimension Measuring Systems

Information	Column I[1]	Column II[1]		Column III
	Provided by device	Provided by invoice or other means		Provided by invoice or other means as specified in contractual agreement
		Customer present	Customer not present	
1. Device identification[2]	D or P	P	P	P or A
2. Error message (when applicable)	D or P	P	N/A	N/A
3. Hexahedron dimensions[3]	D or P	P	P	P or A
4. Hexahedron volume (if used)[3]	D or P	P	P	P or A
5. Actual weight (if used)[3]	D or P	P	P	P or A
6. Dimensional Offset (if used)[3]	D or P	N/A	N/A	N/A

Table S.1.6.1. Required Information to be Provided by Multiple Dimension Measuring Systems				
7. Hexahedron measurement statement[4]	D or P or M	P	P	P or G

A = AVAILABLE UPON REQUEST BY CUSTOMER[5]
D = DISPLAYED
G = PUBLISHED GUIDELINES OR CONTRACTS
M = MARKED
N/A = NOT APPLICABLE
P = PRINTED or RECORDED IN A MEMORY DEVICE and AVAILABLE UPON REQUEST BY CUSTOMER[5]

Notes:
[1] As a minimum all devices or systems must be able to meet either column I or column II.

[2] This is only required in systems where more than one device or measuring element is being used.

[3] Some devices or systems may not utilize all of these values; however, as a minimum either hexahedron dimensions or hexahedron volume must be displayed or printed.

[4] This is an explanation that the dimensions and/or volume shown are those of the smallest hexahedron in which the object that was measured may be enclosed rather than those of the object itself.

[5] The information "available upon request by customer" shall be retained by the party having issued the invoice for at least 30 calendar days after the date of invoicing.

(Amended 2004**, ~~and~~** 2021**, and 20XX**)

S.1.6.2. Volumetric Measuring Devices. – Devices that determine the volume of a bulk commodity shall:

(a) indicate or record an error message as specified in S.1.8.2. Indications Below Minimum and Above Maximum, Volumetric Measuring Device.

(b) indicate and record the net volume of the commodity

(Added 20XX)

S.1.6.3. Recorded Representations, Volumetric Measuring Devices. – When interfaced with the elements that are necessary for a point-of-sale system, the recorded representation provided shall contain:

(a) the net volume of the commodity

(b) the identity of the commodity

(c) the unit price of the commodity

(d) the total price of the commodity

(Added 20XX)

S.1.7. Minimum Measurement.

S.1.7.1. Multiple Dimension Measuring Devices. – Except for entries of dimensional offset, 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 20XX)

S.1.7.2. Volumetric Measuring Devices. – The minimum measurement by a device is 12 d. The manufacturer may specify a larger minimum measurement. For multi-interval devices, this applies only to the first measuring range (or segment).

(Added 20XX)

(Amended 2017**, ~~and~~** 2021**, and 20XX**)

S.1.8. Indications Below Minimum and Above Maximum.

S.1.8.1. Multiple Dimension Measuring Device. – When objects are smaller than the minimum dimensions identified in paragraph S.1.7.**1. Multiple Dimension Measuring Devices** or larger than any of the **marked** maximum dimensions plus 9 d, and/or maximum volume marked on the device plus 9 d, or when a combination of dimensions, including dimensional offset, for the object being measured exceeds the measurement capability of the device, the indicating or recording element shall either:

(a) not indicate or record any usable values; or

(b) identify the indicated or recorded representation with an error indication.

(Amended 2004, 2017, **~~and~~** 2021**, and 20XX**)

S.1.8.2. Volumetric Measuring Device. – When the commodity being measured is smaller than the minimum measurement identified in paragraph S.1.7.2 Volumetric Measuring Devices or larger than the marked maximum volume plus 9 d, or when the commodity being measured exceeds the measurement capability of the device, the indicating or recording element shall either:

(a) not indicate or record any usable values; or

(b) identify the indicated or recorded representation with an error indication.

(Added 20XX)

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S.4.1. Multiple Dimension and Volumetric Measuring Devices, Main Elements, and Components of Measuring Devices. – Multiple dimension **and volumetric** measuring devices, main elements of multiple dimension **and volumetric** measuring devices when not contained in a single enclosure for the entire dimension/volume measuring device, and other components shall be marked as specified in Table S.4.1.a. Marking Requirements for Multiple Dimension **and Volumetric** Measuring Systems and explained in the accompanying notes, Table S.4.1.b. Multiple Dimension **and Volumetric** Measuring Systems Notes for Table S.4.1.a.

(Amended 20XX)

Table S.4.1.a.

Marking Requirements for Multiple Dimension and Volumetric Measuring Systems

To Be Marked With ⇓	Multiple Dimension and Volumetric Measuring Equipment			
	Multiple Dimension or Volumetric Measuring Device and Indicating Element in Same Housing	**Indicating Element not Permanently Attached to Multiple Dimension or Volumetric Measuring Element**	**Multiple Dimension or Volumetric Measuring Element Not Permanently Attached to the Indicating Element**	**Other Equipment (1)**
Manufacturer's ID	x	x	x	x
Model Designation	x	x	x	x
Serial Number and Prefix	x	x	x	x (2)
Certificate of Conformance Number (8)	x	x	x	x (8)
Minimum and Maximum Dimensions **or Volume ~~for Each Axis for Each Range in Each Axis~~** (3)(9)	x	x	x	
Value of Measuring Division, d **~~(for each axis and range)~~** (9)	x	x	x	
Temperature Limits (4)(9)	x	x	x	
Minimum and Maximum ~~s~~**S**peed (5)(9)	x	x	x	
Special Application (6)(9)	x	x	x	
Limitation of Use (7)(9)	x	x	x	

(Amended 2016 **and 20XX**)

Table S.4.1.b.
Multiple Dimension and Volumetric Measuring Systems Notes for Table S.4.1.a.

1. Necessary to the dimension and/or volume measuring system, but having no effect on the measuring value, e.g., auxiliary remote display, keyboard, etc.

2. Modules without "intelligence" on a modular system (e.g., printer, keyboard module, etc.) are not required to have serial numbers.

3. **For multiple dimension measuring systems, t~~T~~**he minimum and maximum dimensions **for each axis and for each range in each axis ~~(using upper or lower case type)~~** shall be marked. For example:

   Length: min _____ max _____
   Width: min _____ max _____
   Height: min _____ max _____

   For volumetric measuring devices the minimum and maximum volume shall be marked. For example:

   Volume: min _____ max _____

Table S.4.1.b.
Multiple Dimension and Volumetric Measuring Systems Notes for Table S.4.1.a.

4. Required if the range is other than − 10 °C to 40 °C (14 °F to 104 °F).

5. Multiple dimension measuring **~~devices~~system**s, which require that the object or device be moved relative to one another, shall be marked with the minimum and maximum speeds at which the device is capable of making measurements that are within the applicable tolerances.

   Volumetric Measuring Systems shall be marked with the minimum and maximum speeds at which the device is capable of making measurements that are within the applicable tolerances.

6. A device designed for a special application rather than general use shall be conspicuously marked with suitable words visible to the operator and the customer restricting its use to that application.

7. Materials, shapes, structures, combination of object dimensions, speed, spacing, minimum protrusion size, or object orientations that are inappropriate for the device or those that are appropriate.

8. Required only if a Certificate of Conformance has been issued for the equipment.

9. This marking information may be readily accessible via the display. Instructions for displaying the information shall be described in the NTEP CC **if not marked on the components of the system**.

(Amended 2004, 2008, **~~and~~** 2016**, and 20XX**)

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N.1. Test Procedures.

N.1.1. General. ~~– The~~

N.1.1.1. Multiple Dimension Measuring Device – **A** device **that measures the dimensions and/or dimensional volume of an object** shall be tested using test standards and objects of known and stable dimensions.

(Added 20XX)

N.1.1.2. Volumetric Measuring Devices – A device that measures the volume of a bulk commodity shall be tested using a transfer standard. The means of conveyance of the transfer standard, e.g., vehicles, rail cars, etc., shall be representative of the conveyance used during the normal operation of the device.

(Added 20XX)

(Amended 20XX)

N.1.2. Position Test. – Measurements **~~are~~shall be** made using different positions of the test object **or conveyance ~~and~~** consistent with the manufacturer's specified use for the device.

(Amended 20XX)

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N.1.4. Test Object or Transfer Standard Size. – Test objects **or transfer standards** may vary in size from the smallest **volume or** dimension to the largest **volume or** dimension marked on the device, and for field verification examinations, shall be an integer multiple of "d."

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N.1.4.3. Transfer Standards. – The volume of the transfer standard must be known to an expanded uncertainty (coverage factor k = 2) of not more than one-third of the applicable device tolerance. The volume shall also be checked to the same uncertainty when used at the extreme values of the influence factors.

The volume of the transfer standard shall be verified using a reference standard that is traceable to NIST (or equivalent national laboratory) and meets the tolerances expressed in NIST Handbook 44 Fundamental Considerations, paragraph 3.2 (i.e., one-third of the smallest tolerance applied to the device).

(Added 20XX)

(Amended 2008~~ and,~~ 2012**, and 20XX**)

N.1.5. Digital Zero Stability. – A zero indication change test shall be conducted on all devices which ~~show~~**display** a digital zero. After the removal of any test object **or conveyance**, the **device shall return to a** zero indication~~ shall not change~~. (Also see G-UR.4.2. Abnormal Performance.)

(Amended 20XX)

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T.1. Principles~~**Design. The tolerance for a multiple dimension measuring device is a performance requirement independent of the design principle used.**~~

T.1.1. Design. – The tolerance for a multiple dimension measuring device or volumetric measuring device is a performance requirement independent of the design principle used.

(Added 20XX)

T.1.2. Device Division. – The tolerance for a multiple dimension measuring device or volumetric measuring device is related to the value of the measuring division (d) and is expressed in terms of d.

(Added 20XX)

(Amended 20XX)

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T.3. Tolerance Values. ~~**– The maintenance and acceptance tolerance values shall be ± 1 division.**~~

T.3.1. For Volumetric Measuring Devices.

(a) Maintenance Tolerance Values. – The maintenance tolerance values shall be as specified in Table T.3.1. Maintenance Tolerances.

(b) Acceptance Tolerance Values. – The acceptance tolerance values shall be one-half of the maintenance tolerance values with a minimum tolerance of 1 d.

(Added 20XX)

Table T.3.1. Maintenance Tolerances (All values in this table are in measuring divisions)			
1	**2**	**3**	**4**
0 – 200[1]	**201 – 400**	**401- 800**	**801 +**
[1] See S.1.7. Minimum Measurement (12 d).			

(Added 20XX)

T.3.2. For Multiple Dimension Measuring Devices. – The maintenance and acceptance tolerance values shall be ± 1 division.

(Added 20XX)

(Amended 2004 **and 20XX**)

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UR.3.1. Minimum and Maximum Measuring Ranges. – A device shall not be used to measure objects ~~**smaller than**~~ **or a commodity in an amount less than** the minimum or ~~**larger**~~**more** than the maximum **volume or** dimensions marked on the device.

(Amended 20XX)

UR.4.1. Zero or Ready Condition. – The zero-setting adjustment of a multiple dimension measuring device **or volumetric measuring device** shall be maintained so that, with no object **or conveyance** ~~**in or**~~ on **or within the range of** the measuring element, the device shall indicate or record a zero or ready condition.

(Amended 20XX)

And Appendix D, Definitions amend the definition of "d," dimension division value as follows:

measuring division, value of "d," ~~**dimension division value.**~~ – The smallest increment that the device displays for any axis and length of object in that axis **or for the total volume**. [5.58]

(Amended 20XX)

dimensional volume. - Volume of the smallest rectangular box which fully encloses the object, and is the product of the indicated values of length axis (x), width axis (y) and height axis (z) (dv = x × y × z). [5.58]
(Added 20XX)

NIST OWM Detailed Technical Analysis:

See Executive Summary.

Summary of Discussions and Actions:

During the 2026 NCWM Interim Meeting, Dick Suiter (MDMD Workgroup, Volume Focus Group Chair) gave a presentation illustrating the operation of Volumetric Measuring Devices (VMD) as well as the equipment used during NTEP evaluation. Dick requested Voting status for each MDM 25-1. Dan Caine (Wingfield Scale Company, Inc.) gave a presentation on the non-commercial use of this technology, demonstrating its acceptance as a tool for measuring inventory for financial reporting. Michael Keilty (Endress-Hauser) asked if volumetric measuring devices could be used to measure bulk liquids. Dick Suiter (Richard Suiter Consulting) replied that these devices aren't designed to measure liquids. Dan Caine (Wingfield Scale Company, Inc.) confirmed that the technology used in VMD, LIDAR, is refracted by

liquids and cannot measure them. Loren Minnich (NIST OWM) indicated that OWM supports a Voting status, noting that this item was considered by each region, and while only one region recommended a Voting status, none of the regions identified areas for improvement. Corey Hainy (SMA) stated that the SMA opposes this item in its current state and recommends further development because this item should reference Handbook 130 as a reminder that selling by volume is only allowed for certain commodities and is missing many specifications that were included when Weigh-In-Motion Vehicle Scales (section S.1.14, additions to Table S.6.3.b, section N.7) were added in 2021, including out of measurement zone, direction (one way/both ways), out of level, and operator notifications of an error condition. Mike Harrington (IA) supported a Voting status of the item as written. Jim Pettinato (MMA) suggested adding "volumetric" to the title of Section 5.58. and referring to MDMD used to measure a volume in this section to provide additional clarity. Derek Schussle (Walz Scale) expressed support for this item and requested a Voting status. Alison Wilkinson (MD) had no status recommendation but suggested that a technical session be provided during the NCWM Annual Meeting. Dick Suiter (MDMD Workgroup, Volume Focus Group Chair) replied that a technical session is a good idea and noted that the item already addresses the concerns raised by the SMA. Jim Willis (NY) spoke in support of a Voting status for the item and a technical session at the NCWM Annual Meeting.

The S&T Committee assigned the item a Voting status.

During the NCWM 2025 Annual Meeting, the Committee modified Table T.3.1 tolerances and added "Volumetric Measuring Devices" to the title of S.1.6.3. During the voting session, Sherry Turvey, representing the CWMA, requested the item be downgraded to Informational due to substantial changes made by the NCWM S&T Committee during the Annual Meeting work session. Considering this request and prior open hearing comments on the item's development, the Committee agreed to downgrade the item to Informational before it was voted on by the body.

At the 2025 NCWM Interim Meeting Dick Suiter (MDMD Workgroup, Volume Focus Group Chair) gave a presentation illustrating the operation of Volumetric Measuring Devices as well as the equipment used during NTEP evaluation. Dick requested Voting status for each MDM item (MDM 25-1, MDM-25.2, and MDM-25.3) and provided written comments to the S&T Committee describing the recommendations received from the regional associations and the evolution of the items since their introduction which included a reference to new language developed by NIST OWM and reviewed by the MDMD Volume Focus Group. The complete text is available on the National Council on Weights and Measures website under the meeting documents archive for the 2024 Interim Meeting. Mike Harrington (IA) spoke in support of the items and recommended a Voting status. Mike indicated that he was familiar with the use of the device, which was tested in IA and was very accurate. Loren Minnich (NIST OWM) speaking to MDM-25.1, MDM-25.2, and MDM-25.3, recommended a Developing status, indicating that these items were not sufficient to amend Section 5.58. to incorporate Volumetric Measuring Devices and referenced additional paragraphs in their analysis that must be considered. Loren indicated that, after the publication of the analysis, OWM worked with the MDMD Volume Focus Group to develop draft language to consider as a basis for further amendments to this section, which was provided to the Committee, and suggested that this language needed further vetting. Derek Schussle (Walz Scale) expressed support for these items (MDM-25.1, MDM-25.2, and MDM-25.3) and requested a Voting status. John Hathaway (Murray Equipment, Inc.) asked which companies have these types of devices (volumetric measuring devices). Dick Suiter (MDMD Workgroup, Volume Focus Group Chair) identified that two companies had provisional Certificates of Conformance (CC), Walz Scale (CC 23-001P, F.L. Walz, Inc.) and Loadscan Limited (CC 24-001P). Matt Douglas (CA DMS) referenced the draft language available on the NCWM website dated 01/09/2025, indicating that there was not enough time to review this new language to assign a Voting status and recommended a Developing status. He agrees with blocking these items (MDM-25.1, MDM-25.2, and MDM-25.3). Cory Hainy (SMA) identified that they (SMA) support the continued development of these items and noted there are many missing items such as marking requirements, reference to specific

commodities from handbook 130, speed, out of measurement zone, direction (one way/both ways), and out of level, and specific to MDM-25.2, the details, requirements, and test equipment for the initial and subsequent field testing are not currently included. Specific to MDM-25.3, the SMA supported this item as written. Dick Suiter (MDMD Workgroup, Volume Focus Group Chair) commented that there is a sense of urgency due to a state not accepting the provisional NTEP CCs and between now and July there is enough time for people to review the new language, noting that two regions will meet during that time and reiterated his support for a Voting status. Jeff Gipson (NTEP) noted that the NTEP CCs for the devices are limited to items in NIST Handbook 130 that are aggregate-based.

The Committee decided to combine MDM-25.1, MDM-25.2, and MDM-25.3 into a single item and update the proposal to include revisions developed by NIST OWM with input from the submitter. The Committee believes the item has merit, is fully developed, and has assigned it a voting status.

Regional Association Reporting:

Western Weights and Measures Association

During the WWMA 2025 Annual Meeting, Mr. Cory Hainy (Representing the Scale Manufacturers Association): SMAs position is published on Publication 16 prior to the 2025 NCWM Annual Conference and recommends further development of this item.

The 2025 WWMA S&T Committee recommends this item remain Informational. No comments were heard from the Multiple Dimensions Measuring Devices Work Group. The committee encourages the Multiple Dimensions Measuring Devices Work Group to consider the comment made during Open Hearings and seek feedback from stakeholders to continue developing this item.

During the 2024 WWMA Annual meeting, Kenn Burt (San Luis Obispo County, California on behalf of the S&T Committee) stated that a letter had been received from the MDMD Work Group in support of this item, speaking to MDM-25.1, MDM-25.2 and MDM-25.3.

Matthew Douglas (State of California, Division of Measurement Standards) stated that they were overall supportive of the concept, however, the item needs clarification. They were not sure that the language presented fulfills the intent, as the language as written may not include the intended devices.

Loren Minnich (NIST OWM) agreed with Matthew Douglas. The language is not achieving what it intends. NIST OWM also had concerns that this section was developed for measurements of length, width and height and that the item needs to be evaluated to ensure that it would apply to a volume measuring device. They suggested that a Developing status might be the most appropriate.

The WWMA 2024 S&T Committee recommends a Developing status. Consideration of the comments heard on the floor were specifically expressing that the language may not be achieving its intended purpose.

The Committee additionally recommends that this item, MDM-25.2, and MDM-25.3 be blocked together and that they be evaluated to ensure they would apply to a volume measuring device.

Southern Weights and Measures Association

During the 2025 SWMA Interim Meeting, Corey Hainey, SMA - They are not in support of Voting Status but recommends Developing Status. Currently, it lacks indications for certain errors. Online comments were submitted to the committee.

The committee recommends Developing status on this item.

At the 2024 SWMA Annual meeting, Dick Suiter, Richard Suiter Consulting gave a presentation on behalf of the NCWM Multiple Dimension Measuring Device Work Group and MDMD 2024 Volume Focus Group.

The presentation demonstrated how the systems operate. In addition, Mr. Suiter provided written comments, which are included in the supporting documents.

Tim Chesser, retired Arkansas – supported the item, but had questions on how the standards were verified. They mentioned that many of the commodities would have voids and would be unlike pea gravel and questioned speed and pausing affecting the measurement.

Dick Suiter, Richard Suiter Consulting – responded to Mr. Chesser's comments stating that there are maximum and minimum speeds and if the measurement was taken outside those parameters, an error message is given. The certified tape measure is used to verify the standard. NTEP verifies the standard during NTEP assessments, currently has provisional NTEP Certificate of Conformance.

Tory Brewer, WV – Questioned the calibration of the standard and if there were labs accredited to perform the calibration.

The committee recommends the items MDM-25.1, MDM-25.2, and MDM-25.3 be blocked and be assigned to informational status. The would like to gather more information from the stakeholders to allow more time for review and to answer some questions raised.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, a Representative from the NIST OWM supports this item as fully developed and ready for voting.

The committee recommended the item remain Voting.

At the 2025 NEWMA Interim Meeting, a representative from NY – Supports voting status. Submitted supporting documents were made available on NEWMA website.

The S&T committee recommended a Voting status.

At the 2025 NEWMA Annual Meeting, A representative from Richard Suiter Consulting, on behalf of the MDMD Work Group, gave a presentation on the application of MDMD devices in the marketplace. A regulator from New Hampshire commented that there is interest in MDMD in the uniform Shipping Law Task Group as they believe the devices are not being used properly. The regulator also indicated that several US regulators took MDMD training hosted by Measurement Canada. The representative from Richard Suiter Consulting commented that most MDMD devices are currently being used for sorting in the shipping space, and the language in the proposal does not change the existing language for MDMD used in shipping, rather just the language for direct volume. A regulator from Massachusetts and Genesee/Orleans County, NY questioned the different types of products that could be measured with the device. The representative from Richard Suiter Consulting commented that the NTEP Certificate of Conformance would list the approved commodities. A regulator from the New York commented that they do not oppose or support the item, but wondered if there might be the need for additional time for review since three items were combined into one after the 2025 NCWM Interim. The regulator also questioned if there was data to support the proposed tolerances. The representative from Richard Suiter Consulting explained the tolerances were formulated using the current tolerances applied to MDMD used in shipping (0.2% for each measurement, with a potential tolerance of 0.6%) and selected 0.5% as the tolerance. The Committee received written comments from the SMA indicating opposition of the item, which can be found in the

supporting documents. The representative from Richard Suiter Consulting also read a statement into the record, which can be found in the supporting documents.

The Committee recommended retaining Voting status and the body concurred.

At the 2024 NEWMA Interim Meeting, no comments were heard from the floor.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommends this item remain as Voting.

At the 2025 CWMA Interim Meeting, the committee recommends this item remain Informational to address comments made during open hearings.

At the 2025 CWMA Annual Meeting, A representative from NIST OWM commented that S.1.6.3. title should be clarified to only include volumetric measuring devices.

A representative from IA supports as voting with the edits recommended by NIST OWM.

Written comments were submitted from the Chair of the MDMD Volume Focus Group who is also a member of the MDMD Work Group. The Focus Group believes the changes to Handbook 44 Section 5.58. are complete and appropriate for recognition of devices that directly measure the volume of a commodity in a conveyance, in Section 5.58. The MDMD Work Group met on May 7, 2025, and reviewed the entire proposal for changes to Handbook 44 Section 5.58. and voted to support the addition to NIST Handbook 44. This entire letter of support can be found on NCWM's Publication 16 site.

The Committee recommends this item move forward as Voting with the following edit to the title of S.1.6.3.:

S.1.6.3. Recorded Representations, Volumetric Measuring Devices. – When interfaced with the elements that are necessary for a point-of-sale system, the recorded representation provided shall contain:

(a) the net volume of the commodity

(b) the identity of the commodity

(c) the unit price of the commodity

(d) the total price of the commodity

At the 2024 CWMA Interim Meeting, a representative from NIST OWM suggested that items MDM-25.1, MDM-25.2, and MDM-25.3 be blocked together. They also support these items but have concerns on issues not addressed by this proposal dealing with length, width, and height.

The submitter of this item gave a presentation on how this device functions and what its purpose is. They asked for support of all MDM items as voting. It was noted that marking requirements need to be addressed for volume only devices and that they can work with NCWM S&T Committee for those changes. The submitter also submitted written comments to the committee; attached to this report as Appendix A.

A regulator from Iowa asked a question regarding if the method of sale was changing from weight to volume. The submitter answered that there may be variations for commodities sold by both weight and volume, but that this will introduce a traceable means of verification.

A second regulator from Iowa asked if there was any special equipment that needed to be installed on the trucks carrying the commodity for measurement. The submitter answered that no additional equipment be installed on those vehicles.

A regulator from Minnesota asked if speed and position restrictions need to be marked on this device or for vehicle operators like they do for an in-motion vehicle scale. They also asked if this device accounted for a live bottom container such as a container with a conveyer belt installed that would compress creating more volume when a commodity is loaded on top of it. The submitter answered that the test method looks at minimum and maximum speed and issues a non-measurement notice if the vehicle speed is too great and that this is also noted in the certificate of the device. They also answered that in the event of a live bottom container, the customer would have the advantage.

A regulator representing the State of Iowa supports this moving forward. They witnessed a demonstration on this item and found that the readings aligned with a static scale verification. It was also noted that this device will eliminate temporary scale needs for businesses that operate seasonally.

The committee recommends that this item be blocked with MDM-25.2 and MDM-25.3 and be assigned a voting status.

Scale Manufacturers Association (SMA)

At the 2026 SMA Spring Meeting, they opposed this item in its current state and recommended further development.

Rationale: The SMA believes this item should reference Handbook 130 as a reminder that selling by volume is only allowed for certain commodities. We also believe this item is missing many specifications that were included when Weigh-In-Motion Vehicle Scales (section S.1.14, additions to Table S.6.3.b, section N.7) were added in 2021, including out of measurement zone, direction (one way/both ways), out of level, and operator notifications of an error condition.

At the 2025 SMA Fall Meeting, they determined that they support the continued development of this item. The SMA feels it is missing many items such as a reference to specific allowable commodities from handbook 130, out of measurement zone, direction (one way/both ways), out of level, and operator notifications of an error condition.

At the 2025 SMA Spring Meeting, they did not support this as a voting item but supported its further development. The SMA feels it is missing many items such as a reference to specific allowable commodities from handbook 130, out of measurement zone, direction (one way/both ways), out of level, and operator notifications of an error condition.

At the 2024 SMA Fall Meeting, they determined that they support the continued development of this item. The SMA feels the proposal is missing many items such as marking requirements, reference to specific commodities from handbook 130, speed, out of measurement zone, direction (one way/both ways), and out of level.

MDM-26.1 V S.1.5.2. Devices Capable of Measuring Irregularly Shaped Objects

Source: Multiple Dimension Measuring Devices Work Group

Submitter's Purpose and Justification:

Amend Handbook 44 to permit Multi-Interval Multi-Dimensional Measuring Devices (MDMD) to measure irregularly shaped objects. This update reflects advancements in technology and aligns with international standards, such as OIML R129, which already accommodates Multi-Interval MDMD for measuring objects with irregular shapes. By incorporating these changes, the regulations will support the adoption of innovative measurement technologies while maintaining consistency with global practices.

Original Justification:

When the MDMD requirements were initially established, there were no Multi-Interval MDMD devices available on the market. However, with advancements in technology, more multi-interval devices are now being developed, necessitating updates to the regulations to ensure they remain relevant and effective. These updates will also support alignment with existing international standards, such as OIML R129, which currently permits Multi-Interval MDMD devices to measure irregularly shaped objects.

The submitter requested voting status.

NIST OWM Executive Summary

MDM-26.1 V S.1.5.2. Devices Capable of Measuring Irregularly Shaped Objects

NIST OWM Recommendation: Voting with suggested changes

- OWM has a few concerns about the existing language in specification S.1.5.2. Devices Capable of Measuring Irregularly Shaped Objects, and the proposed amendments:
    - The title of S.1.5.2. refers to irregularly shaped objects. OWM believes that the existing language applies (or should apply) to all objects and not just irregularly shaped objects.
    - The last portion of the existing language: "*provided that electronic rotation of the object to determine the smallest hexahedron is calculated in only a two-dimension horizontal plane, retaining the stable side plane as the bottom of the hexahedron*" is irrelevant, and unnecessarily prescriptive and/or restrictive.
    - The proposed additional language under consideration can be interpreted as contradicting the existing language in the paragraph.
    - To accommodate multi-interval instruments, additional requirements are necessary. Restriction of the division size, d, is not enough
- OWM has developed alternative language which can be found in the Detailed Technical Analysis.
- OWM supports adoption of this item with the recommended changes to the proposal.

MDM-26.1 V S.1.5.2. Devices Capable of Measuring Irregularly Shaped Objects
• Item MDM-25.1 is assigned a Voting status. The NCWM S&T Committee must have a plan to identify any changes that may be needed to this item if item MDM-25.1 is adopted.

Table 2. Summary of Recommendations

MDM-26.1 V S.1.5.2. Devices Capable of Measuring Irregularly Shaped Objects

	Status Recommendation	Note*	Comments
Submitter	Voting		
OWM	Voting	1	
WWMA	No Recommendation		
NEWMA	No Recommendation		
SWMA	No Recommendation		
CWMA	Voting		
NCWM	Voting		

	Number of Support Letters	Number of Opposition Letters	Comments
Industry			
Manufacturers			
Retailers and Consumers			
Trade Association	1		

***Notes Key:**

1. Submitted modified language
2. Item not discussed or not considered
3. No meeting held
4. Not submitted on agenda
5. No recommendation

Item Under Consideration:

NOTE: This item has been edited to properly identify the section of the handbook affected and to correct formatting errors. The Item Under Consideration now reflects the structure required by NIST Handbook 44.

Amend NIST Handbook 44, Section 5.58. Multiple Dimension Measuring Devices Code as follows:

S.1.5.2. Devices Capable of Measuring Irregularly-Shaped Objects. – For devices capable of measuring irregularly shaped objects, the value of the division size (d) shall be the same for the length axis (x) and the width axis (y) and may be different for the height axis (z), provided that electronic rotation of the object to determine the smallest hexahedron is calculated in only a two-dimension horizontal plane, retaining the stable side plane as the bottom of the hexahedron. ***For multi-interval devices, if the measuring interval for each axis is determined automatically according to the actual dimension being measured, then the division size (d) for each dimension (length, width, height) shall not differ by the orientation of the measured item in the x-y plane.* [*Nonretroactive as of January 1, 20XX]***

(Amended 20XX)

NIST OWM Detailed Technical Analysis:

OWM understands that the current language in Section 5.58. is unclear with regard to MDMD multi-interval devices. However, OWM has a few concerns about the current language in S.1.5.2. and the changes proposed in this item.

S.1.5.2. Devices Capable of Measuring Irregularly Shaped Objects was added to NIST Handbook 44 in 2008 due to the need for specifications for MDMDs that use software algorithms to 'rotate' the object being measured to determine the object's smallest hexahedron shape.

However, OWM believes that the language added in 2008 focused specifically on the situation encountered in the field that initiated the proposal that led to the addition of S.1.5.2.

1. The title of S.1.5.2. refers specifically to irregularly shaped objects. OWM believes that the existing language applies (or should apply) to all objects and not just irregularly shaped objects.

2. The last portion of the existing language: "*provided that electronic rotation of the object to determine the smallest hexahedron is calculated in only a two-dimension horizontal plane, retaining the stable side plane as the bottom of the hexahedron*" is unnecessarily prescriptive and/or restrictive. The use of an electronic rotation has become irrelevant due to the requirement that the division sizes of the x and y axes be the same value. Therefore, this part of the sentence can be removed.

3. The proposed additional language under consideration can be interpreted as contradicting the existing language in the paragraph.

4. The restrictions with respect to the measuring intervals of an MDMD are insufficiently described in S.1.5.2., which may lead to interpretation problems in the field. Focusing on just the division size is not enough. OWM recommends the following additional restrictions:

    - Within a range:
        - The value of x and y should be the same,
        - The number of divisions for x and y should be the same, and
    - The MDMD should determine the measuring range for the different axes automatically.

OWM supports the voting status of the item, but only if amended with the proposed language as follows:

> **S.1.5.2. ~~Devices Capable of Measuring Irregularly Shaped Objects~~Device Divisions in the Horizontal Plane. –** For devices **with a single range of operation** ~~capable of measuring irregularly shaped objects~~, the value of the division size (d) shall be the same for the length axis (x) and the width axis (y) and may be different for the height axis (z)~~, provided that electronic rotation of the object to determine the smallest hexahedron is calculated in only a two-dimension horizontal plane, retaining the stable side plane as the bottom of the hexahedron~~. ***For multi-range devices, the partial measuring ranges (i.e., the number of partial measuring ranges, and for each range, the number of divisions and the division size (d)) shall be identical for the length axis (x) and the width axis (y). The MDMD shall automatically select the partial measuring range for each axis.****
> ***[Nonretroactive as of January 1, 20XX]***
>
> **(Amended 20XX)**

Summary of Discussions and Actions:

At the 2026 NCWM Interim Meeting, Scott Henry (Zebra Technologies), Corey Hainy (SMA), Dick Suiter (Richard Suiter Consulting), and Dan Caine (Wingfield Scale Company, Inc.) supported a Voting status. Jeff Gibson (NTEP Administrator) had no opinion on the item's status but indicated that if adopted, this would allow new technology into the market and allow this technology to be evaluated by NTEP.

The NCWM S&T Committee assigned the item a Voting status.

Regional Association Reporting:

Western Weights and Measures Association

At the WWMA 2025 Annual Meeting, the following comments were received:

No comments were received during open hearings.

The 2025 WWMA S&T Committee does not recommend a status. During Open Hearings, there was no technical analysis available, and no comments were heard on the item. The committee encourages feedback from stakeholders and looks forward to an analysis from NIST OWM to help formulate a position.

Southern Weights and Measures Association

At the 2025 SWMA Annual Meeting, no comments were heard.

The committee has no recommended status for this item.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, A representative from the NIST OWM supports this item as fully developed and ready for voting.

The Committee recommends a Voting status.

At the 2025 NEWMA Interim Meeting, no comments were heard. The committee had no recommended status for this item.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommends this item remain as Voting.

At the 2025 CWMA Interim Meeting, the committee recommends this item be given a Voting status based on comments received during open hearing.

Scale Manufacturers Association (SMA)

At the 2026 SMA Spring Meeting, they supported this item and recommended it for adoption.

At the 2025 SMA Fall Meeting, they supported this item and recommended it as a voting item.

OTH – OTHER ITEMS

OTH-25.1 A 2.26 Weigh-in-Motion Systems Used for Vehicle Direct Enforcement

Source: New York City Department of Transportation

Submitter's Purpose and Justification:

Add a new Section 2.26 Weigh-In-Motion Systems Used for Vehicle Direct Enforcement to standardize the testing method for WIM systems for jurisdictions involved in direct weight limit enforcement. The update is being requested by NYS Dept of Ag & Markets, NJ Off. of W & M, Oregon Dept of Ag, NYCDOT, Washington DC DOT, C2SMARTER and Kistler.

Original Justification:

1. INTRODUCTION

As noted in NIST Special Publication 2200-05 and according to the 2021 Fact Sheet: The Bipartisan Infrastructure Deal, one in five miles of U.S. highways and major roads and over 45,000 bridges are in poor condition. A major contributor to road damage stems from heavy or excess weight vehicles – or to be more precise – the heavy axle loads of these vehicles onto the road surface and/or pavement. As claimed by an article of Inside Science, this damage grows exponentially with the axle load of the vehicle. For comparison, a 40-ton commercial truck with 8 axles causes 625 times more road damage than a 2-ton passenger sedan with 2 axles. See Attachment B for NIST Special Publication 2200-5 for full document.

Enforcement of vehicle weight limits is typically cumbersome, requiring dedicated stations, contributing to freight and travel delays and strain on law enforcement resources. Even with the use of portable scales and virtual WIM systems, these efforts are not comprehensive, and have led to a culture where the disregard of the highway weight limits is giving an unfair economic advantage to those companies willing to risk running overweight trucks on our highways. This issue is exacerbated in our urban environments where limited space and enforcement personnel make it difficult or impossible to catch and cite these violators.

Recognizing the need for better weight limit enforcement, the New York State legislature authorized the New York City Department of Transportation (NYCDOT) in 2021 to conduct direct overweight vehicle enforcement using WIM as a demonstration program on a portion of the I-278 , connecting Brooklyn to Manhattan, Staten Island, and Queens otherwise known as the Brooklyn Queens Expressway or the BQE. The system was certified by the New York State Department of Weights and Measures using the procedure previously submitted for handbook 44 update item WIM 23.1 as developed by NYCDOT, C2SMARTand Kistler. NYCDOT provided all the logistical support and covered the cost of the testing.

In the seven months leading up to the launch of the program, a monthly average of 7,777 overweight trucks traveled this section of the roadway. During the first seven months of direct enforcement, the rate dropped to monthly average of 2,769 overweight trucks. As shown in Figure 1, the decline comes as the overall number of vehicles, including trucks, remains steady, with the share of overweight trucks falling from about 6.3 percent of all trucks on the roadway to 1.9 percent in most recent months. There have been no challenges in this time related to the accuracy of the system.

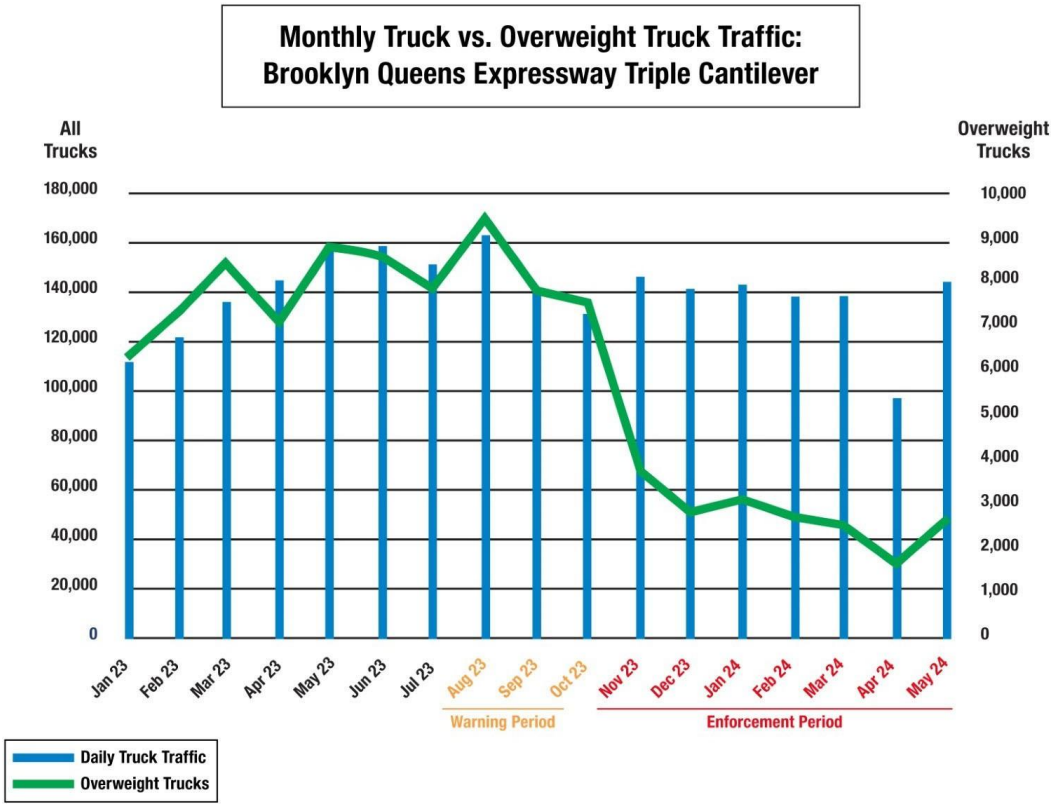

Figure 1 – Monthly Truck versus Overweight Truck Traffic on Brooklyn Queens Expressway (BQE) Triple Cantilever Structure

Since the time NYCDOT began its effort, several other states have proposed legislation for direct enforcement including Georgia and New Jersey. Several other jurisdictions are considering Direct Enforcement using WIM Systems.

The inclusion of the procedure in the handbook does not require a jurisdiction to begin direct enforcement using WIM. That authority remains with the legislative bodies of the jurisdiction. However, it is important for the proposed standard for the system to be formalized and harmonized across the nation to ensure that a unified testing protocol is being used by jurisdictions who so choose. Guarding against violations of vehicle weight restrictions to protect critical infrastructure is an issue of national concern and each jurisdiction will proceed based on local legislative authority

In addition to enforcing weight limits, officers in most States are responsible for checking Commercial Motor Vehicles (CMV's) for safety. This includes different levels of truck inspection, including the driver credentials, hours of service, key systems on the truck, load securement, and many more. Automating the weighing portion of the inspection will allow for a more efficient flow of vehicles through an inspection site and allow officers more time to focus on these other safety issues. Currently, with most sites running with a single officer, as they are focused on weighing, doing an inspection, or interviewing a driver, other unsafe vehicles behind the current one go by without scrutiny. See Attachment C Supporting Letters for letters of support from CVSA and ASCE.

This proposal seeks an amendment of NIST Handbook 44 by adding Section 2.26 to allow for Weigh-In-Motion Systems Used for Direct Vehicle Weight Enforcement certification requirements to be standardized. The remainder of this proposal lays out the justification for the amendment as well as

address some of the arguments that have been raised previously in opposition, using the BQE as an example to establish the urgent need for the amendment.

2. REVIOUS PROPOSAL DATA

A similar proposal, item WIM 23.1 was voted on during the 109th Annual meeting. The original submission was made on 8/15/2022 and received a voting status at the 2024 interim meeting. However, that proposal did not receive adequate support for inclusion into HB 44.

Commenters expressed concerns of the system's tolerance and the testing procedure during open hearings that was previously considered. Previously submitted documents and comments from the regions can be found in the archives of the 108th and 109th annual meeting archives as well as 2023 and 2024 interim meeting archives. Some of the relevant documents are being attached to this submission.

During the development of the item over the time between August 2022 and voting in July 2024, all of the regions had an opportunity to review the proposal and amendments and hear from the stakeholders including the proposers in various forums. A demonstration of the proposal was also conducted in April of 2023 in Madison Wisconsin and witnessed by members of NCWM as well as NIST. In October of 2023, NYS Department of Agriculture certified the BQE site in NYC based on the proposal version of August, 2023. NYCDOT began issuing violations in November of 2023 and data related to decrease in overweight since this effort began was also shared with the council. See Attachment F 2024 Annual Meeting WIM Presentation for summary of previous data.

3. READINESS OF PROPOSAL

With the input that was gathered in the prior efforts, the current proposal has been updated to address several concerns that were raised in the process.

A. Testing Requirements: - Some jurisdictions were concerned that the testing requirements could be burdensome and lengthy. The current proposal has incorporated a potential for reduced number of runs for operational testing after the first acceptance testing is done with the larger number of runs. In addition, a test procedure guidance based on successful testing in NYC with potential ways to handle the test logistics has been attached to provide a roadmap of actual implementation. While the requirements are extensive, they are in line with belt scale testing which is included in the handbook and match international standards. Additionally, the time required is comparable to testing large belt scale installations, in-motion rail systems, and other weighing systems for materials testing where evaluating performance using materials and a reference scale is necessary.

B. Thorough Technical Review: At the Interim 2023 meeting, the previous proposal received a status of informational. This allowed close collaboration with the S&T committee as well as NIST. With this collaboration, the entire proposal was thoroughly reviewed and harmonized with other applicable sections of the Handbook 44 as well as comparable international standards like OIML. Clarifications and updates based on actual implementation in NYC have been incorporated along with the lessons learnt from the demonstration in Wisconsin.

C. Need Across the Nation: While the proposal was brought forward by NYCDOT in 2022, currently there are multiple jurisdictions who are either actively seeking legislation to move forward with Direct Enforcement or are interested in having standards made available for future efforts to obtain legislative approval. Having a national standard will ensure that jurisdictions

moving forward with this approach to weight enforcement will have a better understanding of the resources needed to implement and can appropriately plan for it. In addition, while several WIM manufactures exist, without a clear standard there are varying outcomes from the systems, the industry will have clarity on expectations and can develop their products to match a recognized standard.

4. AUTOMATED TRUCK ENFORCEMENT USING WIM: ACCURACY OF WIM TECHNOLOGY VERSUS ACCEPTABLE TOLERANCE

ACCEPTABLE TOLERANCE: One of the more frequent concerns often voiced is the relatively large tolerance applied to gross vehicle weights, the axle loads, and axle-group loads. The proposal has been updated to include 2 classes of tolerance similar to the OIML standards allowing those officials charged with enforcing the regulations specific to commercial vehicles to select as appropriate based on need, site conditions, and manufacturer's recommendations.

While the tolerances proposed may seem large to the weights and measures community in comparison to commercial weighing equipment, they are non-the-less realistic and suitable for use by law enforcement. Unlike commercial vehicle scales which are installed and operated under very controlled conditions these systems are installed on interstate highways to weigh fully loaded vehicles traveling at highway speeds. The systems are continuously subject to the vibrations and stresses inherent to that environment. Unlike commercial applications where scale tolerances are made intentionally low so that they are a neglectable part of any business transaction in which the scale is used, the law enforcement official must consider the system's tolerances when issuing citations if those citations are to be upheld by a court of law. There is precedence in Handbook 44 to the idea that law enforcement scales be treated separate from commercial scales. Wheel load weighers have their own accuracy class, class IIII and weighing systems are allowed to collect and sum axle weights as an estimate of the gross vehicle weight. It is important to remember that the goal here is to protect our public roads and bridges from some of the worst offenders who are responsible for a disproportionate share of the damage to our infrastructure. Putting it another way, in a state with 80,000 lb weight limits we can risk allowing a truck weighing 85,000 lb to pass undetected if we can catch the one weighing 100,000 lbs.

Scales are evaluated not only to tolerance but to permanence. We expect them to hold their calibration for an extended period of time.

ACCURACY OF THE SYSTEM: The WIM system on the BQE has been certified multiple times and consistently met the tolerances included in the proposal. Prior to the 2nd certification, the system was tested to verify the accuracy retention over 6 months. The maximum error was 6.2%, 9.2% and 5.7% for GVW, single axle weight, and group axle weight, respectively.

The overweight enforcement system retained its accuracy over 6 months. In addition, after the system was installed but before it began to be used for direct violations at the BQE, the data from WIM was shared with NYPD in real time and then violations were issued based on portable scale weighments by the Highway Patrol. Over a span of 27 days, the NYPD enforced penalties on 48 overweight trucks, averaging less than 2 trucks per day using the more typical portable scales. The maximum GVW error was 9.2%, while the mean and average GVW errors were 0.25% and 0.05%, respectively. It should be noted that at the same time several overweight trucks identified by the WIM System could not be stopped as it took the Officers more than 2 hours to completed the inspection of each truck. No major impact was seen in the total number of overweight trucks on the corridor during this period. This is in stark contrast to the impact observed after the direct enforcement began.

Table 1 shows a summary of the data for the accuracy achieved at various sites that have applied similar WIM-based systems. The related background data is provided in Attachment D Sample WIM System Data and Attachment E Purdue WIM Report.

Table 1 – Maximum observed error for WIM-based systems collected at various sites

Sites and Testing Dates	Maximum Observed Error (%)		
	GVW	Single Axle	Group Axle
1- NY BQE Site NY PD Comparison in Mar-Apr '23	9.01%	N/A	N/A
2- NY BQE Site Validation 1 in Oct. '23	9.7%	13.1%	14.2%
3- NY BQE Site Validation 2 in Apr. '24	9.5%	19.2%	13.5%
4- WI Madison SWEF Demonstration in Apr. '23	6.4%	11.3%	7.8%
5- Indiana Study (2018)	5%*	N/A	N/A
* 5% maximum error at 95% compliance			

5. LOGISTICS OF THE TEST

The certification testing requires multiple trucks with varying loads along with drivers to complete the required number of runs. The results are then observed by the inspectors. This type of situations have already been addressed in Handbook 44 General Code, G-UR.4.4

Assistance in Testing Operations. – If the design, construction, or location of any device is such as to require a testing procedure involving special equipment or accessories or an abnormal amount of labor, such equipment, accessories, and labor shall be supplied by the owner or operator of the device as required by the weights and measures official.

As these systems are likely to be owned and operated by the state Department of Transportations, with readily available equipment and personnel to provide assistance with trucks and drivers along with traffic management should it be needed, such assistance should not be difficult to obtain for certification testing. The DOTs also have the option to contract with vendors to provide these services.

In addition, to reduce the time it would require the inspectors to test the systems, the proposal allows for reduced level of testing after the initial acceptance test has been successfully conducted. The requirements around testing and certification of reference scales have also provided jurisdictions with the ability to move forward with the option that best meets their needs based on the WIM site that is to be certified. The attached Test Procedure Guidance for WIM for Direct Enforcement Examination provides potential ways to address the logistics of the test. For reference, the demonstration runs at Wisconsin were completed in a single daytime 8 hour shift for 1 lane, while at the BQE due to traffic congestion, the test occurred during overnight single shift. Overnight testing was a site specific decision and not a requirement of the proposal. See Attachment G for Test Procedure Guidance.

6. CONCLUSIONS

Across the nation, the deterioration of aging infrastructure is exacerbated by the presence of overweight vehicles in excess of the Federal Bridge Formula (FBF). Though several states have implemented vehicle weight enforcement measures using a screening protocol that includes the use of mobile enforcement officers and stationary scales, these measures have been insufficient in significantly reducing the volumes of overweight vehicles on the nation's infrastructure. The use of WIM for the purposes of direct vehicle weight enforcement would both alleviate this problem and free up local and

state resources to address other safety concerns. As noted in the attached letter from CVSA "This action correlates to a positive impact for highway safety, congestion reduction by means of an option to traditional weighing techniques especially in high traffic volume areas and acts as a force multiplier for jurisdictions facing increased traffic volumes with static weight enforcement resources. Coupled with WIM certification standards in place and accurate technology, direct WIM enforcement provides a mechanism for enabling jurisdictions to align weight compliance beyond inefficient past weight enforcement methodologies traditionally used only for screening purposes with minimal detection capability and an effective leveling of the playing field for the trucking industry."

The amendment of NIST Handbook 44 to include the attached proposal as Section 2.26 will provide a standard directly comparable to international standards. This request is not to introduce new regulations to the trucking industries but to guide the trucking industries to comply with the existing applicable laws to protect our infrastructure, provide safe corridors to the nation's taxpayers, and improve the resilience of our built environment. Moreover, this request would allow the United States to catch up with other countries globally (shown in Figure 2) that have successfully implemented and proved automated weight enforcement, including China (2004), the Czech Republic (2010), Russia (2013), Hungary (2016), France (in process) and Brazil (in process).

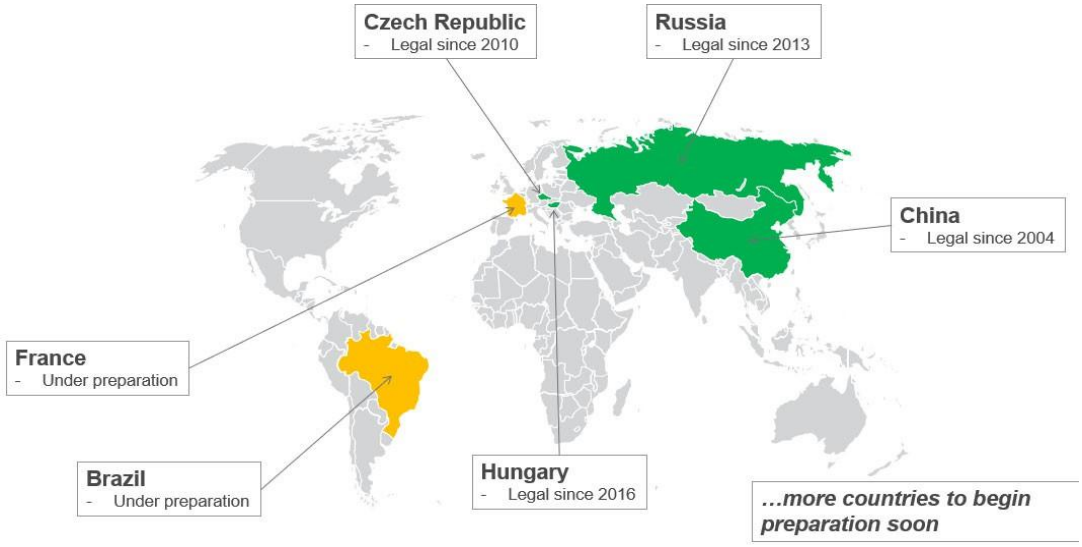

Figure 2. Automated enforcement around the world

The submitter included attachments that are available at https://www.ncwm.com/publication-15.

The submitter recommended that this be a Nonretroactive Voting item in 2025.

NIST OWM Executive Summary

OTH-25.1 A 2.26 Weigh-in-Motion Systems Used for Vehicle Direct Enforcement

NIST OWM Recommendation: Assigned

- The submitters have demonstrated the need for direct and permanent enforcement, and that WIM installations are suitable and extremely effective.
- Regarding the installation in New York State:

  The number of violations has dropped by 60% during its first year of operation.
  - As of 4/4/2025, there had been no legal challenges regarding the accuracy of the WIM system.
  - The WIM installation has proven that WIM systems can be stable over a longer period, depending on the type of pavement.
  - The certification and inspections of the WIM have become part of the regular W&M program of the NYS Department of Agriculture and Markets. Many of these resources are provided by the owner of the WIM system, lifting the burden on the Bureau of Weights and Measures.
- The installation in New York is the first WIM in the US that is used in direct enforcement of weight limit on public roads. NIST OWM expects that, given the success of the pilot in NYC, these systems will also be installed in other places. This creates a need for a national standard to ensure a harmonized approach.
- The submitters have addressed the concerns expressed during meetings of the Council with respect to the failed item WIM-23.1 by:
  - Reducing the number of test runs during subsequent verifications, and
  - Introducing a class with tighter tolerances, which gives states more flexibility to implement WIM systems as they see fit.
- The proposed classification and tolerances are comparable with the WIM standards from ASTM and OIML.
- NIST OWM supports the work to be done by the WIM Task Group.

Table 2. Summary of Recommendations

OTH-25.1 A 2.26 Weigh-in-Motion Systems Used for Vehicle Direct Enforcement

	Status Recommendation	Note*	Comments
Submitter	Voting		
OWM	Assigned		
WWMA	Withdrawal		
NEWMA	Assigned		
SWMA	Withdrawal		
CWMA	Assigned		
NCWM	Assigned		

	Number of Support Letters	Number of Opposition Letters	Comments
Industry			
Manufacturers			
Retailers and Consumers			
Trade Association			

***Notes Key:**

1. Submitted modified language
2. Item not discussed or not considered
3. No meeting held
4. Not submitted on agenda
5. No recommendation

Item Under Consideration:

NOTE: This item has been edited to correct formatting errors. The Item Under Consideration now reflects the structure required by NIST Handbook 44.

Amend NIST Handbook 44, adding new Section 2.26. Weigh-in-Motion Systems Used for Vehicle Direct Enforcement as follows:

Table of Contents

Section 2.26 Weigh-In-Motion Systems Used for Vehicle Direct Enforcement

A. Application

A.1. General. – This code only applies to systems installed in a fixed location used to weigh vehicles, while in motion, for the purpose of direct enforcement of legal weight limits.

A.2. Exception. – This code does not apply to weighing systems intended for the collection of statistical traffic data and weighing systems used for the purpose of screening and sorting the vehicles based on the vehicle weight to determine if a static weighment is necessary. (Also see Section 2.25. Weigh-In-Motion Systems Used for Vehicle Enforcement Screening – Tentative Code)

A.3. Additional Code Requirements. – In addition to the requirements of this code, weigh-in-motion systems shall meet the requirements of Section 1.10. General Code.

S. Specifications

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

S.1.1. Ready Indication. – The system shall provide a means of verifying that the system is operational and ready for use.

S.1.2. Value of System Division Units. – The value of a system division "d" expressed in a unit of weight shall be equal to:

(a) 1, 2, or 5; or

(b) a decimal multiple or submultiple of 1, 2, or 5.

Examples: divisions may be 10, 20, 50, 100; or 0.01, 0.02, 0.05; or 0.1, 0.2, 0.5, etc.

S.1.2.1. Units of Measure. – The system shall indicate weight values using only a single unit of measure.

S.1.3. Maximum Value of Division. – The value of the system division "d" weigh-in-motion (WIM) system shall not be greater than 200 kg or 500 lb.

S.1.3.1. Number of System Divisions. – The number of system divisions shall be a minimum of 50 and a maximum of 1,000.

S.1.3.2. Minimum Capacity. – The minimum capacity in system divisions shall be 10.

S.1.4. Value of Other Units of Measure.

S.1.4.1. Speed. – Vehicle speeds shall be measured in miles per hour or kilometers per hour.

S.1.4.2. Axle-Spacing (Length). – The center-to-center distance between any two successive axles shall be measured in:

(a) meters and decimal submultiples of a meter;

(b) feet and inches; or

(c) feet and decimal submultiples of a foot.

S.1.4.3. Vehicle Length. – If the system is capable of measuring the overall length of the vehicle, the length of the vehicle shall be measured in feet and/or inches, or meters.

S.1.5. Capacity Indication. – An indicating or recording element shall not display nor record any values greater than 105 % of the specified capacity of the load receiving element.

S.1.6. Identification of a Fault. – Fault conditions affecting accuracy as specified in Table T.2.3. Maintenance Tolerances shall be presented to the operator in a clear and unambiguous means. No weight values shall be indicated or recorded when a fault condition is detected. The following fault conditions shall be identified:

(a) Vehicle speed is below the minimum or above the maximum system specified speed.

(b) The maximum number of vehicle axles as specified has been exceeded.

(c) A change in vehicle speed greater than that specified has been detected.

(d) Imbalanced weight between the left and right wheels has exceeded the specified values.

(e) Vehicle has changed lanes between or in the proximity of the first and the last sensors.

(f) Any axle or wheel, or part of each is not on the load-receiving element of the sensors.

(g) Vehicle direction of travel is not valid for the installation.

S.1.7. Recorded Representations.

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

(a) transaction identification number;

(b) station ID;

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

(d) vehicle speed;

(e) number of axles;

(f) weight of each axle;

(g) identification and weight of axle groups;

(h) axle spacing;

(i) gross vehicle weight;

(j) total vehicle length;

(k) all fault conditions that occurred during the weighing of the vehicle, as identified in paragraph S.1.6. Identification of a Fault;

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

(m) time and date.

Note: Consult the specific jurisdictional legislation for additional values that may be required to issue enforcement violations. All gross vehicle, axle, and axle group weights must be printed and/or stored with the

corrected values that include any necessary reductions due to the system tolerance and adopted violation thresholds. Violation thresholds may be dependent on additional items, not specified in this code.

S.1.8. Value of the Indicated and Recorded System Division. – The value of the system's division "(d)," as recorded, shall be the same as the division value indicated.

S.2. System Design Requirements.

S.2.1. Violation Parameters. – The instrument shall be capable of accepting user-entered violation parameters for the following items:

(a) single axle weight limit;

(b) axle group weight limit;

(c) gross vehicle weight limit; and

(d) bridge formula maximum.

The instrument shall display and/or record violation conditions when these parameters have been exceeded.

Note: Jurisdiction-defined weight limits for S.2.1 Violation Parameters (a) through (d) can be used to determine the violation.

S.3. Design of Weighing Elements.

S.3.1. Multiple Load-Receiving Elements. – An instrument with a single indicating or recording element, or a combination indicating-recording element, that is coupled to two or more load-receiving elements with independent weighing systems, shall be provided with means to prohibit the activation of any load-receiving element (or elements) not in use, and shall be provided with automatic means to indicate clearly and definitely which load receiving element (or elements) is in use.

S.4. Design of Weighing Devices. – WIM systems for direct enforcement of legal weight limits shall meet the requirements of this code.

S.5. Design of Balance

S.5.1. Zero-Tracking Device. – A zero-tracking device shall have a range of 4% of the system capacity and operate only when:

(a) the system is in a no-load condition;

(b) is in stable equilibrium; and

(c) the corrections are not more than 0.5 d per second

S.5.2. Totalizing Device. – WIM systems may be provided with a totalizing device for determining gross vehicle weight which operates:

(a) automatically, in which case the instrument shall be provided with a vehicle recognition device defined in S.5.3. Vehicle Recognition/Presence Device; or

(b) semi-automatically (e.g., it operates automatically following a manual command).

S.5.3. Vehicle Recognition/Presence Device. – WIM systems which are able to operate without the intervention of an operator shall be provided with a vehicle recognition device. The device shall detect the presence of a vehicle in the weigh zone and shall detect when the whole vehicle has been weighed. WIM systems shall not indicate or print the vehicle mass unless all wheel loads of the vehicle have been weighed.

S.6. Accidental Breakdown and Maladjustment. – WIM systems shall be so constructed that an accidental breakdown or maladjustment of control elements likely to disturb its correct functioning cannot take place without its effect being evident.

S.7. Marking Requirements. – In addition to the marking requirements in G-S.1. Identification, the system shall be marked with the following information:

(a) value of the system division "d";

(b) operational temperature limits;

(c) number of instrumented lanes (not required if only one lane is instrumented);

(d) minimum and maximum vehicle speed;

(e) maximum number of axles per vehicle;

(f) maximum change in vehicle speed during weighment;

(g) minimum and maximum load;

(h) any restrictions specified in the NTEP Certificate of Conformance; and

(i) accuracy class.

S.7.1. Location of Marking Information. – The marking information required in Section 1.10. General Code, G-S.1. Identification and S.7. Marking Requirements shall be visible after installation. The information shall be marked on the system or recalled from an information screen.

N. Notes

N.1. Test Procedures.

N.1.1. Selection of Test Vehicles. – All dynamic testing associated with the procedures described in each of the subparagraphs of N.1.6 Test Procedures shall be performed with vehicles of these three types, at a minimum.

(a) a two-axle, six-tire, single-unit truck or Federal Highway Administration (FHWA) Class 5; that is, a vehicle with two axles with the rear axle having dual wheels;

(b) a three-axle, single-unit truck or FHWA Class 6; and

(c) a five-axle, single-trailer truck or FHWA Class 9 (3S2 Type).

(d) The gross vehicle weights shall be as stated in N.1.2.2. Dynamic Test Loads.

Note 1: Consideration should be made for testing the system using vehicles which are typical to the roadway in which the system is installed if different than the types listed in (a) through (c) above.

Note 2: If the WIM system will be used to enforce the weight limit for vehicles with liquid loads, a vehicle with a liquid load shall be included in the selection of test vehicles.

N.1.1.1. Weighing of Test Vehicles. – All test vehicles shall be weighed statically on a reference scale, meeting the requirements of Appendix A, before being used to conduct dynamic tests.

N.1.1.2. Determining Reference Weights for Axles, Axle Groups, and Gross Vehicle Weight. – The reference weights shall be the average weight value of a minimum of three static weighments of all single axles, axle groups, and gross vehicle weight on a reference scale before being used to conduct the dynamic tests.

Note: The axles within an axle group are not considered single axles.

N.1.2. Test Loads.

N.1.2.1. Static Test Loads. – All static test loads shall use certified test weights.

N.1.2.2. Dynamic Test Loads. – Test vehicles used for dynamic testing shall be loaded as specified below. Except when testing for liquid loads, the "load" shall be non-shifting and shall be positioned to present as close as possible, an equal side-to-side load.

(a) a half load condition (60-80 % of the legal load limit of the test vehicle) for a minimum of 10 runs per test vehicle type;

(b) a full load condition (> 90 % of the legal load limit for the test vehicle) for a minimum of 20 runs per test vehicle type; and

(c) When it is anticipated that a system will be used to enforce weight limits for vehicles that may be unloaded, e.g., an unloaded Class 9 vehicle crossing a bridge with a 20 TN maximum capacity, tests shall include unloaded vehicles as part of the test load.

N.1.3. Reference Scale. – Each reference vehicle shall be weighed statically on a multiple platform vehicle scale, an axle-load scale, portable axle-load weighers, or wheel-load weighers.

The scale shall be tested prior to use to establish reference test loads and shall meet the applicable NIST Handbook 44 tolerances. The official with statutory authority has the discretion to establish the location of the reference scale and timeframe in which it shall be tested.

N.1.3.1. Multi-Independent Platform Vehicle Scale System. – When using a multi-independent platform vehicle scale system, the three individual weighing/load receiving elements shall be of such dimension and spacing to facilitate the single-draft weighing of all reference test vehicles;

(a) the simultaneous weighing of each single axle and axle group of the reference test vehicles on different individual elements of the scale; and

(b) gross vehicle weight determined by summing the values of the different reference axle and reference axle groups of a test vehicle.

N.1.3.2. Axle-Load Scale. – When using an axle-load scale, each individual axle or axle group of the reference test vehicle shall be measured on the axle-load scale. Only one single axle or axle group for measurement shall be on the single platform, while other single axles or axle groups shall be off the platform. The gross vehicle weight shall be determined by summing all the single axles and axle groups.

N.1.3.3. Portable Axle-Load Weighers.

(a) When using a single portable axle-load weigher, each individual axle or axle group of the reference test vehicle shall be measured on the portable axle-load weigher. Only one single axle or axle group for measurement shall be on the weighing element of the device. The other single axles or axle groups shall not be in contact with the weighing element. The gross vehicle weight shall be determined by summing all the single axles and axle groups.

(b) When using more than a single portable axle-load weigher, each individual axle or axle group of the reference test vehicle shall be on the weighing element of a device. The gross vehicle weight shall be determined by summing all the single axles and axle groups.

N.1.3.4. Wheel-Load Weighers. – When using wheel-load weighers, each individual axle load of the reference test vehicles shall be measured on wheel-load weighers. The gross vehicle weight shall be determined by summing all axle loads.

When utilizing portable axle-load weighers or wheel-load weighers to determine the value of individual axles or axle-group loads, the reference vehicle shall be in a reasonably level position not to exceed 3 degrees or 5 % at the time of such determination.

N.1.4. Test Speeds. – All dynamic tests shall be conducted at two designated speeds.

(a) at a high speed – posted speed limit (S_{max}); and

(b) at a low speed – site-specific minimum speed, not below manufacturer's requirement (S_{min}).

N.1.5. Reference Axle Spacings. – To establish reference axle spacing, before measuring the axle spacing, the test vehicle shall be positioned straight, and the driving axle shall also be straight. A steel tape measure shall be used for measurement. Both left and right axle spacing shall be measured, and the average of two measurements shall be recorded by the nearest cm (inches). Each axle spacing shall be made by a single measurement.

N.1.6. Test Procedures.

N.1.6.1. Dynamic Load Test. – The dynamic test shall be conducted using the test vehicles defined in N.1.1. Selection of Test Vehicles and at the load condition as stated in N.1.2. Test Loads and at the speed as stated in N.1.4. Test Speeds. The number of runs shall be per Table N.1.6.

N.1.6.2. Initial Verification Test. – Initial verification tests shall be performed on any new WIM system, a WIM system at an existing direct enforcement site that has undergone major reconditioning or overhaul, or when the pavement in which the system is installed requires maintenance. At the conclusion of the dynamic test, there shall be a minimum of 20 weight readings for each single axle, axle group, and gross vehicle weight of each test vehicle. The tolerance for each weight reading shall be based on the percentage values specified in Table T.2.1. Maintenance Tolerances.

N.1.6.3. Subsequent Verification Test. – At the conclusion of the dynamic test, there shall be a minimum of 10 weight readings for each single axle, axle group, and gross vehicle weight of each test vehicle. The tolerance for each weight reading shall be based on the percentage values specified in Table T.2.3. Maintenance Tolerances.

Note. Any vehicle records identified as fault conditions listed in S.1.6. Identification of a Fault or jurisdiction defined fault conditions shall be excluded from the minimum weight readings in N.1.6.1. Dynamic Load Test.

See Table N.1.6 below to summarize the minimum number of test runs for Initial and Subsequent Verification Tests.

Table N.1.6 Minimum Number of Test Runs per Each Test Vehicle	
Initial Verification Test	
Load Condition	**Speed**
Half Load (10 runs)	**High Speed S_{max} (5 runs)**
	Low Speed S_{min} (5 runs)
Full Load (20 runs)	**High Speed S_{max} (10 runs)**
	Low Speed S_{min} (10 runs)
Subsequent Verification Test	
Load Condition	**Speed**
Half Load (6 runs)	**High Speed S_{max} (3 runs)**
	Low Speed S_{min} (3 runs)
Full Load (10 runs)	**High Speed S_{max} (5 runs)**
	Low Speed S_{min} (5 runs)

N.1.6.4. Axle Spacing Test. – The axle spacing test is a review of the displayed and/or recorded axle spacing distance of the test vehicles. The tolerance value for each distance shall be based on the tolerance value specified in T.2.4. Tolerance Value for Axle Spacing.

T. Tolerances

T.1. Principles.

T.1.1. Design. – The tolerance for a weigh-in-motion system is a performance requirement independent of the design principle used.

T.2. Tolerance Values.

T.2.1. Acceptance Tolerance. – Acceptance tolerance shall be 50 % of tolerances in Table T.2.3. Maintenance Tolerances. The acceptance tolerance shall apply to a new installation, within 30 days of a new installation being placed in service, when an existing system undergoes major reconditioning or overhaul, or during type evaluation.

T.2.2. Tests Involving Digital Indications or Representations. – To the tolerances that would otherwise be applied in paragraphs T.2.3. Tolerance Value for Dynamic Load Test, there shall be added an amount equal to one-half the value of the system division to account for the uncertainty of digital rounding.

T.2.3. Maintenance Tolerance Values for Dynamic Load Test. – The tolerance values applicable during dynamic load testing are as specified in Table T.2.3. Maintenance Tolerances based on class. See UR.1. Selection Requirements

Table T.2.3. Maintenance Tolerances		
Load Description	**Tolerance as a Percentage of Applied Test Load (Class 5)**	**Tolerance as a Percentage of Applied Test Load (Class 10)**
Gross Vehicle Weight	**± 5 %**	**± 10 %**
Axle Load	**± 10 %**	**± 20 %**
Axle Group Load (including bridge formula)	**± 8 %**	**± 15 %**

T.2.4. Tolerance Value for Axle Spacing. – The tolerance value applied to each axle spacing measurement shall be ± 0.15 m (6 inches) at 100 % compliance.

T.3. Influence Factors. – The following factors are applicable to tests conducted under controlled conditions only.

T.3.1. Temperature. –The instrument shall operate within tolerance throughout the specified operational temperature range.

T.3.2. Temperature Effect on Zero-Load Balance. – The zero-load indication shall not vary by more than one division per 5 °C (9 °F) change in temperature.

T.3.3. Power Supply. – System shall satisfy the tolerance requirements in Table T.2.3. Maintenance Tolerances under voltage ranges of -15 % to +10 % of the marked nominal line voltage(s) at 60 Hz or the voltage range marked by the manufacturer at 60 Hz. The battery-operated systems shall satisfy the tolerance requirements in Table T.2.3. Maintenance Tolerances when the battery power output is not excessive or deficient.

T.4. 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 the tolerance value as stated in Table T.2.3. Maintenance Tolerances.

UR. User Requirements

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 system divisions, value of the system division, minimum capacity, and the accuracy class. The system owner shall determine the appropriate accuracy class based on an analysis of the site per ASTM E1318, roadway maintenance capacity, legislative requirements, and manufacturer's recommendations.

UR.2. Installation and Maintenance.

UR.2.1. System Modification. – The dimensions (e.g., length, width, thickness, etc.) of the load receiving element of a system shall not be changed beyond the manufacturer's specifications, nor shall the capacity of a sensor be increased beyond its design capacity by replacing or modifying the original primary indicating or recording element with one of a higher capacity, except when the modification has been approved by a competent engineering authority, preferably that of the engineering department of the manufacturer of the system, and by the weights and measures authority having jurisdiction over the system.

UR.2.2. Foundation, Supports, and Clearance. – The foundation and supports shall be such as to provide strength, rigidity, and permanence of all components.

On load-receiving elements, which use moving parts for determining the load value, clearance shall be provided around all live parts to the extent that no contacts may result when the load-receiving element is empty, nor throughout the weighing range of the system.

UR.2.3. Access to Weighing Elements. – If necessary, adequate provision shall be made for inspection and maintenance of the weighing elements.

UR.2.4. Site Selection. - In order for any WIM system to perform properly, the user must provide and maintain an adequate operating environment for the system's sensors and instruments. This includes maintaining surface smoothness in advance of and beyond the WIM-system sensors per manufacturer's recommendation.

UR.3. Maximum Load. – A system shall not be used to weigh a load of more than the marked maximum load of the system.

UR.4. Enforcement Guidance. – Prior to the issuance of an enforcement violation, the enforcement entity shall ensure compliance with specific jurisdictional legislation and/or protocols taking into account system tolerance. All gross vehicle, axle, and axle group weights must be printed and/or stored with the corrected values that include any necessary reductions due to the system tolerance and adopted violation thresholds.

UR.5. Notification of Violation. – If a violation occurs, there shall be an audible or visual notification provided to the vehicle operator. The method used to provide notification of a violation shall be determined by the jurisdiction with authority.

Add the following definitions to Appendix D:

axle. – The axis oriented transversely to the nominal direction of vehicle motion, and extending the full width of the vehicle, about which the wheel(s) at both ends rotate. [2.26]

axle-group load. – The sum of all tire loads of the wheels on a group of adjacent axles; a portion of the gross-vehicle weight. [2.26]

axle load. – The sum of all tire loads of the wheels on an axle; a portion of the gross-vehicle weight. [2.26]

axle spacing. – The distance between the centers of any two axles. When specifying axle spacing, the axels used also need to be identified. [2.26]

weigh-in-motion (WIM). – A process of determining a moving vehicle's gross weight and the portion of that weight that is carried by each wheel, axle, or axle group, or combination thereof, by measurement and analysis of dynamic vehicle tire forces. [2.26]

WIM System. – A set of load receptors and supporting instruments that measure the presence of a moving vehicle and the related dynamic tire forces at specified locations with respect to time; determine tire loads; calculate speed, axle spacing, vehicle class according to axle arrangement, and other parameters concerning the vehicle; and process, display, store, and transmit this information. This standard applies only to highway vehicles. [2.26]

NIST OWM Detailed Technical Analysis:

Permanently installed WIM systems are used in several countries around the world and are generally used for protection of fragile and critical infrastructure. The submitters clearly showed that there is a need for direct and permanent enforcement and that WIM installations are suitable and effective.

The 2024 Report by New York City Department of Transportation on the New York City Weigh-in-Motion Automated Enforcement Program (https://www.nyc.gov/html/dot/downloads/pdf/weigh-in-motion-report.pdf) shows that before direct enforcement by the WIM installation was applied, less than a quarter of all violations were ticketed. This number increased to 100% when the direct enforcement using WIM came into force. This increase in efficiency has resulted in a 60% decrease in overweight vehicles on the Brooklyn-Queens Expressway.

The report also states that hearings were requested for less than 15% of the violations issued during the first year of operations. NYC DOT has not received any indication that the accuracy or trustworthiness of the WIM system was challenged during any of these hearings (and following appeals).

Unfortunately, there is little data available on the stability of the performance of WIM systems, as this depends heavily on multiple factors, such as quality and type of pavement, sensor type, weather conditions

and type of traffic. NYC has indicated that there have been issues with pavement, which has led to damage to one set of sensors. However, they have had good results with the same type of sensors in a slightly different type of pavement, which provided stability of performance over a long period.

An international report (https://www.mdpi.com/1424-8220/24/24/8178) on the stability of performance of the sensors of a WIM installation in Poland indicated that the performance of this particular installation was stable over a two-year period without maintenance or adjustment of the system during this period.

The results of NYC and the international analysis indicate that the stability of the performance of a WIM installation heavily depends on the site conditions (pavement quality, type of traffic, and weather conditions). The calibration and inspection interval must be determined per site. This site dependency also justifies the multiple accuracy classes. Sites with favorable conditions may be certified to a higher accuracy class with tighter tolerances than sites with less favorable conditions. Unlike traditional weighing instruments where the accuracy class is tied to the application, the accuracy class of a WIM system can be dictated by the specific site of installation.

The certification and inspections of the WIM system in New York City are part of the regular W&M program of the New York State Department of Agriculture and Markets. The unique testing needs (overnight and on weekends) do call for overtime and flexibility from staff members. However, the majority of the resources (the trucks, material loaded on the trucks, traffic tenders) are all provided by the owner of the WIM system, lifting the burden of the Bureau of Weights and Measures. The inspection of the WIM installation on the Brooklyn-Queens Expressway has become routine.

The pilot in New York City has been a success. Multiple states have shown interest in and support for the use of WIM systems in direct enforcement. Subsequently, NIST OWM expects that WIM systems will be installed in other locations throughout the US. This creates a need for a national standard to guarantee a harmonized approach. Adoption of regulation for these systems in NIST Handbook 44 is favorable, as it is possible that local jurisdictions operating these WIM stations may outsource inspection and certification of these installations to the local Weights and Measures divisions.

After the previous item, WIM-23.1, failed during the voting session at the 2024 NCWM Annual meeting, the submitters have worked with NIST OWM to address concerns heard from stakeholders.

The two main amendments to the proposal are:

1. To reduce the burden on inspection bodies, the submitters created a distinction between initial and subsequent verifications. In the item under consideration, the number of test runs during a subsequent verification has been reduced by approximately 50%, while the number of test runs for the initial verification remains the same as in the final proposal of WIM-23.1.

2. The submitters introduced two classes (Class 5 and Class 10) with different tolerances. Class 10 has the same tolerances as proposed in the final proposal of WIM-23.1. The tolerances of Class 5 are approximately half the tolerances of Class B. The introduction of multiple classes allows states to appoint the class they see fit. The classification may depend on the location of installation.

The proposal under consideration:

Leaves the existing code for screening WIM systems in section 2.25. untouched.

Includes similar requirements (e.g., voltage variation, definition of acceptance tolerance) as are applicable to scales under section 2.20. of Handbook 44 (e.g., T.2. & T.3.).

Prescribes tolerance levels and test procedures that are in line with internationally recognized documentary standards, such as OIML R 134 and ASTM E1318.

Includes guidance when considering penalties for overweight vehicles (UR.4.).

Does not include any requirements regarding the provision of evidence to support automatic citation of violators.

The requirements, test procedures, tolerances, and accuracy classes proposed by the submitter are comparable to the international standards by ASTM and OIML.

NIST OWM supports the work to be done by the WIM Vehicle Scale Task Group.

Summary of Discussions and Actions:

At the 2026 NCWM Interim Meeting, Eric Hooks (Quarterhill/International Road Dynamics) gave a presentation supporting the item. Kristin Walters (AR) reading from written comments, stated that asking to adopt this standard is also asking to support it's intended use as identified in the Application section, suggesting that these need to be separate issues. AR recognizes that the priority is adoption of the standard and, if adopted, the use of these devices for enforcement is legitimized. There are still concerns with the device's ability to maintain accuracy (permanence). There is a lack of data regarding the faults that these devices recognize, which affects it ability to be accurate. While AR doesn't plan to reference this section if adopted, its residents could still be affected by their use in other states to issue fines. Adoption may result in discontinuing the use of WIM as a screening tool to direct potential violations to a static scale for enforcement. Due to the lack of data supporting the permanence of these devices, AR supports withdrawal of this item. Tory Brewer (WV) agreed with many of the comments made by AR and supports withdrawal or Voting status. Matt Douglas (CDA DMS) noted that CA has made extensive comments regarding the design, testing procedures, and tolerances of these devices, and they agree with the previous comments regarding permanence, and supported withdrawal. Alison Wilkinson (MD) provided the S&T Committee written suggestions to modify the proposal. These include modifying A.1. to clarify the use of these devices to enforce weight limits on overweight vehicles only after the violation exceeds the specified maintenance tolerance for that load, modifying S.1.7.1. to require data to be retained for one year, excluding the use of axle-load scales, portable axle-load weighers, or wheel-load weighers as reference scales, requiring the reference scale to be tested 24 hours prior to use and after weighment of the reference vehicles is completed to ensure errors that are 1/3 of the acceptance tolerance, striking paragraphs N.1.3.2., N.1.3.3., and N.1.3.4. to remove the test notes for axle-load scales, portable axle-load weighers, or wheel-load weighers used as reference scales, and amending UR.4. to clarify that only overweight vehicles are subject to enforcement action and only after maintenance tolerances are exceeded. MD also suggests adding a note requiring the jurisdiction with authority over the device to be responsible for proper maintenance and testing expenses. MD also supports NTEP evaluation of these systems. They ask that the submitter consider these suggestions, believe the item is fully developed, and recommend Voting status. Robert Huff (DE) agreed with MD regarding the use of wheel-load weighers as reference scales and the time frame for testing reference scales, and supports withdrawal. Paul Floyd (LA) noted that there still seem to be issues with the proposal and recommended an Assigned status. John McGuire (NIST OWM) supported Voting status, noting that the submitter has addressed the technical issues identified. Jason Flint (NJ) is interested in MD suggested language but believes that the item is fully developed and recommended Voting status. Chaekuk Na (Rutgers) replying to comments regarding data, indicated that the S&T Committee has been provided data that shows the device maintaining accuracy over an extended period of time (10 years). Jeff Cooper (NMFTA) opposes the item because the accuracy is much greater than static scales used for enforcement, adding that WIM should only be used for screening. Enforcement at weigh stations also includes safety checks that are important. Jim Willis (NY) replied that the intent of the item isn't to replace WIM as

screening tools but to provide another option for areas where static scales aren't viable. Corey Hainy (SMA) stated the SMA opposes this item and recommends it be withdrawn. Mike Harrington (IA) spoke in support of a Voting status. Eric Hooks (Quarterhill/International Road Dynamics) stated that data has been provided, and there is a lot of data that has been collected from WIM screening devices. These devices won't achieve static scale accuracy. The suggestions from MD are appreciated. Dave Rodrigues (MA) supports item a Voting.

The S&T Committee gave the item an Assigned status and requested the creation of a task group to further develop the proposal.

At the 2025 NCWM Annual Meeting, Tanvi Pandya (New York City Department of Transportation), co-submitter of the item, delivered a presentation with Lukas Koch, Kistler Instrument Corp. in support of the item. Jason Flint (NJ), co-submitter, stated that these devices are not a new concept and noted that the screening code (Section 2.25.) was brought forward by NIST. He stated that adoption of the item wouldn't require every jurisdiction to begin testing immediately. States that oppose adoption can exempt this section. Chad Parker (NC) noted that NC W&M has not met with anyone from NC DOT, and NC W&M doesn't support the item. Steve Harrington (OR) supports the item and agrees with Jason Flint. Kristin Walter (AR) stated that this proposal should ensure accuracy of these devices. She visited sites (screening devices) in her state and couldn't get any data that contrasted the accuracy of WIM devices to static scales and stated that data would help legitimize the device. She also expressed concern that there are many environmental variables that can impact the devices, e.g. road conditions, etc., and that because of the test procedures that reference posted speed limits for tests, there would be a lack of uniformity in test procedures, e.g. different jurisdictions would test at different test speeds. Alison Wilkinson (MD) recognizes the need for the item, but is still opposed, noting that this item is essentially the same item that failed last year. The submitter hasn't provided any new information to justify reconsideration of the item indicated. She stated concerns that no device has been evaluated and approved in the U.S. If adopted, developing Pub 14 test procedures will take a lot of time. Believes the item is fully developed, but is opposed to it and doesn't think it belongs in NIST Handbook 44. Asked if the devices provide equity. Stated that her agency is required to test all law enforcement scales in Maryland. She is concerned that legislatures will use the devices to generate revenue. Steve Harrington (OR) noted that DOT has their own authority in Oregon and are facing budget constraints, which will continue, and it is just a matter of time until there is pressure to adopt these types of requirements. He supports the item. Jeffery Cooper (National Motor Freight Traffic Association) opposed based on the device's accuracy. If the technology can't produce the accuracy needed, then it shouldn't be used. Jim Willis (NY, co-submitter) supports the item and stated that adoption would allow the use of these devices throughout NY state and if law enforcement jurisdictions continue to allow the devices, then standards will be needed. His agency relies heavily on DOT for assistance in testing and the vehicles used. Tanvi Pandya (NY DOT) speed is based on speed prevalent in area of use, updated data has been provided. Robert Huff (DE) pointed out that on page 128 of Pub 16, there is no requirement for applying acceptance tolerance within 30 days of a rejection. Suggested referencing the general code instead. His agency is obligated to check every scale twice per year. Testing one of the scales in their jurisdiction would require a 600-mile round trip. The code also allows split-weighing and liquid loads. There are no real guidelines as to when the devices should be tested. He is concerned that some trucks will get fined that don't deserve it. Robert suggested withdrawing the item from the agenda. Matt Douglas (CA DMS) stated that the item is basically the same as last year's item and recommended withdrawing it. Jeffery Cooper (National Motor Freight Traffic Association) added to his previous comments, stating that his organization opposed the use of these devices for law enforcement purposes. Corey Hainy (SMA) opposed the item due to the large tolerances. Greg Gholston (MS) stated MS remains opposed to this item. The current language in UR.4. Enforcement Guidance does not go far enough to clarify how the tolerances must be accounted for and leaves the decision to jurisdictional legislation and/or protocols to determine that. Due to the large tolerances, applicable tolerance weighment deductions must be mandatory before citations are issued. Maurico Mejia (FL) opposes for the reason given by other states. Kristin Walter (AR) commented that she supports the offer by

NY to collect data from the devices, but stated her concern that overweight trucks may be avoiding the device installed on the Brooklyn Queens Expressway.

During the NCWM 2025 Annual Meeting, the Committee made several amendments to the item to be more consistent with other code sections in NIST Handbook 44. The Committee removed the words "for Accuracy" from T.2. and corrected the references to Table T.2.3. Maintenance Tolerances in paragraphs S.1.6., T.3.3., and T.4.

During the NCWM 2025 Interim Meeting, the Committee Chair announced that updates to the proposal from the submitters are on the NCWM website. The Committee modified the proposal to include those updates and some additional changes, which include amending the language in paragraphs A.1. General, N.1.6.2. Initial Verification Test, and UR.1. Selection Requirements, as well as paragraph references in paragraph T.2.3. Maintenance Tolerance Values for Dynamic Load Test. The Committee believes the item is fully developed and has assigned it a Voting status.

Regional Association Reporting:

Western Weights and Measures Association

At the 2025 WWMA Annual Meeting, the following comments were received:

Mr. Aaron Yanker (WWMA S&T Committee Chair): Updated the body to the item not having an assigned status by the NCWM S&T Committee.

As a point of clarification, this item went to vote at the 2025 NCWM Annual Conference and was returned to the 2025 NCWM S&T Committee. The 2025 NCWM S&T Committee recommended the submitters address concerns raised and requested comments from the regions before assigning a status at the 2026 NCWM Interim Conference.

Mr. Cory Hainy (Representing the SMA): SMA believes the tolerances are too large and opposes this item, recommends a Withdrawal status.

Mr. Kyle Plas (Kissler): Acknowledged he is one of the submitters of the item. Recognizes there are concerns with some specific sections of the item and open to discussion, recommends a Voting status.

Mr. Matthew Douglas (State of California, Division of Measurement Standards): Confirmed his previous comments on the item still applies and opposes the item, recommends a Withdrawal status.

Mr. Kurt Floren (Los Angeles County, California): Expressed several issues he has with the item including the exorbitant testing requirements. He also stated the 15% and 20% tolerances are too large and oppose this item. recommends a Withdrawal status.

The 2025 WWMA S&T Committee recommends that this item be assigned a Withdrawal status based on comments heard during the 2025 WWMA Annual Conference Open Hearing.

As a point of technical reference, the 2025 WWMA's review of the item as published on the 2025 WWMA S&T Agenda does not appear to reflect changes addressing concerns raised at the 2025 NCWM Annual Conference.

During the 2024 WWMA Annual meeting, Kenn Burt (S&T Committee Chair) clarified all entities listed under the purpose section of the item are also included as the source of the item.

A presentation on behalf of the submitters was given by Tanvi Pandya (New York, Department of Transportation). It demonstrated that the proposed standards now match the international standards for Weigh in Motion systems (WIM). She clarified the item is intended for law enforcement, not commercial transactions.

Steven Harrington (Oregon, Department of Agriculture, Weights and Measures Program, Submitter) stated this is a complete proposal. They compared the testing of this system to belt conveyors and WIM rail scale tests in that they require a significant amount of coordination, logistics, and time to complete. They also stated the tolerances in this proposal seem large but asked the body to consider that this is intended for law enforcement only and not commercial applications. They recommended a Voting status.

Corey Hainy (SMA) stated the SMA will meet November 2024 to discuss this item.

Matthew Douglas (State of California, Division of Measurement Standards) asked the following questions regarding the outlined test procedures for both initial testing and subsequent testing: How many trucks are needed for the inspection? How fast are the vehicles typically traveling during the tests?

Tanvi Pandya responded to Matthew Douglas by clarifying the speed of the vehicle during the test is determined by the person conducting the testing or what the normal travel speed is for that section of highway. The test is conducted with three different types of trucks that are “normally” traveling on that highway.

Matthew Douglas asked the following questions: Are the conditions of the road being considered? Is the vehicle selection and safety of the loaded vehicle at the travel speeds being considered? Can the system identify the weight depending on the location in the lane the vehicle is traveling? Does this item have merit? In your jurisdiction would you feel comfortable with your seal on this device? They recommended this item be assigned a Withdraw status.

Tanvi Pandya responded to Matthew Douglas by stating the system is for law enforcement and the system can meet everything questioned including lane straddling.

Aaron Yanker (Colorado, Department of Agriculture, Weights and Measures) asked the following questions: Is this a new item or just a reintroduction of the previous item that failed to be adopted at the 2024 NCWM Annual Conference last July? Does the item clearly define the vehicle speed? Does the item address any interferences? Does the item clearly define how to select and safely load the test vehicles? He stated that their state’s DOT will not be using this system for enforcement. They expressed concerns of training both inspection staff and other agencies on the use of this system, interpretation of the test procedures, tolerances, and application of this proposed code section being used correctly for enforcement and issuing violations. They recommends this item be assigned a Withdraw status.

Steven Harrington clarified the item has a 10% tolerance to address any interference in the system. They acknowledged the testing portion of this item is a challenge. They confirmed the test vehicles would first be weighed on a certified reference scale and then used in the dynamic test. Additionally, in response to Matthew Douglas they would seal this device.

Tanvi Pandya urged the body to read all the supporting material including the NIST deep dive document, and claimed that data from each state’s highway department is available to support this item.

Steven Harrington reaffirmed the item is intended for Law Enforcement and each jurisdiction can determine the level of application of any item in NIST Handbook 44.

Kevin Schnepp (State of California, Division of Measurement Standards) confirmed California Highway Patrol will not be using this system for direct enforcement.

Loren Minnich (NIST, OWM) clarified a static reference scale is required to be tested with certified test weights and then that reference scale is used to verifying the weight of the test vehicles prior to testing the WIM system.

Aaron Yanker asked the following questions: Does the item address the use of the reference scale in relation to the WIM system minimum divisions that is allowable between the two devices? Does the item address the allowable tolerances specifically in relation to static weight and the WIM weight of the same vehicle if those weights do not match?

Tanvi Pandya stated that each state's DOT must submit truck weights to a federal database. The weights are determined by WIM systems that are already in place and the Feds are supposed to hold the states accountable for overweight vehicles.

Steven Harrington stated that the submitters acknowledge each jurisdiction will have the discretion to use this item for enforcement or not. The specific jurisdictions stance should not preclude the code from being adopted into NIST Handbook 44 for use by other jurisdictions that choose to use it.

The 2024 WWMA S&T Committee recommends a Voting status. The committee feels that this item is fully developed.

Southern Weights and Measures Association

At the 2025 SWMA Annual Meeting, the Committee heard the following comments:

Kiel Clasing, Kistler- co sponsor – Presentation was given and brought device samples. Recommends Voting Status.

Roy Czinku, ITS Solutions & Maintenance – Standardizing testing is very important to ensure everyone is using same standard across the board in all states. Proposal compliments [sic] existing procedures. He believes this is a necessity to preserve infrastructure and is in support of this item.

Robert Huff, Delaware – The verbiage where it states that an official has discretion is too vague and leaves it open. If this is verified – it should be used immediately prior and immediately after. If margin of error is established – "each state can determine error" He doesn't believe this should be in the handbook. Recommends Withdrawn status.

Corey Hainey, SMA – opposes item because the tolerance is too large.

Tory Brewer, West Virginia – there are a lot of variables that affect accuracy that are addressed in the handbook in other places to account. He finds it concerning that these variables are not addressed in this proposal. Recommends Withdrawn status.

Brian Terry, Arkansas – agrees with West Virginia's comments and would like clarification of the variation of when conditions are ideal versus not ideal. He doesn't agree with an inflation of tolerance due to this variation and recommends Withdrawn status. Overcompensation of tolerance is not allowed for other devices and they have set tolerance they are required to meet.

Kiel Clasing, Kistler– While the road conditions are one factor, so is braking and acceleration. The tolerance window accounts for all of that and sets realistic thresholds to account for all.

Robert Huff, Delaware – He would like wheel load weighers removed as a verification standard.

Alison Wilkinson, Maryland – opposed to this item, as currently written. Recommendations are as follows:

When using static scales as a reference standard they should be tested before and upon conclusion of testing

User requirements – maintenance tolerances should be taken into consideration when applying enforcement action.

Another recommendation is that sites are used only in enforcement when used at a site not available for static scales.

Kiel Clasing, Kistler – addresses question saying that is a policy decision to be made.

Alison Wilkinson, Maryland – Recommends adding a user requirement in the proposal that a double fine cannot be assess on the same day/same road. Only the first violation can be implemented on the same load.

The committee recommends Withdrawn status on this item based on testimony from 3 states in the region requesting the item be withdrawn.

At the 2024 SWMA Annual Meeting, Tanvi Pandya, NYC DOT gave a presentation on behalf of the submitters. They pointed out new submitters, referenced supporting documents posted on the NCWM website and provided updates from the previous version. They noted they have been issuing violations in NYC since November 2023, without any litigation or challenges.

Alison Wilkinson (MD) recommends withdrawal. Current proposal is similar to previous version that failed to be adopted. Maryland DOT and state police are opposed to using this device for enforcement. However, they are currently using this device for screening. Due to no significant changes to the proposal, recommends it to be withdrawn.

Mark Lovisa (LA) would like to see the item assigned to task group, specific to this technology. Currently, the test procedures don't address all the parameters. Simultaneously weighments should be tested to rule out interference. Questioned if indicators are shared across multiple sensors. Also questioned if the camera system was a part of the testing system or separate. Because it is separate, wondering if it should be stamped to tie it to the weighment occurring. Believes a task group would assist in developing test procedures and stipulations needed to complete the testing process.

Kristen Walter (AR) agrees with Maryland and Louisiana comments. Is in opposition and requests item to be withdrawn.

Anisah Crosby (Washington DC) spoke in support of the item. Washington DC DOT worked closely with the submitters and are in support of this item.

Greg Gholston (MS) highlighted that the current language allows for the user to set the tolerance which not allowed anywhere else in the Handbook. There is currently no criteria set forth for selecting the tolerance. Agrees that a task group would be beneficial in ironing out the details in specifications. In addition, no marking requirements are listed for the tolerance classes. NIST Special Publication (SP 2200-05) states that the weighments must be corrected for inaccuracies. The language in UR.4. as it currently reads does not require the correction be mandatory. Commenter suggests adding that mandatory requirement, so it is not left up to each jurisdiction, as it is currently proposed. Also noted editorial changes needed:

Reference in Paragraph S.5.2.a. references S.5.4. but should be S.5.3.

N.1.1. Note 2. – Systems is plural and should be singular.

Consider consolidating N.1.6.2. with N.1.6.3.

Jason Glass (KY) reiterated it can be used for information gathering and pointed to G-A.1. (2) showing that the handbook applies to devices used for law enforcement.

Tanvi Pandya (NYC DOT) responded to questions regarding the camera being a part of the system. The system only includes what is needed to determine whether the vehicle is overweight or not. Cameras are not a part of the system. Enforcement evidence is not a part of the system.

Robert Huff (DE) – They would be obligated to test twice a year and respond to consumer complaints and recommends the item be withdrawn.

The committee recommends the item be assigned to a task group to focus on more comprehensive test procedures and specifications using this new technology

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, A representative from the State of New York stated that Jim Willis is chairing the task group. The task group will be meeting soon to discuss the topics that were brought up at the NCWM Interim Meeting. The ideas and concerns that were raised will be addressed in time for the NCWM Annual Meeting. The State of New York is currently testing these devices, and it is going well. A second location will be tested in the coming month.

The Committee recommended the item remain Assigned.

At the 2025 NEWMA Interim Meeting, a regulator from New York commented they support the item. They believe the tolerances are appropriate, and that the device is not a scale, but a device with sensors. A regulator from Vermont commented that while they believe the item is fully developed, they continue to have concerns, such as large tolerances and classifications of class 5 and class 10 being selected by the device owner. They do not believe that the differentiation between commercial and law enforcement tolerance should be so great and recommends tolerances closer to class 4 scales. A regulator from New Jersey commented that this device is not being used for commercial transactions, but for law enforcement use to address overweight vehicles, akin to axle-load scales and wheel load weighers. They also commented support of the item. The Committee received written comments from the SMA, indicating opposition for the item, believing the tolerances are too large.

The Committee recommended retaining Voting status and the body concurred.

At the 2025 NEWMA Annual Meeting, a regulator from New York commented they support the item. They believe the tolerances are appropriate, and that the device is not a scale, but a device with sensors. A regulator from Vermont commented that while they believe the item is fully developed, they continue to have concerns, such as large tolerances and classifications of class 5 and class 10 being selected by the device owner. They do not believe that the differentiation between commercial and law enforcement tolerance should be so great and recommends tolerances closer to class 4 scales. A regulator from New Jersey commented that this device is not being used for commercial transactions, but for law enforcement use to address overweight vehicles, akin to axle-load scales and wheel load weighers. They also commented support of the item. The Committee received written comments from the SMA, indicating opposition for the item, believing the tolerances are too large.

The Committee recommended retaining Voting status and the body concurred.

At the 2024 Interim Meeting, Tanvi Pandya (NYCDOT) gave a presentation on behalf of the submitters.

Walt Remmert (PA) voiced support for the item and recommended a voting status.

Marc Paquette (VT) voiced opposition to the item due to the large tolerances. They believe the tolerances should be closer to a Class IIII scale. They also questioned the definition of Class 5 and Class 10 and how they would be applied to the device.

Tanvi Pandya stated that the user would determine the class and set up/build the system to that class, but once the class is chosen, it cannot be changed.

Marc Paquette commented that even though they are opposed to the item, they believe it is fully developed and recommended a voting status.

Shane Ireland (ME) commented that the tolerances are too great.

Scott Dolan (VT) questioned if this system needs to appear in the handbook.

Jason Flint (NJ) commented that this is a system, not a device, and it is not being used commercially, rather for law enforcement. They pointed out that law enforcement equipment is specifically mentioned in the general code and recommend a voting status.

Jim Willis (NY), Cheryl Ayer (NH), Frank Greene (CT), John Dillabaugh (PA) recommended a voting status.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommended the item remain Assigned.

At the 2025 CWMA Interim Meeting, the Committee recommended this item be given a Voting status as no changes were made since the NCWM 2025 Annual meeting.

At the 2025 CWMA Annual Meeting, a representative from IA stated support for this item, believes this item is fully developed, and should remain Voting.

The Committee recommends this item remain as Voting.

At the 2024 CWMA Interim Meeting, the submitter of this item gave a presentation on the changes made from the last submission and read excerpts from a letter of support from the Commercial Vehicle Safety Alliance (CVSA). This letter is posted on NCWM's Publication 15 webpage under supporting documents for OTH-25.1.

A representative from NIST OWM stated that these systems are not intended to be used like the red-light cameras. Each jurisdiction that chooses to implement this device must do due diligence in how they are going to use the item. This device is to gather data.

A regulator from Iowa asked what the problem was for those who oppose this item. It was noted that this device will be used this for citations and that if this makes it better for the motoring public then what we should support this item.

A regulator representing the State of Iowa supports this item. They note that there were talks about tolerances at national meetings that showed that there is a misunderstanding about how to use them. It was stated that the tolerances are wide because they want to ensure they are only picking up the grossly overweight vehicles. This is not a commercial scale.

The committee recommends this item as voting.

Scale Manufacturers Association (SMA)

At the 2026 SMA Spring Meeting, the SMA opposed this item and recommended it be withdrawn.

At the 2025 SMA Fall Meeting, the SMA opposed this item and recommended it be withdrawn.

At the 2025 SMA Spring Meeting, the SMA opposed this item.

Rationale: The SMA believes the tolerances are too large.

OTH-26.1 V Appendix D Definitions – interference test

Source: NIST Office of Weights and Measures

Submitter's Purpose and Justification:

This is a new proposal to define the term "interference test" and clarify how the test applies to an electric vehicle supply equipment (EVSE) system. The proposed new definition was developed to clarify the specific parameters to be examined and verified when these systems operate to indicate and record sales transactions information for the delivery of electrical energy (by the kilowatt-hour) along with time related services that are being assessed as part of an EV charging session.

Original Justification:

The NIST Handbook 44 General Code and other code sections require that interference tests are performed to determine if conditions such as radio frequency interference (RFI), if when verified to exist, adversely affect the performance of a device under conditions that are usual and customary for the environment and location where a device is in commercial use. The permissible tolerance between the device's performance with and without such conditions are specified in the device-specific codes or some codes will specify options such as the equipment shall clearly blank the indications, provide an error message, or be so uninterpretable as to be unusable.

In the case of two other devices (i.e., the EVSE and taximeter) their applicable codes specify there will be no interference between the measurement of time and any portion of any other parameter driving any measurement mechanism of the device. For the taximeter the other type of measurements that occur during the normal operation of the device along with time measurement is that of distance. However, the taximeter has a design feature where at the point when the vehicle reaches a threshold where the vehicle when accelerated in speed reaches the "crossover speed" then only the distance traveled is registering. The taximeter code specifies separate tolerances that apply in the direction of overregistration and underregistration for distance and time registration. In the case of the "Interference Test" for the taximeter, the device must meet a specified distance tolerance when the operation of the vehicle is at speeds where the

normal conditions of operation for the taximeter were to assess fares for distance traveled in the "time on" and "time off" mode. Clearly a unique set of procedures applicable only to the taximeter.

EVSE transactions may consist of fees (fixed and/or variable) for the total kilowatt-hours of electrical energy the system delivers to an EV as well as the total amount of time and the corresponding fee that is assessed for time-related service associated with the charging of the EV's battery. Given the NIST Handbook 44 codes also include unique procedures and requirements for the implementation of an interference test, NIST OWM recommends a definition for the test that is applicable to EVSEs be included in Appendix D.

Possible Opposing Arguments: Currently NIST Handbook 44 does not include any device-specific definition(s) for the "interference test" even though the procedure is required in various code sections. The adoption of the EVSE Code and modification to the Timing Devices Code to recognize time related fees assessed by the EVSE in association with EV battery charging are relatively new to the Handbook (circa 2015), hence the test procedure is not likely being applied. Additionally, EVSEs which feature both an electrical energy and a time measuring element are not prevalent in the marketplace.

In contrast, currently the handbook code sections that cite and require an interference test are expanding and do include variations on the interference test. Therefore, the test should be clear to any sector performing an examination of a device. There are a multitude of devices in the marketplace where General Code paragraph G.N.2. Testing with Nonassociated Equipment would apply because of the device's and its associated equipment's proximity to other equipment that might generate signals that could affect the device's performance. In each case an interference test should be performed to ensure there is no disruption of normal operation or the accuracy of those devices. The interference test of an EVSE as required in paragraph N.3. Interference Test, EVSE in Code Section 5.55 Timing Devices examines operational conditions beyond environmental factors to verify the system's design. Including this newly developed device-specific definition of an EVSE interference test provides everyone with a clear uniform interpretation and application of the test.

The submitter requests Voting status in 2026.

NIST OWM Executive Summary

OTH-26.1 V Appendix D Definitions – interference test
NIST OWM Recommendation: Voting • The adoption of this definition separates the interference test applicable to EVSE that assess fees for time-based services from the interference tests for other device types.

Table 2. Summary of Recommendations
OTH-26.1 V Appendix D Definitions – interference test

	Status Recommendation	Note*	Comments
Submitter	Voting		
OWM	Voting		
WWMA	Voting		
NEWMA	Voting		
SWMA	Developing		
CWMA	Voting		
NCWM	Voting		

	Number of Support Letters	Number of Opposition Letters	Comments
Industry			
Manufacturers			
Retailers and Consumers			
Trade Association			

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

Item Under Consideration:

Amend NIST Handbook 44, Appendix D as follows:

interference test, EVSE. – A test intended to determine the proper operation of the measuring, indicating, and recording elements to automatically, accurately, clearly, and separately provide all required transaction information, as set forth in NIST Handbook 44 Sections 3.40. and 5.55., for an EVSE designed to assess time-based fees associated with the fees for the delivery of electrical energy (by the kilowatt-hour) to an EV. [5.55]
(Added 20XX)

NIST OWM Detailed Technical Analysis:

See Executive Summary.

Summary of Discussions and Actions:

At the 2026 NCWM Interim Meeting, Loren Minnich (NIST OWM) provided updated language to facilitate interpretation of this definition, and requested that this version replace the current item under consideration:

interference test. – A test intended to determine the proper operation of the measuring, indicating, and recording elements to automatically, accurately, clearly, and separately provide all required transaction information, as set forth in NIST Handbook 44 Sections 3.40. and 5.55., for an EVSE

designed to assess time-based fees associated with the fees for the delivery of electrical energy (by the kilowatt-hour) to an EV. [5.55]

(Added 20XX)

With this update, OWM supported a Voting status.

The NCWM S&T Committee accepted the new version of the definition, replacing the Item Under Consideration and assigned a Voting Status.

Regional Association Reporting:

Western Weights and Measures Association

At the 2025 WWMA Annual Meeting, Mr. Loren Minnich (NIST Office of Weights and Measures): This item is intended to define Interference Test. Currently there is no definition, this item will add clarity to what an interference test is.

Mr. Matthew Douglas (State of California, Division of Measurement Standards): Supports a Voting status.

The 2025 WWMA S&T Committee recommends a Voting status. The committee believes the item is fully developed and ready for a vote.

Southern Weights and Measures Association

At the 2025 SWMA Annual Meeting, Michael Keilty, Endress+Hauser - recommends a Developing Status. He would like there to be a reference to OIML R117, which has a testing procedure for this. Proposal is blind to any other type of reference to this test and needs to be consistent. He also noticed there is minimal reference to interference in the EVSE HB 44 S.3.4 (b) code to implement this definition.

The committee recommends Developing status on this item.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, a Representative from the NIST OWM stated that this is just one step in improving the timing section of code in relation to EVSE. It provides clear separation from the other timing devices, such as RMI, EMI. NIST OWM supports this item for voting. A Representative from the State of New Jersey agrees that the item is ready for a vote. Interference tests appear in many different places throughout the handbook, so with addition of "evse" in the definition New Jersey supports this as a voting item.

The Committee recommends this item remain as Voting.

At the 2025 NEWMA Interim Meeting, a representative from NJ provided the following comments

- Interference test is explained in the Taxi Meter Code 5.54 N.3 Interference Test.
- In the Timing Device Code 5.55, it is already explicit in S.3 Interference that for EVSE, no interference between the time and electrical energy measurement elements of the system shall exist.
- In N.3 Interference Tests, EVSE., there is an explanation of the test to include no interference between time and electrical energy measurements. If the accuracy of associated fees, indicating and recording elements are desired, as this item proposes, it should be added to this specification.

- If this definition is to exist in Appendix D - Definitions, it should read interference test, EVSE. But I would caution against defining every interference test for every device. The parameters of the test should be included in each individual code if needed.

The committee recommends developing status.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommends this item remain as Voting.

At the 2025 CWMA Interim Meeting, the committee recommends this item be given a Voting status based on comments received during the open hearing.

OTH-26.2 V Appendix D Definitions – scale division, value of (d)

Source: NIST Office of Weights and Measures

Submitter's Purpose and Justification:

To update the definition of scale division to recognize electronic recorded representations.

Original Justification:

NIST Handbook 44 was amended in 2014 and 2023 to allow recorded representations in electronic form, but this definition seems to limit the use of the scale division, d, to printed receipts. The NIST Office of Weights and Measures views this as a clean-up item. This wouldn't change the intent of the definition; it would just update it to reflect the current handbook.

It's rare that there aren't possible arguments against a proposed change, but in this case, the definition is out of date and could cause an issue with systems that issue electronic receipts.

The submitter requested Voting status in 2026.

NIST OWM Executive Summary

OTH-26.2 V Appendix D Definitions – scale division, value of (d)
NIST OWM Recommendation: Voting • This item updates the definition to clearly allow electronic recorded representations and corrects an inaccurate reference to the "verification scale division". • The item is fully developed, has been vetted, and is ready for adoption.

Table 2. Summary of Recommendations

OTH-26.2 V Appendix D Definitions – scale division, value of (d)

	Status Recommendation	Note*	Comments
Submitter	Voting		
OWM	Voting		With suggested edit
WWMA	Voting		
NEWMA	Voting		
SWMA	No recommendation		
CWMA	Voting		
NCWM	Voting		

	Number of Support Letters	Number of Opposition Letters	Comments
Industry			
Manufacturers			
Retailers and Consumers			
Trade Association			

***Notes Key:**

1. Submitted modified language
2. Item not discussed or not considered
3. No meeting held
4. Not submitted on agenda
5. No recommendation

Item Under Consideration:

NOTE: This item has been edited to correct formatting errors. The Item Under Consideration now reflects the structure required by NIST Handbook 44.

Amend NIST Handbook 44, Appendix D as follows:

scale division, value of (d). T~~**he value of the scale division, expressed in units of mass, is t**~~he smallest subdivision of the scale for **an** analog indication or the difference between two consecutively indicated or ~~**printed**~~**recorded** values for **a** digital indication or ~~**printing**~~**recorded representation, expressed in units of mass**. (Also see "verification scale ~~**division**~~**interval, value of (e)"**) [2.20, **2.21,** 2.22**, 2.24**]

NIST OWM Detailed Technical Analysis:

See Executive Summary.

Summary of Discussions and Actions:

This item is new for the 2026 NCWM cycle. There has been no discussion at the NCWM level.

Regional Association Reporting:

Western Weights and Measures Association

At the 2025 WWMA Annual Meeting, Mr. Loren Minnich (NIST Office of Weights and Measures) stated this item is a "clean up", the definition of scale division seems to limit the recording of the values to printing only. This item is to allow electronic representation along with printed recorded representation.

Mr. Matthew Douglas (State of California, Division of Measurement Standards) supports a Voting status.

The 2025 WWMA S&T Committee recommends a Voting status. The committee believes the item is fully developed and ready for a vote.

Southern Weights and Measures Association

At the 2025 SWMA Annual Meeting, there were no comments on this item.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, a representative from the NIST OWM supports this item as voting. This item updates the definition and correctly references the scale interval.

The committee recommended a Voting status.

At the 2025 NEWMA Interim Meeting, there were no comments on this item.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommends this item remain as Voting.

At the 2025 CWMA Interim Meeting, the committee recommends this item be given a Voting status based on comments received during open hearing.

Scale Manufacturers Association (SMA)

At the 2026 SMA Spring Meeting, the SMA supported this item and recommended it for adoption.

At the 2025 SMA Fall Meeting, the SMA supported this item and recommended it as a Voting item.

ITEM BLOCK 1 (B1) – TRANSPORTATION-FOR-HIRE SYSTEMS

TNS-25.1 I ~~Section 5.60. Transportation Network Measurement Systems – Tentative Code~~

Source: Transportation-For-Hire Systems Task Group

Submitter's Purpose and Justification:

Remove the Transportation Network Measurement Systems Tentative Code completely.

Item under Consideration:

Delete in NIST Handbook 44, Section 5.60. Transportation Network Measurement Systems – Tentative Code as follows:

~~Table of Contents~~

Section 5.60. Transportation Network Measurement Systems – Tentative Code

This tentative code has a trial or experimental status and is not intended to be enforced. The requirements are designed for study prior to the development and adoption of a final code. Officials wanting to conduct an official examination of a device or system are advised to see paragraph G-A.3. Special and Unclassified Equipment.

(Tentative Code Added 2017)

A. Application

A.1. General. – This code applies to a transportation network measurement system used in connection with a digital network that determines the actual time elapsed and/or distance travelled during a network-arranged ride to calculate a fare for transportation services.

Note: The fare is calculated by software services residing on the transportation network company servers using data transmitted by the indicating elements present in the vehicle, which are running software applications or services supplied by the transportation network company. The measurement data is generated from sources not physically connected to the vehicle (e.g., a navigation satellite system such as GPS and/or other location services).

A.2. Exceptions. – This code does not apply to the following:

(a) Any system that charges a flat rate or fixed charge, and/or does not use a measurement of actual time elapsed or distance travelled to calculate a fare for transportation services.

(b) Odometers on vehicles that are rented or hired on a distance basis. (Also see Section 5.53. Odometers.)

(c) Taximeters. (Also see Section 5.54. Taximeters.)

(d) Any system where the fare is calculated by equipment located in the vehicle.

A.3. Additional Code Requirements. – In addition to the requirements of this code, transportation network measurement systems shall meet the requirements of Section 1.10. General Code.

S. Specifications

S.1. Design of Indicating and Recording Elements. – Indicating and recording elements shall provide indications and recorded representations that are clear, definite, accurate, and easily read under any conditions of normal operation of the device(s).

All indicating and recording elements used in a transportation network measurement system shall operate correctly while using the online-enabled technology application service provided by the transportation network company.

S.1.1. General Indicating Elements. – A transportation network measurement system shall include, as a minimum:

(a) an indicating element used by a transportation network company driver that displays information and facilitates the measurements during a network arranged ride to calculate a fare for transportation services; and

(b) an indicating element used by a transportation network company rider that displays information that allows the rider to review the current rate(s) for the transportation service and to request a ride.

S.1.2. General Recording Elements. – A transportation network measurement system shall be capable of:

(a) recording all information necessary to generate a receipt specified in S.1.10. Receipt;

(b) providing information to transportation network company drivers, including, but not limited to, a summary of rides given as specified in S.1.11. Driver's Summary; and

(c) providing a copy of all metrological data required by law to a weights and measures jurisdiction with statutory authority.

S.1.3. Identification. – All transportation network measurement system indicating elements shall display for the purposes of identification the following information:

(a) the name, initials, or trademark of the transportation network measurement system manufacturer, distributor, or developer; and

(b) the current version or revision identifier of the software application service provided by the transportation network company running on the indicating elements identified in S.1.1. General Indicating Elements.

(1) The version or revision identifier shall be prefaced by words or an abbreviation that clearly identifies the number as the required version or revision.

(2) Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number." Abbreviations for the word "Revision" shall, as a minimum, begin with the letter "R" and may be followed by the word "Number." The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).

S.1.4. Location of Identification Information. – The information required by S.1.3. Identification shall be accessible through an easily recognized menu and, if necessary, a submenu or other appropriate means. Examples of menu and submenu identification include, but are not limited to, "Help," "About," "System Identification," "Weights and Measures Identification," or "Identification."

S.1.5. Display of Rates and Additional Charges. – The transportation network measurement system shall

~~be designed to make available to transportation network company riders the rate(s) for transportation services before the beginning of a network-arranged ride. The system shall be capable of providing an explanation of the basis for calculating a fare including, if applicable, the base fare, rates for time and distance, and the amount of a booking fee, platform fee, or other similar service fee, before a rider submits the request for a network-arranged ride.~~

~~**S.1.6. Fare Estimates.** The transportation network measurement system shall be capable of displaying a fare estimate to the transportation network company rider before a request for a network-arranged ride is made.~~

~~**S.1.7. Actuation of Measurement System.** Following the initiation of a network-arranged ride by the transportation network company driver, and prior to the conclusion of that network-arranged ride, the transportation network measurement system shall only indicate and/or record measurements resulting from the movement of the vehicle or by the time mechanism.~~

~~***S.1.8. Fare Adjustment.*** *A transportation network measurement system shall be designed with:*~~

~~*(a) a "time off" mechanism and a "distance off" mechanism provided for the transportation network system driver to render the measurement of time and distance either operative or inoperative during the ride; or*~~

~~*(b) the capability to make post-transaction fare adjustments to reduce the amount of the fare, provided the system creates a record of all location and time data from the time the ride request was accepted by the transportation network company driver.*~~

~~*[Nonretroactive as of January 1, 2018]*~~

~~**S.1.9. Fare Identification and Other Charges.**~~

~~**S.1.9.1. Fare Identification.** Fare indications shall be identified by the word "Fare" or by an equivalent expression when displayed on the transportation network company system receipt required by S.1.10 Receipt. Values shall be defined by suitable words or monetary signs.~~

~~**S.1.9.2. Other Charges.** Other charges shall be indicated as separate line items when displayed on the receipt required by S.1.10. Receipt. Other charges shall be identified using an appropriate descriptive term, including but not limited to "Booking Fee," "Tolls," "Airport Pickup/Drop-off Surcharge" or an equivalent expression. Values shall be defined by suitable words or monetary signs.~~

~~**S.1.10. Receipt.** A transportation network measurement system shall issue a printed or electronic receipt to a transportation network company rider. This receipt shall include as a minimum the following:~~

~~(a) date of the start of the trip;~~

~~(b) unique identifying information sufficient for the transportation network company to identify the transaction, or other identifying information as specified by the statutory authority;~~

~~(c) start and end time of trip, total time of trip (maximum increment of one second), and if applicable, the total elapsed time during any time-off period;~~

~~(d) distance traveled, maximum increment of 0.01 km or 0.01 mi;~~

~~(e) the associated fare in $;~~

~~(f) other charges where permitted shall be identified and itemized;~~

~~(g) total charge in $;~~

~~(h) the start and end addresses or locations of the trip;~~

~~(i) a map showing the route taken; and~~

~~(j) a means to obtain transportation network company rider assistance.~~

S.1.11. Driver's Summary. – A transportation network measurement system shall be capable of providing a summary of the driver's activity regarding network-arranged rides. The summary shall include, but not be limited to, the following information about each ride:

(a) date and time for start of trip;

(b) unique identifying information sufficient for the transportation network company to identify the transaction, or other identifying information as specified by the statutory authority;

(c) total time of trip, maximum increment of one second;

(d) distance traveled, maximum increment of 0.01 km or 0.01 mi;

(e) the total fare received;

(f) other charges where permitted; and

(g) a means to obtain transportation network company driver assistance.

S.2. Provision for Sealing.

S.2.1. System Security. – Adequate provision shall be made to provide security for a transportation network measurement system. The system shall be designed to:

(a) protect the integrity of metrological data and algorithms used to compute fares from such data against unauthorized modification using industry-standard technological protection mechanisms such as data encryption; and

(b) use software-based access controls or equivalent technological protections that limit access to metrological data and algorithms used to compute fares from such data only to authorized persons.

S.2.2. System Audit. – The transportation network measurement system shall be designed in a manner that permits officials having statutory authority to verify compliance with this transportation network measurement system code.

S.2.3. Change Tracking. – Changes made by the manufacturer, distributor, or developer of a transportation network measurement system to any algorithms or code, which have a metrological effect, shall be logged and recorded. The period covered by this change record is not required to exceed one year.

S.3. Provision for Trip Data Loss. – If a portion of the trip data is lost due to power or signal interruption by the transportation network company driver's indicating element, the transportation network measurement system shall be capable of determining the information needed to complete any transaction in progress at the time of the power or signal loss.

S.3.1. Intermittent Trip Data Loss. – When the location services signal is lost intermittently during a prearranged ride (e.g., traveling through a tunnel), but recovered prior to the end of the ride, the transportation network measurement system shall be capable of calculating an accurate fare in accordance with T.1. Tolerance Values.

S.3.2. Significant Trip Data Loss. – When the location services signal is lost for a significant portion of the network-arranged ride, the transportation network measurement system shall provide for alternative fare structures.

Note: Significant trip data loss refers to instances when the location services signal is lost to the extent the transportation network measurement system is not capable of calculating an accurate fare in accordance with T.1. Tolerance Values using actual time and actual distance, or when the signal is not regained by the end of the ride.

S.3.3. Alternative Fare Structures. – If the transportation network measuring system is not using actual time and actual distance for a particular trip (e.g., zone-based fares, signal loss), that portion of the fare not based on actual time and actual distance is not subject to this code. Charges not based on actual time and actual

distance measurements may be based on the terms of service.

N. Notes

N.1. Distance Tests.

N.1.1. Test Methods. To determine compliance with distance tolerances, distance test(s) of a transportation network measurement system shall be conducted. The distance test(s) shall consist of a road test unless safety or other practical concerns prohibit road testing. A transfer standard test may be performed in the absence of a road test. At least one test shall be of a length sufficient to exceed the minimum fare.

N.1.1.1. Road Test. The test consists of operating the conveyance over a precisely measured course calibrated to a traceable linear measure of at least one mile in length

N.1.1.2. Transfer Standard Test. **The** test consists of operating the conveyance over an unmeasured course while using a calibrated transfer standard, such as a fifth-wheel, to measure the distance travelled.

Note: Field examinations of transportation network measurement systems need not include testing of all individual devices used as driver/passenger indicating elements in connection with the service provided. It is considered sufficient that a representative sample of various indicating elements be incorporated in testing to verify proper operation of the system.

N.1.2. Test Procedures.

N.1.2.1. Test Length. All tests must be at least one mile in length. If a measured course or testing equipment is not readily available that will enable a test of a length sufficient to exceed the minimum fare, after completing the testing specified in N.1.1. Test Methods, an additional unmeasured test may be conducted. The purpose of this additional unmeasured test is to verify compliance with S.1.10. Receipt.

N.1.2.2. Additional Tests. If during testing a transportation network measurement system produces a measurement that does not comply with the tolerance values in T.1.1. Distance Tests, a minimum of three additional tests shall be conducted at the same location where all test variables are reduced to the greatest extent practicable to verify the system's ability to repeat transaction indications. Repeatability testing performed in excess of these three additional tests is done at the discretion of the official with statutory authority.

To verify system-wide noncompliance, tests for variability shall be conducted, including a minimum of three consecutive tests of varying lengths, locations, and/or environmental conditions.

N.1.3. Test Conditions.

N.1.3.1. General. Except during type evaluation, all tests shall be performed under the conditions that are considered usual and customary within the location(s) where the system is normally operated as deemed necessary by the statutory authority.

N.1.3.2. Roads. All tests shall be conducted on public roads.

N.1.3.3. Testing for Environmental Influences. During type evaluation, the distance test may include a route traveled by the vehicle that will expose the system to conditions that could contribute to the loss of, or interference with, the location service's signal. This may include:

(a) objects that may obstruct or reflect signals such as tall buildings/structures, forestation, tunnels, etc.;

(b) routes that do not follow a straight-line path;

(c) significant changes in altitude; and

(d) any other relevant environmental conditions.

N.2. Time Test. – A transportation network measurement system, which determines time elapsed, shall be tested for compliance with the tolerances values specified in T.1.2. Time Tests, using a certified, traceable standard.

T. Tolerances

T.1. Tolerance Values. – The tolerances will be as specified in T.1.1. Distance Tests and T.1.2. Time Tests. (The following proposed tolerance values will be confirmed based on performance data evaluated by the NIST U.S. National Work Group on Taximeters before the transportation network measurement systems code becomes a permanent code.)

T.1.1. Distance Tests. – Maintenance and acceptance tolerances shall be as follows:

(a) On Overregistration: 2.5

(b) On Underregistration: 2.5 %

T.1.2. Time Tests. – Maintenance and acceptance tolerances shall be as follows:

(a) On Overregistration: 5 seconds or 0.5 %, whichever is greater

(b) On Underregistration: 5 seconds or 0.5 %, whichever is greater

T.2. 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.

UR. User Requirements

UR.1. System Indications. – The indicating elements identified in S.1.1. General Indicating Elements shall display indications and information in a manner such that they can be conveniently read by the user of the device, computer, website, or online-enabled technology application service.

UR.1.1. Statement of Rates. – The transportation network company rider shall be able to view the basis for calculating the fare including, if applicable, the base fare, rates for time and distance, and the amount of a booking fee, platform fee, or other similar service fees.

UR.2. Change Tracking. – Upon request by an official having statutory authority, the transportation network company shall provide an explanation of changes that are logged pursuant to S.2.3. Change Tracking requirement during the time period covered by the request. Any such request shall be answered within two business days, unless extended by the official having statutory authority. Records provided pursuant to S.2.3. Change Tracking shall be treated as confidential and proprietary to the extent permitted by any applicable law.

UR.3. System Installation and Operation. – The transportation network company driver shall use the indicating elements identified in S.1.1.(a) General Indicating Elements in accordance with the requirements of the manufacturer, distributor, or developer.

UR.4. Fare Estimates. – Estimates for fare charges shall be provided by the transportation network measurement system when requested by the transportation network company rider and following the input of a final destination for the trip being requested. The recipient of the fare estimate shall be able to access information about the fare estimate, including key variables that may lead to discrepancies between actual fare charged and the fare estimate provided as required by law.

UR.5. Determination of Total Charges When Location Service Data Is Lost. – At the conclusion of the trip, the transportation network company shall disclose to the transportation network measurement service rider and driver the manner in which total charges are determined when there is significant data loss from location services.

Appendix D.

~~**digital network.** — An online-enabled technology application service, website, or system offered or used by a transportation network company that enables a transportation network company rider to arrange a network-arranged ride with a transportation network company driver. [5.60]~~

N

~~**network-arranged ride**. — The provision of transportation by a transportation network company driver to a transportation network company rider, or other persons selected by the transportation network company rider, arranged through a digital network. [5.60]~~

T

~~**transportation network company.** — An entity that uses a digital network to connect transportation network company riders with transportation network company drivers who provide network-arranged rides, and offers or provides a transportation network measurement system, subject to an agreement or terms of service between the transportation network company and transportation network company rider or driver. [5.60]~~

~~**transportation network company driver.** — An individual authorized by the transportation network company to access the digital network and receive connections to transportation network company riders for the purpose of providing network-arranged rides. [5.60]~~

~~**transportation network company rider.** — An individual who has obtained an account with a transportation network company and uses the transportation network company's digital network to connect with a transportation network company driver who can offer or provide a network-arranged ride to the transportation network company rider or other persons selected by the transportation network company rider. [5.60]~~

~~(d) **transportation network measurement system.** — The information technology infrastructure and services offered or used by a transportation network company that receives data collected through a digital network and calculates a fare for a network-arranged ride. [5.60]~~

TXI-25.1 I 5.54 Taximeters Transportation-For-Hire Systems

Source: Transportation-For-Hire Systems Task Group

Submitter's Purpose and Justification:

Add a new Transportation-For-Hire Systems Code to replace the existing Taximeter Code and Transportation Network Measurement Systems Tentative Code.

This code has been developed by the Transportation for Hire Task Group with the goal of producing a unified code that can be applied to all transportation for hire systems including traditional taximeters and app based rideshare companies.

It is based off of Section 5.54 Taximeters, which it will ideally replace. Bold and underlined portions in the submission indicate Task Group additions to the existing Taximeter Code. The Committee can decide whether a better path would be to wholly replace Section 5.54 with this item or to amend it throughout.

Original Justification:

A unified code is needed because these devices and systems exist across a spectrum. Traditional taxicab companies can now use fully app-based fare calculating measurement and payment systems. Some systems blend in vehicle app-based GPS measurement systems with traditional in person ride pick-ups, while others can utilize physical metering inside the vehicle with electronic ride acquisitions.

A unified code will standardize the specifications, tolerances, test procedures, and user requirements for all types of these systems, as much as possible, bringing equity to the industry.

NIST OWM Executive Summary

ITEM BLOCK 1 (B1) I Transportation-for-Hire Systems

NIST OWM Recommendation: Informational

- NIST OWM suggests the NCWM S&T Committee review the comments received at the Regional Meetings and at the 2026 NCWM Interim Meeting to determine if this item needs further development.

Table 2. Summary of Recommendations

ITEM BLOCK 1 (B1) I Transportation-for-Hire Systems

	Status Recommendation	Note*	Comments
Submitter	Voting		
OWM	Informational		
WWMA	Assigned		
NEWMA	Informational		
SWMA	Voting		
CWMA	Informational		
NCWM	Informational		

	Number of Support Letters	Number of Opposition Letters	Comments
Industry			
Manufacturers			
Retailers and Consumers			
Trade Association			

***Notes Key:**

1. Submitted modified language
2. Item not discussed or not considered
3. No meeting held
4. Not submitted on agenda
5. No recommendation

Item Under Consideration:

Amend NIST Handbook 44, Section 5.54. Taximeters Code as follows:

Section 5.54. ~~Taximeters~~Transportation-for-Hire-Systems

A. Application

– **A.1. General.** – This code applies to ~~taximeters; that is, to~~ devices **and systems** that ~~automatically~~ calculate ~~at a predetermined rate or rates and indicate~~**fare charges for transportation services when those charges are based on** the ~~charge for hire of a vehicle~~**distance traveled and/or time elapsed during the transport of passenger(s). This code applies to systems using single or multiple sources of data used to determine distance and/or time during transportation service for the purpose of calculating fees charged to passengers and/or payment for drivers.**

Except where expressly stated as applicable only to specific types of systems:

(a) the requirements for transportation-for-hire systems in this code will apply to those systems using the data input used for calculation of charges from sources that are physically connected to the vehicle, systems using data input from external sources, or a combination of these sources; and

(b) requirements in this code apply to systems that provide periodic updates of fare charges accumulated during a trip and those systems that supply a good faith estimate of the total fare charges prior to a trip.

(Amended 20XX)

A.2. Exceptions. – This code does not apply to the following:

(a) any system that charges a flat rate or fixed charge which does not use a dynamic measurement of time elapsed, or distance travelled to calculate a fare for transportation services;

~~(a)~~**(b)** odometers on vehicles that are rented **or hired** on a distance basis. (Also see Section 5.53. Code for Odometers.)

~~(b)~~**(c)** devices ~~that only display a flat rate~~ or ~~negotiated rate;~~ **systems used to determine shipping** or **freight charges.**

~~(c) Transportation Network Measurement Systems. (Also see Section 5.60. Transportation Network Measurement Systems.)~~

(Amended 1977, 2016, ~~and~~ 2017**, and 20XX**)

A.3. Additional Code Requirements. – In addition to the requirements of this code, ~~Taximeters~~**transportation-for-hire systems** shall meet the requirements of Section 1.10. General Code.

(Amended 20XX)

S. Specifications

S.1. Design of Indicating and Recording Elements. – Indicating and recording elements shall provide indications and recorded representations that are clear, definite, accurate, and easily read under any conditions of normal operation of the device(s).

For transportation-for-hire systems operating using application software provided by a transportation network company and installed on a user's computing device (i.e., transportation network measurement systems), the indicating and recording elements shall provide an appropriate digital platform (i.e., operating system) for the online-enabled application software allowing the system to operate as designed. Any additional features or functions installed on the user's indicating/recording element shall not interfere with the proper operation of the transportation-for-hire application software.

(Amended 20XX)

S.1.1. General. ~~– A taximeter shall be equipped with a primary indicating element.~~

(a) (Amended 1988~~ and,~~ 2015**, and 20XX**)

(b) S.1.1.1. For Systems Including a Built-for-Purpose Device Installed in the Vehicle. – A built-for-purpose device (e.g., taximeter) shall be equipped with a primary indicating element. The indicating element shall be installed and positioned in the vehicle so that all relevant indications are readily observable by a driver and passengers.

(c) **(Added 20XX)**

S.1.1.2. For Systems Consisting of Application Software Installed on Not Built-for-Purpose Devices. – The indicating element(s) in systems for transportation network measurement systems using not built-for-purpose devices on which an application software has been installed shall operate as follows.

(a) An indicating element used by a transportation network company driver shall:

- **receive data input used to compute distance traveled and/or time elapsed;**
- **display trip information;**
- **provide a means of communications between system components; and**
- **provide a trip summary at the conclusion of all network-arranged transportation services.**

The device used by the driver shall perform only those functions necessary to facilitate transportation-for-hire service during the period of time when that service is being provided.

(b) An optional device operated by a rider or consumer shall provide the user with all required information on a rider/consumer's receipt of the transaction and may also provide a means for making payment for the transportation service.

(Added 20XX)

S.1.~~1~~2.~~1.~~ Recording Elements, General. – A **transportation-for-hire service shall be capable of making available a** receipt **~~providing~~(in printed or electronic format) including** information as required in S.1.**~~9~~10**. Recorded Representations **~~shall be available from a taximeter or taximeter system~~** through an integral or separate recording element for all transactions conducted.
~~[Nonretroactive January 1, 2016]~~

(Added 2015) **(Amended 20XX)**

S.1.~~2~~3. Advancement of Indicating Elements. – **~~Except when a taximeter is being cleared, t~~T**he primary indicating and recording elements shall be susceptible of advancement only by the movement of the vehicle or

by the time mechanism **except where an advancement of analog indications occurs on a taximeter when being cleared.**

(Amended 20XX)

(d) S.1.3.1. For Systems Using a Built-for-Purpose Device Installed in the Vehicle. –

(a) *At the conclusion of a transaction (e.g., following the totalizing of all accrued charges and having a customer receipt made available), no other advancement of fare, extras, or other charges shall occur until the taximeter has been cleared.*

[Nonretroactive as of January 1, 2017]

(b) Where permitted, a flat rate or negotiated rate shall be displayed in the "fare" indicating mechanism, provided that once a flat rate or negotiated rate is entered the fare may no longer be advanced by movement of the vehicle or the time mechanism.

(Amended 1988 ~~and,~~ 2016 **and 20XX**)

(e) S.1.~~2~~3.~~1~~2. Time and Distance Mechanisms. ~~— Means shall be provided on all taximeters designed to calculate fares based on a combination of time elapsed and distance traveled, to enable the vehicle operator to render the time mechanism either operative or inoperative with respect to the fare-indicating mechanism.~~ A transportation-for-hire system shall include either of the following:

~~S.1.2.2. Distance Mechanism. —~~* (a) *~~Means shall be provided on all taximeters designed to calculate fare based on a combination of time elapsed and/or distance traveled to enable~~a "time off" mechanism and a "distance off" mechanism for** the vehicle operator to render the **measurement of time and/or** distance ~~mechanism either operative or~~ inoperative ~~with respect to the fare-indicating mechanism~~during a ride. Each use of these mechanisms shall be reflected in the calculation of total charges and recorded on the passenger's receipt; or

[Nonretroactive as of January 1, ~~2020~~20XX]

(Amended 2018 **and 20XX**)

(b) for systems not equipped with a "time off" and/or "distance off" mechanism, the system shall be equipped with means to make post-transaction fare adjustments to reduce the amount of the fare, provided the system creates a record of all location and time data from the initiation of the transportation service.
(Added 20XX)

(Added 2017) **(Amended 20XX)**

S.1.~~3~~4. Visibility of Indications. – Primary indications displayed on indicating elements shall be clear, definite, accurate, and easily read under any conditions of normal operation.

(Amended 20XX)

S.1.~~3~~4.1. – ~~Taximeter~~ Indications For Built-for-Purpose Devices Installed in the Vehicle. – The indications of fare, including extras, and the mode of operation, such as "time" or "hired," shall be constantly displayed whenever the meter is in operation. All indications of passenger interest shall be easily read from a distance of 1.2 m (4 ft) under any condition of normal operation. This includes any necessary lighting, shading, or other means necessary to make displayed indications clearly visible to operator and passenger.

(Amended 1977, 1986, 1988, ~~and~~ 2017**, and 20XX**)

S.1.~~3~~4.~~2~~1.1. Minimum Height of Figures, Words, and Symbols. – The minimum height of the figures used to indicate the fare shall be 10 mm and for extras, 8 mm. The minimum height of the

figures, words, or symbols used for other indications, including those used to identify or define, shall be 3.5 mm.

(Added 1986)

S.1.~~3~~4.~~3~~1.2. Passenger's Indications. *– A supplementary indicating element installed in a taxi to provide information regarding the taxi service to the passenger (i.e., Passenger Information Monitor or PIM), shall clearly display the current total of all charges incurred for the transaction. The accruing total of all charges must remain clearly visible on the passenger's display (unless disabled by the passenger) at all times during the transaction.*

[Nonretroactive as of January 1, 2016]

(Added 2015) (Amended 2017)

S.1.~~3~~4.~~3~~1.2.1. Additional Information. *– Additional information shall be displayed or made available through a passenger's indicating element (as described in S.1.~~3~~4.~~3~~1.2 Passenger's Indications) and shall be current and reflect any charges that have accrued. This additional information shall include:*

(a) an itemized account of all charges incurred including fare, extras, and other additional charges; and

(b) the rate(s) in use at which any fare is calculated.

Any additional information made available must not obscure the accruing total of charges for the taxi service. This additional information may be made accessible through clearly identified operational controls (e.g., keypad, button, menu, ~~touch-screen~~touchscreen).

[Nonretroactive as of January 1, 2016]

(Added 2015) **(Amended 20XX)**

S.1.~~3~~4.~~3~~1.~~2~~3. Fare and Extras Charges. *– The indication of fare and extras charges on a passenger's indicating element shall agree with similar indications displayed on all other indicating elements in the system.*

[Nonretroactive as of January 1, 2016]

(Added 2015)

S.1.4~~5~~. Actuation of Fare Indicating Mechanism. – When a ~~taximeter~~**built-for-purpose device installed in the vehicle** designed to calculate fares upon the basis of a combination of distance traveled and time elapsed, but not both time and distance used concurrently to calculate fare, is operative with respect to fare indication, the fare indicating mechanism shall be actuated by the distance mechanism whenever the vehicle is in motion at such a speed that the rate of distance revenue equals or exceeds the time rate, and may be actuated by the time mechanism whenever the vehicle speed is less than this and when the vehicle is not in motion.

(Amended 1977 ~~and~~ 2017**, and 20XX**)

S.1.~~5~~6. Operating Condition.

(f) S.1.~~5~~6.1. General. – When a ~~taximeter~~**built-for-purpose device installed in the vehicle** is cleared, the indication "Not Registering," "Vacant," or an equivalent expression shall be shown. Whenever a ~~taximeter~~**built-for-purpose device installed in the vehicle** is set to register charges, it shall indicate "Registering," "Hired," or an equivalent expression and the rate at which it is set shall be automatically indicated (Rate 1 or Rate A, for example).

(Amended 1988 **and 20XX**)

(g) S.1.~~5~~6.2. Time not Recording. – When a ~~**taximeter**~~**built-for-purpose device installed in the vehicle** is set for fare registration with the time mechanism inoperative, it shall indicate "Time Not Recording" or an equivalent expression.

(Amended 1988 **and 20XX**)

(h) S.1.~~5~~6.3. Distance Not Recording. *– When a ~~taximeter~~built-for-purpose device installed in the vehicle is set for fare registration with the distance mechanism inoperative, it shall indicate "Distance Not Recording" or an equivalent expression.*
[Nonretroactive as of January 1, 2020]

(Added 2017) (Amended 2018 **and 20XX**)

S.1.~~6~~7. Fare Identification. – Fare indications shall be identified by the word "Fare" or by an equivalent expression. Values shall be defined by suitable words or monetary signs.

S.1.~~7~~8. Extras. – Extras shall be indicated as a separate item and shall not be included in the fare indication. They shall be identified by the word "Extras" or by an equivalent expression. Values shall be defined by suitable words or monetary signs. Means may be provided to totalize the fare and extras if the totalized amount returns to separate indications of fare and extras within 5 seconds or less.

(Amended 1988)

(i) S.1.~~7~~8.1. Nonuse of Extras. – If and when ~~**taximeter**~~ extras are prohibited by legal authority or are discontinued by a vehicle operator, the extras mechanisms shall be rendered inoperable, or the extras indications shall be effectively obscured by permanent means.

(Amended 20XX)

S.1.~~8~~9. Protection of Indications. – All indications of fare and extras shall be protected from unauthorized alteration or manipulation.

(Amended 2015)

S.1.~~9~~10. Recorded Representation. *– A printed or electronic receipt issued from a ~~taximeter~~built-for-purpose device installed in the vehicle, whether through an integral or separate recording element, shall include as a minimum, the following information when processed through the taximeter system:*

(a) date;

*(b) unique vehicle identification number, such as the medallion number, taxi number, vehicle identification number (VIN), permit number, or other identifying information as specified by the statutory authority;**

*(c) start and end time of the trip;**

*(d) distance traveled, maximum increment of 0.1 km (0.1 mi);**

(e) fare in $;

*(f) each rate at which the fare was computed and the associated fare at that rate;**

*(g) additional charges (in $) where permitted such as extras, any surcharges, telecommunication charges, and taxes shall be identified and itemized;**

*(h) total charge for service in $ (inclusive of fare, extras, and all additional charges);**

*(i) trip number, if available;***

*(j) telephone number (or other contract information) for customer assistance;** ~~and~~*

*(k) a statement of chargeable time and chargeable distance for taximeters that calculate fare using time and distance concurrently~~.~~**:*** ***and***

(l) for software-based systems, the software version identification number *.***
(Added 20XX)

Note: When processed through the taximeter or taximeter system, any adjustments (in $) to the total charge for service including discounts, credits, and tips shall also be included on the receipt.**

[Nonretroactive as of January 1, 1989]

**[Nonretroactive as of January 1, 2000]*

***[Nonretroactive as of January 1, 2016]*

****[Nonretroactive as of January 1, 2018]*

*****[Nonretroactive as of January 1, 20XX]***

(Added 1988) (Amended 1999, 2015, ~~and~~ 2017**, and 20XX**)

(j) S.1.~~9~~10.1. Multiple Recorded Representations - Duplicate Receipts. – *A recording element may produce a duplicate receipt for the previous transaction provided the information printed is identical to the original with the exception of time issued. The duplicate receipt shall include the words "duplicate" or "copy." The feature to print a duplicate receipt shall be deactivated at the time the meter is hired for the next fare.*

[Nonretroactive as of January 1, 2000]

(Added 1999)

S.1.~~10~~11. Non-fare Information. *– The fare and extras displays may be used to display auxiliary information, provided the meter is in the ~~v~~Vacant condition, and such information is only displayed for10 seconds, or less. If the information consists of a list of information, the list may be displayed one item after another, provided that each item is displayed for 10 seconds, or less.*

[Nonretroactive as of January 1, 2002]

(Added 2000) **(Amended 20XX)**

S.1.12. Electronic Receipt Required. – An electronic receipt shall be provided to the customer from software and application-based meters, when the payment transaction is completed electronically via the businesses application or software program.

(Added 20XX)

– **S.2. Basis of Fare Calculations.** – A ~~taximeter~~**transportation-for-hire system** shall calculate fares only upon the basis of:

(a) distance traveled;

(b) time elapsed; or

(c) a combination of distance traveled and time elapsed.

A ~~taximeter~~**transportation-for-hire system** may utilize more than one rate to calculate the fare during a trip. Any change in the applied rate must occur at the completion of the current interval.

(Amended 1977~~ and~~**,** 2016**, and 20XX**)

S.2.1. Initial Time and Distance Intervals. – The time and distance intervals of a ~~taximeter~~**built-for-purpose device installed in the vehicle** that does not calculate fares based on distance traveled and time elapsed used concurrently shall be directly proportional as expressed in the following formula:

$$\frac{Seconds\ of\ Initial\ Time\ Interval}{Seconds\ per\ Non-Initial\ Time\ Interval} = \frac{Distance\ of\ Initial\ Mileage\ Interval}{Distance\ per\ Non-Initial\ Mileage\ Interval}$$

(Added 1990) (Amended 2017)

- **S.3. Design of Operating Control.**

S.3.1. Positions of Control. – The several positions of the operating controls shall be clearly defined and shall be so constructed that accidental or inadvertent changing of the operating condition of the ~~taximeter~~**built-for-purpose device installed in the vehicle** is improbable. Movement of the operating controls to an operating position immediately following movement to the cleared position shall be delayed enough to permit the ~~taximeter~~**device's display** to come to a complete rest in the cleared position.

(Amended 1988 **and 20XX**)

S.3.2. Control for Extras Mechanism. – The knob, handle, or other means provided to actuate the extras mechanism shall be inoperable whenever the ~~taximeter~~**built-for-purpose device installed in the vehicle** is cleared.

(Amended 20XX)

S.4. Interference. – The design of a ~~taximeter~~**built-for-purpose device installed in the vehicle** shall be such that when a fare is calculated by using time and/or by using distance (but not used concurrently) there will be no interference between the time and the distance portions of the mechanism device at any speed of operation.

(Amended 1977, 1988, ~~and~~ 2017**, and 20XX**)

S.5. Provision for Security Seals. – Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or physically applying security seals in such a manner that requires the security seal to be broken before an adjustment or interchange can be made of:

(a) any metrological parameter affecting the metrological integrity of the ~~taximeter~~**transportation-for-hire systems** and associated equipment; or

(b) any metrological parameter controlled by software residing in the ~~taximeter~~**built-for-purpose device installed in the vehicle** or an associated external computer network.

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

(Audit trails shall use the format set forth in Table S.5. Categories of Device and Methods of Sealing)

(Amended 1988, 2000, ~~and~~ 2017**, and 20XX**)

Table S.5. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or* ~~*two event counters: one*~~***,*** *for* ~~*calibration parameters*~~***components that may be removed from the vehicle, a combination of physical seals*** *and* ~~*one for configuration parameters*~~***a physical or electronic link as described in S.5.2. Taximeters Calibrated to Specific Vehicles****.*

Table S.5. ***Categories of Device and Methods of Sealing***	
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode. The device shall not operate as normal when in the remote configuration mode.*	*The hardware enabling access for remote access to calibration functions must be at the device and sealed using a physical seal and the device shall include an event logger.* *An event logger must be used to record changes to configuration parameters made through remote access.* *The event logger must include event counters (000 to 999 with a minimum count of 1000 events), the parameter ID, the date and time of the change, and the new value of the parameter. A printed or electronic copy of the information must be available through the device. The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required.* *(Note: Does not require 1000 changes to be stored for each parameter.*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode. The device shall not operate as normal when in the remote configuration mode.*	*An event logger must be used to record changes to adjustable parameters that are made through remote access, and which is accessible only by authorized persons (using an Internet web browser or other such secure software.* *The event logger shall include event counters, the date and time of the change, the parameter ID, and the new value of the parameter. A printed or electronic copy of the information must be available through the device. The event loggers 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 change to be stored for each parameter.)* *The device shall become inoperable when access to the system's metrological parameters is made through unapproved or unauthorized means. The device shall remain inoperable until cleared by the official having statutory authority.*

[Nonretroactive as of January 1, 2018]

(Table Added 2017) (Amended 2022 **and 20XX**)

S.5.1. Taximeter Connected to Networked Systems. – Metrological features that are not located on the taximeter device installed in the vehicle (i.e., accessed through a computer network, server, or "cloud") shall be secured by means that will:

(a) protect the integrity of metrological data and algorithms used to compute fares from such data against unauthorized modifications; and

(b) use software-based access controls or equivalent technological protections that limit access to metrological data and algorithms used to compute fares from such data only to authorized persons.

(Added 2017)

S.5.2. Taximeters Calibrated to Specific Vehicles. – In the case of taximeters where the proper performance and calibration of the device has been verified when used in a specific vehicle and which may be removed from the vehicle (e.g., slide mounting the taximeter), means shall be provided through a physical seal or electronic link between components affecting accuracy or indications of the device to ensure that its performance is not affected and operation is permitted only with those components having the same unique properties.

(Added 2017)

- **S.6. Power Interruption, Electronic Taximeters.**

(a) After a power interruption of three seconds or less, the fare and extras indications shall return to the previously displayed indications and may be susceptible to advancement without the taximeter being cleared.

(b) After a power interruption exceeding three seconds, the fare and extras indications shall return to the previously displayed indications and shall not be susceptible to advancement until the taximeter is cleared.

*After restoration of power following an interruption exceeding three seconds, the previously displayed fare shall be displayed for a maximum of one minute at which time the fare shall automatically clear, and the taximeter shall return to the vacant condition.**

*[*Nonretroactive as of January 1, 2002]*

(Added 1988) (Amended 1989, 1990, and 2000)

S.7. Measurement Signal Loss. – If the measurement signal is interrupted, the taximeter shall be capable of determining any information needed to complete a transaction in progress at the time of signal loss/interruption.

Note: If the meter ceases to increment fare based on distance, the taximeter may continue to increment fare based on elapsed time provided the time mechanism is not affected by signal loss.

(Added 2017)

S.7.1. Intermittent Trip Data Loss. – When the measurement signal is lost intermittently during a trip (e.g., traveling through a tunnel), but recovered prior to the end of the trip, the taximeter shall be capable of calculating an accurate fare in accordance with T.1. Tolerance Values.

(Added 2017)

S.7.2. Significant Trip Data Loss. – When the signal is lost for a significant portion of the trip, the taximeter shall calculate the total charge utilizing recorded time and distance measurements and other charges (e.g., tolls and airport fees), and may also include other means in accordance with the terms of service (or other agreement) the passenger has agreed to.

Note: Significant trip data loss refers to instances when the measurement signal is lost to the extent that the taximeter cannot perform an accurate measurement or when the signal is not regained by the end of the trip.

(Added 2017)

S.8. Anti-Fraud Provisions, Electronic Taximeters. – An electronic taximeter may have provisions to detect and eliminate distance input that is inconsistent with the taximeter's source(s) of distance measurement data. When a taximeter equipped with this feature detects input inconsistent with the distance measurement data source(s):

(a) the meter shall either filter out the inconsistent distance input signals or cease to increment fare based on distance until the distance input signal is restored to normal operation. If the meter

ceases to increment fare based on distance, the taximeter may continue to increment fare based on elapsed time when (1) permitted by the statutory authority; and (2) the time mechanism is not affected by inconsistent signals;

(b) the taximeter shall provide a visible or audible signal that inconsistent input signals are being detected; and

(c) the taximeter shall record the occurrence in an event logger. The event logger shall include an event counter, the date, and the time of at least the last 1000 occurrences.

(Added 2001) (Amended 2017)

N. Notes

N.1. Distance Tests.

N.1.1. Test Methods. – To determine compliance with distance tolerances, a distance test of a taximeter shall be conducted utilizing one or more of the following test methods:

(a) **Road Test.** – A road test consists of driving the vehicle over a precisely measured road course.

(b) **Fifth Wheel Test.** – A fifth wheel test consists of driving the vehicle over any reasonable road course and determining the distance actually traveled through the use of a mechanism known as a "fifth wheel" that is attached to the vehicle and independently measures and indicates the distance.

(c) **Simulated Road Test.*** – A simulated road test consists of determining the distance traveled by use of a roller device, or by computation from rolling circumference and wheel turn data.

*Simulated-road testing is not appropriate for taximeters using measurement data from sources other than signal(s) generated by rotation of the wheels of the vehicle.

Note: Field examinations of transportation network measurement systems need not include testing of all individual devices used as driver/passenger indicating elements in connection with the service provided. It is considered sufficient that a representative sample of various indicating elements be incorporated in testing to verify proper operation of the system.

(Amended 1977, ~~and~~ 2017**, and 20XX**)

N.1.2. Test Procedures. – The distance test of a taximeter, whether a road test, a simulated road test, or a fifth wheel test, shall include at least duplicate runs of sufficient length to cover at least the third money drop or 1 mi, whichever is greater, and shall be at a speed approximating the average speed traveled by the vehicle in normal service. In the case of metric calibrated taximeters, the test should cover at least the third money drop or 2 km, whichever is greater.

(Amended 1977)

N.1.2.1. Taximeters Using Measurement Data Sources from Other Than Rotation of the Wheels.

N.1.2.1.1. Testing, General. – Testing of taximeters with metrologically significant parameters that do not completely reside within the taximeter device shall include tests performed under variable conditions to verify that any non-compliant issue is generated from a network system rather than a single taximeter device. The variability tests shall include a minimum of three consecutive tests of varying lengths, locations, and/or ~~environment~~**environmental** conditions.

(Added 2017) **(Amended 20XX)**

N.1.2.1.2. Repeatability Testing, Taximeters Using Measurement Data Sources From Other Than Rotation of the Wheels. – Repeatability testing shall be conducted if, during testing, a taximeter

registers a distance measurement that does not comply with the tolerance values in T.1.1. Distance Tests. A minimum of three additional tests shall be conducted at the same location and where all test variables are reduced to the greatest extent practicable to verify the system's ability to repeat transaction indications. Repeatability testing performed in excess of these three additional tests is done at the discretion of the official with statutory authority.

(Added 2017)

N.1.3. Test Conditions.

N.1.3.1. Measurement Data Based on the Rotation of the Vehicle's Wheels. – For taximeters that receive input of measurement data generated (directly or indirectly) from rotation of the vehicle's wheels, the test of the taximeter shall be performed under the following conditions.

(Added 2017)

N.1.3.1.1. Vehicle Lading. – During the distance test of a taximeter, the vehicle shall carry two persons, or in the case of a simulated road test, 70 kg or 150 lb of test weights may be substituted in lieu of the second person.

N.1.3.1.2. Tire Pressure. – At the completion of test run or runs, the tires of the vehicle under test shall be checked to determine that the tire pressure is that operating tire pressure posted in the vehicle. If not, the tire pressure should be adjusted to the posted tire pressure and further tests may be conducted to determine the operating characteristics of the taximeter.

(Amended 1977)

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

(Added 2017)

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

(a) objects that may obstruct or reflect signals such as tall buildings/structures, forestation, tunnels, etc.;

(b) routes that do not follow a straight-line path;

(c) significant changes in altitude; and

(d) any other relevant environmental conditions.

(Added 2017)

– **N.2. Time Test.** – If a taximeter is equipped with a timing device through which charges are made for time intervals, the timer shall be tested at the initial interval, four separate subsequent intervals, and an average time test of at least four consecutive subsequent time intervals.

(Amended 1988)

– **N.3. Interference Test.** – For taximeters that calculate fares based on time and/or distance but not simultaneously, a test shall be conducted to determine whether there is interference between the time and distance elements. During the interference test, the vehicle's operating speed shall be 3 km/h or 4 km/h (2 mi/h or 3 mi/h) faster, and then 3 km/h or 4 km/h (2 mi/h or 3 mi/h) slower than the speed at which the basic distance rate equals the basic time rate. The basic rate per hour divided by the basic rate per mile is the speed (km/h or mi/h) at which the basic time rate and basic distance rate are equal.

Note: Performance of the interference test may not be considered appropriate as a field test while travelling in a vehicle equipped with a taximeter. This test may be performed during type evaluation under controlled conditions for practicality and for safety concerns.

(Amended 1988 and 2017)

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.

(b) On Underregistration: 4 % of the interval under test, with an added tolerance of 30 m or 100 ft whenever the initial interval is included in the interval under test.

T.1.2. On Time Tests.

T.1.2.1. On Individual Time Intervals. – Maintenance and acceptance tolerances on individual time intervals shall be as follows:

(a) On Overregistration: 3 seconds per minute (5 %).

(b) On Underregistration: 9 seconds per minute (15 %) on the initial interval, and 6 seconds per minute (10 %) on subsequent intervals.

T.1.2.2. On Average Time Interval Computed After the Initial Interval. – Except for the initial interval, maintenance and acceptance tolerances on the average time interval shall be as follows:

(a) On Overregistration: 0.2 second per minute (0.33 %).

(b) On Underregistration: 3 seconds per minute (5 %).

(Amended 1991)

T.1.3. On Interference Tests. – For taximeters designed to calculate fares upon the basis of a combination of distance traveled and time elapsed (but not using both simultaneously), the distance registration of a taximeter in the "time on" position shall agree within 1 % of its distance registration in the "time off" position.

(Added 1988) (Amended 2017)

T.2. 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 (i.e., fifth-wheel) when compared to the basic reference standard.

(Added 2017)

UR. User Requirements

UR.1. Inflation of Vehicle Tires. – For taximeters that receive input of measurement data generated (directly or indirectly) from rotation of the vehicle's wheels, the operational tire pressure of passenger vehicles and truck tires shall be posted in the vehicle and shall be maintained at the posted pressure.

(Amended 1977 and 2017)

UR.2. Position and Illumination of Taximeter. – A taximeter shall be so positioned and illuminated that its indications, operational markings, and controls of passenger interest can be conveniently read by a passenger seated in a position of up to 1.2 m (4 ft) away from the taximeter under any condition of normal operation.

Note: Software and application-based systems are exempt from this user requirement if all transaction related information is readily accessible, clear, and verifiable by customers through their digital interface.

(Amended 1985, 1986, ~~and~~ 2017**, and 20XX**)

- **UR.3. Statement of Rates.** – The distance and time rates for which a taximeter is set, including the initial distance interval and the initial time interval, the local tax rate, and the schedule of extras when an extras indication is provided shall be conspicuously displayed inside the front and rear passenger compartments. The words "Rate," "Rates," or "Rates of Fare" shall precede the rate statement. The rate statement shall be fully informative, self-explanatory, and readily understandable by the ordinary passenger, and shall either be of a permanent character or be protected by glass or other suitable transparent material.

Note: Software and application-based systems are exempt from this user requirement if all transaction related information is readily accessible, clear, and verifiable by customers through their digital interface.

(Amended 1977, 1988, 1990, ~~and~~ 1999**, and 20XX**)

NIST OWM Detailed Technical Analysis:

See Executive Summary.

Summary of Discussions and Actions:

At the 2025 Interim NCWM Meeting, Mark Lovisa (Transportation For Hire Task Group Chair) provided the background of the item, that it is to bring the Tentative TNS and Taximeters Sections together to equitably regulate both forms of transportation systems. The task group reviewed the comments provided at the regional level and the NCWM meetings, and they believe the item is fully developed and recommended a Voting status for the block of items, indicating that the task group has completed its mission. Khoa Lam (LA County, CA) noted that the item has merit, but more clarification is needed, specifically the variables that affect "Good Faith Estimates", which is referenced in A.1.(b). The concern is that this estimate can change based on the route selected by the driver, and there are no safeguards to limit the circumstances that affect the change in the fare. There are also concerns with the manipulation of "surge" pricing, as drivers could exploit the software to create the appearance of an increase in demand. When field tests identify an issue, who is responsible, the driver or the rideshare company responsible for the application? Additional clarification is needed to provide guardrails to prevent software exploitation. Traditional taximeters can be misused as well, but there is a responsible party driving the vehicle with the physical device. The task group has worked hard on this item and recommend an Assigned status. Austin Shepherd (San Diego CO, CA) commented that San Diego County has over 600 registered taxi's and over 10,000 estimated rideshares drivers and are very interested in the proposal. As taxis increasingly turn to technology similar to rideshare applications, this proposal becomes more important. There needs to be clarification regarding how rideshares fit into the application section. A.1.(b). seems to include them in this section, but A.2.(a). could be interpreted as excluding them. There also needs to be parameters that address price changes for rideshare services when the final price is different than the initial estimate. There are also questions related to the equity of only testing a sample of devices within a jurisdiction. Until these issues are resolved, an Assigned status is recommended. Paul Floyd (LA) supported the work of the task group and recommended a Voting status. Jose Arriaga (Orange County, CA) agrees with the comments from the other counties in CA and supports an Assigned or Developing status. Matt Douglas (CDA DMS) supported an Assigned status as the proposal doesn't clearly make a distinction between app-based rideshare services, app-based taxi's, and traditional taxi's and cited many of the concerns expressed by the CA county representatives. Mark Lovisa (Transportation For Hire Task Group Chair) indicated that the comments are

appreciated and noted that industry participated in the task group but is no longer involved, thinking the item was fully developed.

At the 2025 Annual NCWM Meeting, Mark Lovisa (Transportation For Hire Task Group Chair) indicated that the task group considered the comments from the Interim and decided to provide clarification by adding a footnote for "built-for-purpose" devices, and addressed a question about how the number of representative samples is determined, which is by the device characteristics and jurisdictional discretion. Matt Douglas (CA DMS) supports Informational status, noting that the Transportation Network Systems code may not be applicable to the operation of current technology. Austin Shepherd (San Diego CO, CA) supports the work of the task group, but has questions about the scope of the item. Part of the concern is the subparts (a) and (b) in A.1., as they are confusing and need clarification.

At the 2025 Interim NCWM Meeting, Matt Douglas, California Division of Measurement Standards, agrees with the intent of the item to merge both codes; however, has issues with how devices are identified. An example was "Built for Purpose Devices" in Section 1.4 and suggested Developing status. Kurt Floren, County of Los Angeles, CA, questioned how this might impact other or different technologies. Kurt would like Built for Purpose to be clarified within the code and pointed to S1.3.2. Austin Shepherd, San Diego County CA Department of Agriculture, stated he had concerns with pg. 189 where exemption is provided from the device from a customer display if it can be on a consumer device. Austin suggested removing this from the code. Austin reference pg. 187, suggesting the removal of three additional tests for out-of-tolerance verification. Also, on pg. 187, Austin recommends defining "a representative sample of various indicating elements" as it leads to questions of hardware vs software. Austin mentioned pg. 183 discussing electronic receipts and thinks the code should also provide for paper receipts. John McGuire NIST OWM recommends Informational status to allow the membership to provide comments to the S&T and Transportation for Hire committees for these blocked items.

Regional Association Reporting:

Western Weights and Measures Association

At the WWMA 2025 Annual Meeting, the following comments were received:

Mr. Matthew Douglas (State of California, Division of Measurement Standards): Recommends the item be assigned to the NCWM Transportation for Hire Systems Task Group, this item is not fully developed, needs repeatability testing, this is an opportunity to update the code.

The 2025 WWMA S&T Committee recommends an Assigned status. The committee is recommending this item be returned to the NCWM S&T Transportation-For-Hire Systems Task Group for further development with consideration to the comment heard during Open Hearings.

At the 2024 WWMA Annual Meeting Matthew Douglas (State of California, Division of Measurement Standards): Recommends a developing status too allow the submitter an opportunity to receive feedback from body, industry, and stakeholders. The WWMA 2024 S&T Committee recommends a Developing status.

Southern Weights and Measures Association

At the 2025 SWMA Annual Meeting, no comments were heard.

The committee does not recommend changing the status of this item.

At the 2024 SWMA Annual Meeting, Mark Lovisa, Chair of Transportation for Hire Systems Task Group requested informational status. Believes the code needs finishing touches to polish and address editorial errors. Intent of the proposal is to even out the rules and regulations among taxis and rideshare companies. Soliciting input from the regulators that regulate transportation technology. The committee recommends the item be assigned an Informational status.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, a representative from the State of New Jersey provided an update from the Transportation for Hire Working Group. The group felt this item is ready for a vote and has not moved forward with any of the items brought up at the NCWM Interim Meeting.

The Committee recommends this item block remain as Informational.

At the 2025 NEWMA Interim Meeting, no updates were provided by the task group representative.

The committee recommended retaining the Voting status of the item.

At the 2025 NEWMA Annual Meeting, a representative from NIST-OWM commented that the Task Group is looking to remove the tentative code status of TNMS and incorporate TNMS in the existing Taxi Code. Additional language changes were submitted during the 2025 NCWM Interim, the Task Group is looking for feedback and hopes to move forward with voting in the next cycle.

The Committee recommended retaining Informational status and the body concurred.

At the 2024 NEWMA Interim Meeting, Mr. Michael Peeler (NJ) commented that the items still need some work with wording and recommended a developing status. Mr. Steve Timar (NY) concurs with NJ. He commented that TNMS supports the tolerances that appear in the proposal, but should remain developing so all parties can review the items. Ms. Cheryl Ayer (NH) agrees with NJ and NY.

After hearing comments from the floor, the Committee recommended a Developing status for this item and the body concurred.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommends this item block remain as Informational.

At the 2025 CWMA Interim Meeting, no comments were heard during open hearing.

The committee recommends this item remain Voting.

At the 2025 CWMA Annual Meeting, no comments were heard.

The Committee recommends this item remain Informational.

At the 2024 CWMA Interim Meeting, no comments were heard during open hearing.

The committee recommends this item as developing and recommends the submitter gather more input from stakeholders and NIST OWM.

ITEM BLOCK 2 (B2) – REFERENCES TO TYPE EVALUATION

B2: CDL-26.1 V ~~A.4. Type Evaluation~~

B2: HGM-26.1 V ~~A.4. Type Evaluation~~

B2: EVF-26.1 V A.4. Type Evaluation

B2: EMS-26.1 V A.4. Type Evaluation

B2: GMA-26.1 V ~~A.4. Type Evaluation~~

Source: NIST Office of Weights and Measures

Submitter's Purpose and Justification:

To remove several paragraphs that require a device or systems to comply with NIST Handbook 44, before being submitted for NTEP evaluation.

Original Justification:

These paragraphs specify that a device must meet NIST Handbook 44 requirements before being submitted for type evaluation. These paragraphs were part of various codes when they had a tentative status, but were not removed when the code was changed to permanent status.

Codes adopted prior to 1998 did not include a variation of this paragraph. The language creates a circular argument, in that a device cannot be determined to comply with NIST Handbook 44 until evaluated, but the device cannot be submitted for evaluation until it is determined to comply with NIST Handbook 44.

The submitter acknowledged that these paragraphs establish the responsibility of manufacturers to design devices that comply with NIST Handbook 44 requirements. Although they are not included in each section, they should remain.

NIST OWM Executive Summary

ITEM BLOCK 2 (B2) V References to Type Evaluation
NIST OWM Recommendation: Voting • This item removes paragraphs that no longer serve their intended purpose**.** • OWM consulted Jeff Gibson, NTEP Administrator, and Darrell Flocken, Former NTEP Administrator, regarding this proposal. Neither Jeff nor Darrell had concerns with the proposed amendments in this block of items.

Table 2. Summary of Recommendations
ITEM BLOCK 2 (B2) V References to Type Evaluation

	Status Recommendation	Note*	Comments
Submitter	Voting		
OWM	Voting		
WWMA	Voting		
NEWMA	Voting		
SWMA	Withdrawal		
CWMA	Voting		
NCWM	Voting		

	Number of Support Letters	Number of Opposition Letters	Comments
Industry			
Manufacturers			
Retailers and Consumers			
Trade Association			

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

Item Under Consideration:

NOTE: This item has been edited to properly identify the section of the handbook affected and to correct formatting errors. The Items Under Consideration now reflect the structure required by NIST Handbook 44.

B2: CDL-26.1 V ~~A.4. Type Evaluation~~

Amend NIST Handbook 44, Section 3.38. Carbon Dioxide Liquid-Measuring Devices Code as follows:

~~A.4. Type Evaluation. The National Type Evaluation Program will accept for type evaluation only those devices that comply with all requirements of this code.~~
~~(Added 1998)~~

B2: HGM-26.1 V ~~A.4. Type Evaluation~~

Amend NIST Handbook 44, Section 3.39. Hydrogen Gas-Measuring Devices Code as follows:

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

B2: EVF-26.1 V A.4. Type Evaluation

Amend NIST Handbook 44, Section 3.40. Electric Vehicle Fueling Systems Code as follows:

A.4. Type Evaluation. – The National Type Evaluation Program (NTEP) will accept for type evaluation only those EVSEs that ~~**comply with all requirements of this code and**~~ have received safety certification by a nationally recognized testing laboratory **also referred to as an** ~~(~~NRTL~~)~~.

(Amended 20XX)

B2: EMS-26.1 V A.4. Type Evaluation

Amend NIST Handbook 44, Section 3.41. Non-Utility Electricity-Measuring Systems – Tentative Code as follows:

A.4. Type Evaluation. – The National Type Evaluation Program (NTEP) will accept for type evaluation only those measuring systems that have received safety certification by a nationally recognized testing laboratory ~~(~~also referred to as "NRTL")~~ and shall issue an NTEP Certificate of Conformance only to those measuring systems that comply with all requirements of this code.~~

(Amended 20XX)

B2: GMA-26.1 V ~~A.4. Type Evaluation~~

Amend NIST Handbook 44, Section 5.56.(a) Grain Moisture Meters Code as follows:

~~**A.3. Type Evaluation. – The National Type Evaluation Program (NTEP) will accept for type evaluation only those devices that comply with this code. State enforcement will be based upon the effective dates identified with each requirement when specific dates are shown.**~~
~~**(Added 1993)**~~

NIST OWM Detailed Technical Analysis:

See Executive Summary.

Summary of Discussions and Actions:

At the 2026 NCWM Interim Meeting, Loren Minnich (NIST OWM) provided the background regarding these requirements. When a new section was added to HB 44 as a tentative code, a version of this language was added to reinforce that, prior to submitting a device for NTEP evaluation, the manufacturer was responsible for ensuring the device was designed to comply with the handbook. While this was the intent of the language, the literal interpretation required the device to comply with the handbook before submission, but compliance cannot be conclusively verified until type evaluation has been conducted, creating a circular argument. These paragraphs were intended to be temporary, and when a code was adopted as permanent, these paragraphs were to be removed. In the case of these sections, that process was overlooked. Prior to submitting this proposal, OWM contacted the NTNEP Administrator to verify that removing these paragraphs would not affect the NTEP evaluation process. Loren requested a Voting status for this group of items. Jeff Gibson (NTEP Administrator) confirmed OWM contacted NTEP and there is no issue with removing these paragraphs. Dick Suiter (Richard Suiter Consulting), a former NIST employee who was also an NTEP evaluator when NTEP was administered by NIST, confirmed the history of these paragraphs as described by OWM and supported a Voting status. Kurt Floren (LA County, CA), Matt Douglas (CDA DMS), Jason Flint (NJ), Jim Willis (NY), and Mauricio Mejia (FL), supported moving Block 2 forward with a Voting status. Michael Keilty (Endress+Hauser) said he had previously opposed this group of items, but now understands the purpose of this block and supports Voting status.

The NCWM S&T Committee assigned each item in the block a Voting Status.

Regional Association Reporting:

Western Weights and Measures Association

At the 2025 WWMA Annual Meeting, the following comments were received:

Mr. Loren Minich (NIST Office of Weights and Measures): OWM believes this item is a clean-up; each code section listed has similar language that was added during the tentative status, stating they must comply with HB44 before being submitted for NTEP evaluation. This section should have been removed when the codes changed to permanent status. OWM has consulted with NTEP, and both believe the paragraph can be removed. This issue is covered by NTEP administrative policy.

Mr. Matthew Douglas (State of California, Division of Measurement Standards): Acknowledged the comments from NIST OWM, supports a voting status.

Mr. Kurt Floren (Los Angeles County, California): supports Voting status.

The 2025 WWMA S&T Committee recommends that this item be assigned a Voting status based on comments and support heard during the 2025 WWMA Annual Conference Open Hearing.

Southern Weights and Measures Association

At the 2025 SWMA Annual Meeting, the following comments were heard:

Alison Wilkinson, Maryland – is unsure why this item was proposed, believes it to have no merit and recommends Withdrawn status. When a developer submits their device, they should be familiar with Handbook 44 requirements and how they apply to the device to ensure the device is capable of meeting NIST HB 44 requirements. Device should be ready for evaluation upon submission and NTEP evaluators shouldn't be used as consultants.

Michael Keilty, Endress+Hauser – agrees with Alison that there isn't a need to make this modification. He doesn't believe that it is a circular argument and doesn't see the need to change the language – Recommends Developing or Withdrawn status.

The committee recommends Withdrawn status on this item.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, a representative from the NIST OWM states this item removes several paragraphs referencing type evaluation which should have been removed when codes became permanent, but their removal was overlooked. Representatives from the State of New Jersey and the State of New York agree that the reference to NTEP and type evaluation should be removed.

The Committee recommended a Voting status.

At the 2025 NEWMA Interim Meeting, the committee recommended a Voting status for this block of items. The Final Report for the meeting didn't include comments related to these items.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommends this item block remain as Voting.

At the 2025 CWMA Interim Meeting, the committee recommended this item be given a Voting status based on comments received during open hearing.

ITEM BLOCK 3 (B3) – METHOD OF SEALING, CATEGORY 3

B3: SCL-26.1 V Section 2.20, Table S.1.11. Categories of Device and Method of Sealing

B3: BCS-26.1 V Section 2.21, Table S.6 Categories of Device and Method of Sealing

B3: AWS-26.1 V Section 2.24, Table S.1.3. Categories of Device and Methods of Sealing

B3: LMD-26.2 V Section 3.30, *Table S.2.2. Categories of Device and Methods of Sealing*

B3: VTM-26.1 V Section 3.31, *Table S.2.2. Categories of Device and Methods of Sealing*

B3: LPG-26.1 V Section 3.32, *Table S.2.2. Categories of Device and Methods of Sealing*

B3: CLM-26.1 V Section 3.34, *Table S.2.5. Categories of Device and Methods of Sealing*

B3: MLK-26.1 V Section 3.35, *Table S.2.3. Categories of Device and Methods of Sealing*

B3: WTR-26.1 V Section 3.36, *Table S.2.1. Categories of Device and Methods of Sealing*

B3: MFM-26.1 V Section 3.37, *Table S.3.5. Categories of Device and Methods of Sealing*

B3: CDL-26.1 V Section 3.38, *Table S.2.5. Categories of Device and Methods of Sealing*

B3: HGM-26.2 V Section 3.39, Table S.3.3. Categories of Device and Methods of Sealing

B3: EVF-26.3 V Section 3.40, Table S.3.3. Categories of Device and Methods of Sealing

B3: EMS-26.2 V Section 3.41, Table S.2.2. Categories of Device and Methods of Sealing

B3: MDM-26.2 V Table S.2.2. Categories of Device and Methods of Sealing

Source: Endress+Hauser Flow USA, Inc and Metron

Submitter's Purpose and Justification:

In 2022, HB 44 Code Section 3.30 LMD Table S.2.2 Methods of Sealing, Category 3 was amended. The purpose of this proposal is to amend the same section found in the other HB 44 Device 3.XX Code Sections with the same language.

Original Justification:

Technology has advanced in all measurement areas with the integration of electronics for measuring devices and wireless transmission.

It is not practical to have direct wired connections to measuring devices where there are multiple devices or where access is limited for safety or installation requirements.

It was shortsighted to not address this when the change was made to 3.30 LMD Table S.2.2 Methods of Sealing Category 3 back in 2022.

The proposed language enables non-wired transmission from the measuring device to another device from which the information can be printed.

The submitter acknowledged these potential arguments against:

Do not change the other code sections Method of Sealing Category 3because the LMD code section was modified for RMFDs which are burdened if required a direct wired connection.

Devices are not secure and could be fraudulently adjusted if wireless transmission is allowed for all measuring devices.

Weighing devices in Code Sections 2.XX are not recognized in the proposal.

The submitter requested Voting status in 2026.

NIST OWM Executive Summary

ITEM BLOCK 3 (B3) V Method of Sealing, Category 3

NIST OWM Recommendation: Voting

- OWM agrees that similar language across the sections of NIST HB 44 would help with the uniform interpretation of the Method of Sealing for Category 3 devices.
- At the 2026 NCWM Interim Meeting the requirements for Method of Sealing, Category 3 in additional codes were added to this item per comments received from SMA and supported at the meeting.
- The submitter, Michael Keilty, incorporated the proposed NIST wording below into the Category 3 Sealing requirements for the various codes previously included in the item under consideration and added language to amend these requirements in the Scales, Belt-Conveyor Scales Systems, and Automatic Bulk Weighing Systems codes.

  "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. The event logger information shall be available at the time of inspection either as a printed copy or transmitted in an electronic format. The event

ITEM BLOCK 3 (B3) V Method of Sealing, Category 3
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.)" • Although NIST OWM supports this item as a Voting item, there were three new codes added to this item at the Interim • This may require additional review, and if the weights and measures community feels the item needs to be downgraded to allow for sufficient review of these changes, OWM would support an Informational status.

Table 2. Summary of Recommendations
ITEM BLOCK 3 (B3) V Method of Sealing, Category 3

	Status Recommendation	Note*	Comments
Submitter	Voting	1	
OWM	Voting		
WWMA	Developing		Based on previous language
NEWMA	Voting	1	
SWMA	Voting		Considered item submitted by the NTEP Measuring Sector
CWMA	Developing		
NCWM	Voting		

	Number of Support Letters	Number of Opposition Letters	Comments
Industry			SMA supports this item and recommends similar language for the Scales Code.
Manufacturers			
Retailers and Consumers			
Trade Association			

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

Item Under Consideration:

NOTE: This item has been edited to properly identify the section of the handbook affected and to correct formatting errors. The Items Under Consideration now reflect the structure required by NIST Handbook 44.

B3: SCL-26.1 V Table S.1.11. Categories of Device and Methods of Sealing

Amend NIST Handbook 44, Section 2.20. Scales Code as follows:

Table S.1.11. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware. The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode.*	*The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).*	*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 transmitted in an electronic format.*** *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 20XX)**

B3: BCS-26.1 V Table S.6. Categories of Device and Methods of Sealing

Amend NIST Handbook 44, Section 2.21. Belt Conveyor Systems Code as follows:

Table S.6. ***Categories of Device and Methods of Sealing***	
Categories of Devices	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 3: *Remote configuration capability.*	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter.* ~~***A printed copy of the information must be available 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 transmitted in an electronic format.*** *The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)*

[Nonretroactive as of January 1, 1999]
(Table Added 1998) **(Amended 20XX)**

B3: AWS-26.1 V Table S.1.3. Categories of Device and Methods of Sealing

Amend NIST Handbook 44, Section 2.24. Automatic Weighing Systems Code as follows:

Table S.1.3. Categories of Device and Methods of Sealing	
Categories of Device	**Methods of Sealing**
Category 1: No Remote configuration capability.	Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.
Category 2: Remote configuration capability, but access is controlled by physical hardware. The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode.	The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters: one for calibration parameters and one for configuration parameters.
Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).	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 transmitted in an electronic format.** 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.)

(Amended 20XX)

B3: LMD-26.2 V Table S.2.2. Categories of Device and Methods of Sealing

Amend NIST Handbook 44, Section 3.30. Liquid Measuring Devices Code as follows:

Table S.2.2. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.*	*[The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.]** *[*Nonretroactive as of January 1, 1996]*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *[Nonretroactive as of January 1, 1995]* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.* *[Nonretroactive as of January 1, 2001]*	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. The event logger information shall be available at the time of inspection either as a printed copy or* ***transmitted*** *in* ***an*** *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, 2015, ~~and~~ 2022**, and 20XX**)

B3: VTM-26.1 V Table S.2.2. Categories of Device and Methods of Sealing

Amend NIST Handbook 44, Section 3.31. Vehicle Tank Meters Code as follows:

Table S.2.2. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.*	*The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an onsite device.*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *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.*	*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 transmitted in an electronic format.*** *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 2006) (Amended 2016 **and 20XX**)

B3: LPG-26.1 V Table S.2.2. Categories of Device and Methods of Sealing

Amend NIST Handbook 44, Section 3.32. Liquefied Petroleum Gas and Anhydrous Ammonia Liquid Measuring Devices Code as follows:

Table S.2.2. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.*	*The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *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.*	*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 transmitted in an electronic format.*** *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 2006) (Amended 2016 **and 20XX**)

B3: CLM-26.1 V Table S.2.5. Categories of Device and Methods of Sealing

Amend NIST Handbook 44, Section 3.34. Cryogenic Liquid-Measuring Devices Code as follows:

Table S.2.5. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.*	*The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *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.*	*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 transmitted in an electronic format.*** *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 2006) (Amended 2016 **and 20XX**)

B3: MLK-26.1 V Table S.2.3. Categories of Device and Methods of Sealing

Amend NIST Handbook 44, Section 3.35. Milk Meters Code as follows:

Table S.2.3. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.*	*The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *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.*	*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.~~*** ***<u>The event logger information shall be available at the time of inspection either as a printed copy or transmitted in an electronic format.</u>*** *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 2006) (Amended 2016 **<u>and 20XX</u>**)

B3: WTR-26.1 V Table S.2.1. Categories of Device and Methods of Sealing

Amend NIST Handbook 44, Section 3.36. Water Meters Code as follows:

Table S.2.1. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Method of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.*	*The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *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.*	*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 transmitted in an electronic format.*** *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, 2019]
(Table Added 2018) **(Amended 20XX)**

B3: MFM-26.1 V Table S.3.5. Categories of Device and Methods of Sealing

Amend NIST Handbook 44, Section 3.37. Mass Flow Meters Code as follows:

Table S.3.5. Categories of Device and Methods of Sealing	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.*	*[The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.]** *[*Nonretroactive as of January 1, 1996]*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *[Nonretroactive as of January 1, 1995]* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.* *[Nonretroactive as of January 1, 2001]*	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter.* ***~~A printed copy of the information must be available on demand through the device or through another on-site device. The information may also be available electronically.~~*** ***<u>The event logger information shall be available at the time of inspection either as a printed copy or transmitted in an electronic format.</u>*** *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 1995) (Amended 1995, 1998, 1999, 2006, ~~**and**~~ 2016**<u>, and 20XX</u>**)

B3: CDL-26.2 V Table S.2.5. Categories of Device and Methods of Sealing

Amend NIST Handbook 44, Section 3.38. Carbon Dioxide Liquid-Measuring Devices Code as follows:

Table S.2.5. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.*	*The hardware enabling access for remote communication must be onsite. 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.*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *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.*	*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 transmitted in an electronic format.*** *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 2006) (Amended 2016 **and 20XX**)

B3: HGM-26.2 V Table S.3.3. Categories of Device and Methods of Sealing

Amend NIST Handbook 44, Section 3.39. Hydrogen Gas-Measuring Devices Code as follows:

Table S.3.3.
Categories of Device and Methods of Sealing

Categories of Device	Method of Sealing
Category 1: No remote configuration capability.	Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.
Category 2: Remote configuration capability, but access is controlled by physical hardware. The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.	The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.
Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password). 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.	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 transmitted in an electronic format.** 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.)

(Amended 2016 **and 20XX)**

B3: EVF-26.3 V Table S.3.3. Categories of Device and Methods of Sealing

Amend NIST Handbook 44, Section 3.40. Electric Vehicle Fueling Systems Code as follows:

Table S.3.3. Categories of Device and Methods of Sealing	
Categories of Device	**Method of Sealing**
Category 1: No remote configuration capability.	Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.
Category 2: Remote configuration capability, but access is controlled by physical hardware. The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.	The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring EVSE or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual EVSEs at a location. If the counters are located in the system controller rather than at the individual EVSE, means must be provided to generate a copy of the information through an on-site device; this information may be provided electronically in lieu of or in addition to a hard copy at the time of inspection.
Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password). 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.	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. The event logger information **shall**~~**may**~~ be ~~**provided electronically in lieu of or in addition to a hard copy**~~ **available** at the time of inspection **either as a printed copy or transmitted in an electronic format**~~**provided the event logger information is retained in the system for future reference**~~. The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the ~~**EVSE**~~**device**, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)

(Amended 2021 **and 20XX)**

B3: EMS-26.2 V Table S.2.2. Categories of Device and Methods of Sealing

Amend NIST Handbook 44, Section 3.41. Non-Utility Electricity-Measuring Systems Code as follows:

Table S.2.2.
Categories of Device and Methods of Sealing

Categories of Device	Method of Sealing
Category 1: No remote configuration capability.	Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.
Category 2: Remote configuration capability, but access is controlled by physical hardware.	The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode. The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in the system controller rather than at the individual device, means must be provided to generate a hard copy of the information.
Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password). The device shall clearly indicate that it is in the remote configuration mode and record such message or shall not accumulate kWh while in this mode.	An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. **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. <u>The event logger information shall be available at the time of inspection either as a printed copy or transmitted in an electronic format.</u>** 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.)

<u>(Amended 20XX)</u>

B3: MDM-26.2 V Table S.2.2. Categories of Device and Methods of Sealing

Amend NIST Handbook 44, Section 5.58. Multiple Dimension Measuring Devices Systems Code as follows:

Table S.1.11.
Categories of Devices and Methods of Sealing for Multiple Dimension Measuring Systems

Categories of Devices	Methods of Sealing
Category 1: No remote configuration.	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. Device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode.	The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters: one for calibration parameters and one for configuration parameters.
Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).	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 transmitted in an electronic format.** 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.)

(Amended 20XX)

NIST OWM Detailed Technical Analysis:

Since this block of items was introduced for the 2026 NCWM cycle, the language has changed significantly and several items were added.

At the 2026 NCWM Interim Analysis, NIST OWM recommended alternative language for the items in Block 3 as provided below:

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. The event logger information shall be available at the time of inspection either as a printed copy or transmitted in an electronic format. 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.)

It is essential that an inspector has access to the audit trail information during an inspection and, in some cases, may need to review it at a later date, depending on the amount of information that needs to be reviewed. As such, a statement that the event logger information for a Category 3 device "**shall be"** or "**must be"** available "**at the time of inspection**" or "**on demand**" is needed.

All the Category 3 Methods of Sealing paragraphs within the "Categories of Device and Method of Sealing" tables in Handbook 44, with the exception of EVFS and the Tentative NUEMS Codes, state that the Event logger information "**must be**" or "**shall be**:"

> "Available **at the time of inspection**" or "**on demand** through the device or through another onsite device."

The EVFS Code states, "The event Logger information **may be** provided electronically in lieu of or in addition to a hard copy at the time of inspection, provided the event logger information is retained in the system for future reference.

The Tentative NUEMS Code states, "A printed copy of the information **must be** available through the device or another device. There is currently no mention of electronic event logger information. And no mention of the information being available "**at time of inspection**" or "**on demand**".

In September of 2025, the Measuring Device Sector submitted a proposal that removed "**shall be**" or "**must be**" and added the statement "The event logger information "**may be**" provided electronically in lieu of or in addition to a hard copy at time of inspection. The updated language was based on the sealing requirements in Table S.3.3. in Section 3.40. OWM was concerned about the permissive nature of the term "may", which was proposed to replace "shall" or "must". In addition, this new proposal did not include the Tables from each section proposed to be amended and didn't reflect that some Tables were nonretroactive.

In preparation for the 2026 NCWM Interim Meeting, OWM created a review Table which included the Category 3 Method of Sealing language from each Table in the 2026 version of NIST HB 44, the language proposed by the Measuring Sector, and the suggested language from OWM, properly formatted. This document was sent to the S&T Committee to assist in determining how to proceed with this block.

Summary of Discussions and Actions:

At the 2026 NCWM Interim Meeting, the submitter of the initial item, Michael Keilty (Endress+Hauser), explained the reason for submitting the proposal. In speaking with a manufacturer of water meters, who was having difficulty getting approval for a meter because of the way it was designed to be sealed, he realized that the language in the sealing tables was inconsistent and outdated in some sections, as they didn't allow sealing data to be provided electronically as the only option. The language for Category 3 sealing methods in the LMD Code served as the basis for the initial language. After hearing comments at the WWMA Annual Meeting, Michael added the item to the NTEP Measuring Meeting agenda. At that Sector meeting, the members agreed that the Category 3 Method of Sealing language in Section 3.40 EVFS was preferable, and they submitted a Form 15 to replace the item submitted by Michael. After further deliberation, changing "shall" to "may" would potentially introduce permissive language and requested that the Committee consider the language proposed by OWM. Corey Hainy (SMA) spoke to the SMA positions and identified that they are based on outdated language. Speaking unofficially, in conversations with Mike (Michael Keilty), it was recognized that the language proposed by the Measuring Sector may not be ideal, and they support language that is consistent across each section, and requested that sections applicable to weighing devices be added to the block with whatever language the Committee determines is appropriate. Brent Price (Gilbarco) agreed with Michael Keilty's comments, specifically in reference to considering OWM's proposed language and supported this block as Voting with updated language from NIST. Loren Minnich (NIST OWM) referred to a review table, which was emailed to the Committee, that included Category 3 Method of Sealing language from each Table in the 2026 version of NIST HB 44, the language proposed by the Measuring Sector, and the suggested language from OWM. OWM doesn't support the language proposed by the Measuring Sector, specifically the use of the term "may" as it could be misinterpreted as allowing the option to not have event logger information available at the time of

inspection. That "new" proposal also included language that, if adopted, would make all the tables retroactive; many are currently nonretroactive and should remain that way. Based on the LMD code Method of Sealing for Category 3, NIST OWM suggests language similar to that included in our Detailed Analysis. Since the EVSE and the Tentative NUEMS codes differ more from other Measuring Codes, more feedback may be needed from stakeholders on the NIST, OWM proposed language. OWM suggested that an updated version could be assigned a Voting status, and if there are concerns, it could later be downgraded. Jason Flint (NJ) indicated that they didn't support the item as included in the agenda, but supported the OWM-suggested language, recommending a Developing status. Kurt Floren (LA County, CA) had concerns with the agenda item but supported OWM language and recommended a Voting status with this updated language. Matt Douglas (CDA DMS) agreed with OWN and NJ, and supported a Voting status with the OWM language and inclusion of additional sections as specified by the SMA. Brent Price (Gilbarco) asked about the nonretroactive vs. retroactive language referred to by OWM. Loren Minnich (NIST OWM) clarified that the tables with nonretroactive language should remain nonretroactive, as proposed in the NIST review table. Michael Keilty (Endress+Hauser) commented that based on what has been shared, the key is uniformity between sections supporting a Voting status, which could be downgraded in July if any issue is identified.

The S&T Committee updated the item based on input from NIST OWM and Michael Keilty, the submitter of the item, and added additional weighing codes as recommended by SMA, and assigned a Voting status to all Block 3 items.

Regional Association Reporting:

Note: The 2025 regional associations reported the same comments for each item in this Block as provided below.

Western Weights and Measures Association

At the 2025 WWMA Annual Meeting, the following comments were received:

Mr. Loren Minich (NIST Office of Weights and Measures): NIST OWM has not had time to evaluate this block of items thoroughly. We understand the idea of the proposal, however the LMD language should be reviewed as this language could be used as an alternative, or it could be helpful in developing this item further. The language currently as written in this item does not seem to carry out the stated purpose.

Mr. Kurt Floren (Los Angeles County, California): Spoke to concerns with the event logger. An onsite inspector should be able to review a printed copy at the time of inspection. The information may also be available electronically, but it must be available on site. The current language may allow the event log to only be available off-site.

Mr. Cory Hainy (Avery Weigh-Tronix): Asked why the submitter chose to leave outweighing devices. Position on the item is neutral.

Mr. Loren Minich (NIST Office of Weights and Measures): Stated OWM did not know why scales code was not included. OWM believes this proposal is an attempt to harmonize with the LMD code. The event logger must be available at the time of inspection printed or electronically. This must be in the language.

Mr. Matthew Douglas (State of California, Division of Measurement Standards): Responding to Mr. Hainy – see additional documentation as to why 2.20 was not included. Language from 3.30 categories for sealing table code could be used: "The information may be printed by the device, printed by another on-site device, or transmitted electronically." Rather than the language as it appears in the agenda, which seems to still require a printed copy of the event logger information. Each one of these codes will need to be assessed to

verify that the proposed update is applicable and appropriate and that they all reflect that this information must be produced by the device and available at the time of the inspection. If the item moves forward, Matthew Douglas recommends a Developing status.

Mr. Kurt Floren (Los Angeles County, California): Supports California DMS and OWM. Requests the committee include the LMD language as a suggestion to the submitter. The language at the time of inspection is critical language that must be included. The item should remain Developing and hear the comments from the other regions.

Mr. Scott Wagner (Colorado Division of Oil & Public Safety): Raised concern as this proposal applies to Category 3 sealing and would this language conflict with current methods particularly USB devices. The item has merit but needs additional work. Supports a Developing status.

Mr. Scott Simmons (P20:10 Services, LLC): Raised concern that the ability to use a memory stick device remains available. Supports a Developing status.

The 2025 WWMA S&T Committee recommends that this item be assigned a Developing status based on comments and testimony heard during the 2025 WWMA Annual Conference Open Hearing.

The WWMA S&T Committee recommends the submitter review the comments stated above particularly the language referenced from the LMD code and seek feedback from all stakeholders including NIST OWM and all the regional associations and its members who speak to this item.

Southern Weights and Measures Association

At the 2025 SWMA Annual Meeting, the S&T Committee heard the following comments:

Michael Keilty, Endress+Hauser (submitter) – Questioned Category 3 devices and mentioned that the descriptions in each Measuring code has disparities. Michael Keilty noted that the Liquid Measuring Device (LMD) Code had the best wording initially, so this wording was used in the original proposal to recommend for Category 3 Method of Sealing in the Measuring Codes for uniformity. Later, it was revised to the EVSE Cat 3 description as it is more explicit on how to provide event log information. There is materials available online, 2 submittals, (1) a letter to withdraw the original language (using LMD language) and (2) a new request (using EVFS language), MS Form 15 Method of Sealing 3.40 EVFS Table S.3.3, which includes an edit to strike “EVSE” and replace with “Device”.

Sections to be affected to allow uniformity:

- 3.30 LMD Table S.2.2,
- 3.31 VTM Table S.2.2.,
- 3.32 LPG&AALM Table S.2.2.,
- 3.34 CLM Table S.2.5.,
- 3.35 MM Table S.2.3.,
- 3.36 WM Table S.2.1.,
- 3.37 MFM Table S.3.5.,

- 3.38 CDLM Table S.2.5.,
- 3.39 HGM Table S.3.3,
- 3.40 EVFS Table S.3.3., and
- 3.41 NUEMS Table S.2.2.

This proposal allows for a device to be designed so that the event log can be obtained by some format, securely. Michael Keilty, Endress+Hauser, recommends Voting status.

Brent Price, Gilbarco, supports the item moving forward as Voting. He noted to be sure to include LMDs as part of this.

Alison Wilkinson, Maryland, supports Voting status

The committee recommends Voting status on the item, as revised and with the additional editorial revision removing the extra period in "3.4.1 NUEMs", changing it to "3.41 NEUMS". The comments apply for all Block 3 items.

The S&T committee added LMD-26.2 to the addendum sheet because it was left off from the form 15 codes to be edited.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, a representative from the State of New Jersey believes the event logger data must be available at the time of inspection, however the first EVF Table S.3.3 should be removed. The second version of the table is correct. A Representative from the State of New York echoed the comment made by New Jersey.

NEWMA recommended retaining the Voting status of the item.

At the 2025 NEWMA Interim Meeting, the S&T Committee heard from a representative from Vermont who recommended these tables should be consolidated and moved to a single location in the handbook, for example the general code or in an appendix.

A representative from New Jersey explained that the event logger information should be available at the time of inspection and was not sure if the information is transmitted electronically would allow for this.

The S&T Committee recommends a Developing status. Updates were submitted to the NEWMA S&T Chair.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommends this item block remain as Voting.

At the 2025 CWMA Interim Meeting, the Committee reviewed and considered updated language from the submitter of this block of items. This language differed from what was printed in the agenda. After the original Block 3 items were published, the NTEP Measuring Sector met and wanted to further harmonize the Category 3 Sealing language between various Codes. The updated language from the NTEP Measuring Sector was presented to the body during open hearing. The comments and recommendation below are based on the updated language. All supporting documents can be found on the CWMA site.

Loren Minnich – NIST OWM, commented that “may” in the proposal needs further review. This seems to move away from what was previously required. The intent is to allow electronic as an option in place of physical, but this could be interpreted to not require either method.

The S&T committee recommended this item, as it appears below, be given a Developing status based on comments received during open hearing.

3.30 LMD Table S.2.2.

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. The event logger information shall may be available at the time of inspection either as a printed copy or in electronic format. provided electronically in lieu of or in addition to a hard copy at the time of inspection, provided the event logger information is retained in the system for future reference. 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.)

3.31 VTM Table S.2.2., 3.32 LPG&AALM Table S.2.2., 3.34 CLM Table S.2.5., 3.35 MM Table S.2.3., 3.36 WM Table S.2.1., 3.37 MFM Table S.3.5., 3.38 CDLM Table S.2.5., 3.39 HGM Table S.3.3, 3.41 NUEMS Table S.2.2.

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 may be provided electronically in lieu of or in addition to a hard copy at the time of inspection, provided the event logger information is retained in the system for future reference. 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.)

3.40 EVFS Table S.3.3.

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. The event logger information may be provided electronically in lieu of or in addition to a hard copy at the time of inspection, provided the event logger information is retained in the system for future reference. The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the EVSE device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.).
At the 2026 CWMA Annual Meeting..

Scale Manufacturers Association (SMA)

The SMA position on this item was developed on November 5, 2025:

The SMA supports this as a Voting item with the addition of the corresponding sections from the 2.20 Scales code, 2.21 Belt-Conveyor Scale Systems code, 2.24 Automatic Weighing Systems code, and 5.58 MDMD code.

Scales – Table S.1.11 Category 3 Methods of Sealing

Belt-Conveyor Scale Systems– Table S.6 Category 3 Methods of Sealing

Automatic Weighing – Table S.1.3 Category 3 Methods of Sealing

MDMD – Table S.1.11 Category 3 Methods of Sealing for all four of the above additional sections, the changes would be as below:

An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available through the device or through another on-site device. The event logger information may be provided electronically in lieu of or in addition to a hard copy at the time of inspection, provided the event logger information is retained in the system for future reference. 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.)

ITEM BLOCK 4 (B4) – ELECTRIC VEHICLE ~~FUELING SYSTEMS~~ SUPPLY EQUIPMENT

B4: OTH-26.3 V Handbook 44 Main Table of Contents

B4: OTH-26.4 V Section 3 Table of Contents

B4: EVF-26.4 V Section 3.40. Electric Vehicle ~~Fueling Systems~~ Supply Equipment

B4: EMS-26.1 V A. Application

B4: TIM-26.1 V S.1.4. Recorded Representations

Source: National Council on Weights and Measures

Submitter's Purpose and Justification:

Rename the Handbook 44 3.40 Code to match the terminology used within the Code.

Original Justification:

The terminology, "Electric Vehicle Fueling Systems" is the title of the NIST Handbook 44 Code, but within the Code, the terminology, "Electric Vehicle Supply Equipment (EVSE)" is used. The latter is also what is defined in Appendix D. Having differing names for the same device type in Handbook 44 is confusing and unnecessary. "EVSE" has become the common acronym in referencing the devices by both regulators and industry.

NIST OWM Executive Summary

ITEM BLOCK 4 (B4) V Electric Vehicle ~~Fueling Systems~~ Supply Equipment
NIST OWM Recommendation: Voting • OWM supports renaming Section 3.40. Electric Vehicle Fueling Systems, replacing the phrase "Electric Vehicle Fueling Systems" with "Electric Vehicle Supply Equipment", in the title and throughout NIST HB 44. • Because the phrase "Electric Vehicle Supply Equipment" is used in most instances in NIST HB 44 when referring to devices that supply electrical energy to electric vehicles, it is defined in Appendix D, and is used in NIST HB 130 in the Method of Sale for Retail Sales of Electricity Sold as a Vehicle Fuel, this proposed change will make both handbooks' terminology more consistent.

ITEM BLOCK 4 (B4) V Electric Vehicle ~~Fueling Systems~~ Supply Equipment
• In item OTH-26.3, the words "Supply Equipment" should be underlined, instead of stricken through.

Table 2. Summary of Recommendations

ITEM BLOCK 4 (B4) V Electric Vehicle ~~Fueling Systems~~ Supply Equipment

	Status Recommendation		Note*	Comments
Submitter	None Specified			
OWM	Voting			
WWMA				Submitted after the regional associations met.
NEWMA	Voting			
SWMA				Submitted after the regional associations met.
CWMA	Voting			
NCWM	Voting			
	Number of Support Letters	**Number of Opposition Letters**	**Comments**	
Industry				
Manufacturers				
Retailers and Consumers				
Trade Association				

***Notes Key:**

1. Submitted modified language
2. Item not discussed or not considered
3. No meeting held
4. Not submitted on agenda
5. No recommendation

Item Under Consideration:

NOTE: This item has been edited to properly identify the section of the handbook affected and to correct formatting errors. The Items Under Consideration now reflect the structure required by NIST Handbook 44.

B4: OTH-26.3 V Handbook 44 Main Table of Contents

Amend NIST Handbook 44, Main Table of Contents as follows:

Main Table of Contents

.
.
.

Section 3.

B4: OTH-26.4 V Section 3 Table of Contents

Amend NIST Handbook 44, Section 3 Table of Contents as follows:

Section 3

Table of Contents

Page

Note: In this section of Handbook 44, the reference temperature for the temperature compensation of refined petroleum products is shown as “15 °C (60 °F).” Although these values are not exact equivalents, they reflect industry usage when the SI and U.S. customary units are used in measurements.

B4: EVF-26.4 V Section 3.40. Electric Vehicle ~~Fueling Systems~~Supply Equipment

Amend NIST Handbook 44, Section 3.40. Electric Vehicle Fueling Systems Code as follows:

Table of Contents

Page

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Section 3.40. Electric Vehicle ~~Fueling Systems~~Supply Equipment

Section 3.40. Electric Vehicle ~~Fueling Systems~~Supply Equipment was added as a "tentative code" in 2015. In July 2022, the status of the code was changed from "tentative" to "permanent" effective January 1, 2023. (Amended 2022 **and 20XX**)

B4: EMS-26.3 V A. Application

Amend NIST Handbook 44, Section 3.41. Non-Utility Electricity-Measuring Systems – Tentative Code as follows:

A. Application

A.1. General. – This code applies to measuring systems used in non-utility sales of electric energy wherein the sale is based in whole or in part on one or more measured quantities.

A.2. Exceptions. – This code does not apply to:

(a) The use of any measuring system owned, maintained, and/or used by a utility.

(b) Measuring systems used solely for delivering electric energy in connection with operations in which the amount delivered does not affect customer charges or compensation.

(c) ~~Electric vehicle fueling s~~Systems **used for the measurement of electricity dispensed in vehicle fuel applications**. (See 3.40. Electric Vehicle ~~Fueling Systems~~Supply Equipment Code).

(d) Transactions not subject to weights and measures authority

(Amended 20XX)

B4: TIM-26.1 V S.1.4. Recorded Representations

Amend NIST Handbook 44, Section 5.55. Timing Devices Code as follows:

S.1.4. Recorded Representations.

S.1.4.1. Recorded Representations, Electric Vehicle Supply Equipment (EVSE) Timing Devices. – A timing device incorporated into an EVSE for use in assessing charges for timing separate from charges for electrical energy shall issue a recorded representation itemizing the charges for these services as defined in Section 3.40. Electric Vehicle ~~Fueling Systems~~Supply Equipment.

(Added 2015) **(Amended 20XX)**

NIST OWM Detailed Technical Analysis:

See Executive Summary.

Summary of Discussions and Actions:

At the 2026 NCWM Interim Meeting, Jose Arriaga (Orange County, CA) and Matt Douglas (CDA DMS) spoke in support of this item with a Voting Status. Loren Minnich (NIST OWM) supported Voting status, and for additional clarity and consistency, suggested this edit to A.2.(c) in EMS-26.3 (formerly EMS-26.1):

> ~~**Electric vehicle fueling s**~~**S**ystems **used for the measurement of electricity dispensed in vehicle fuel applications**.

Kurt Floren (LA County, CA) noted that the words "Supply Equipment" should be underlined, rather than stricken through in OTH-26.3, and supported Voting status with this change.

The NCWM Committee amended the item as suggested and assigned a Voting status to each item in the block.

Regional Association Reporting:

Western Weights and Measures Association

Submitted after the 2025 WWMA Annual Meeting.

Southern Weights and Measures Association

Submitted after the 2025 SWMA Annual Meeting.

Northeastern Weights and Measures Association

At the 2026 NEWMA Annual Meeting, the Committee recommended that the line in the table of contents should read as follows.

3.40. Electric Vehicle ~~**Fueling Systems**~~**Supply Equipment……**……..3-151

With this edit, the Committee recommends a Voting status.

NEWMA Annual 2026: A Representative from Tesco supports this item for clarity and alignment with the conventional language use regarding electric vehicle supply equipment.

Central Weights and Measures Association

At the 2026 CWMA Annual Meeting, the Committee recommends this item block remain as Voting.

References:

NIST OWM Analysis and Executive Summary reports **https://www.nist.gov/pml/weights-and-measures/publications/owm-technical-analysis**

National Conference on Weights and Measures Publication 15 (2023) and 16 (2022) **https://www.ncwm.com**

1905-2022 NCWM Annual Conference reports **https://www.nist.gov/pml/owm/publications/ncwm-annual-reports**

Appendix A. Supplemental Documents:

There are no supplemental documents within this Analysis.

Appendix B. List of Symbols, Abbreviations and Acronyms

FHWA

Automatic Bulk Weighing System

AAR

Association of American Railroads

API

American Petroleum Institute

CNG

Compressed Natural Gas

CWMA

Central Weights and Measures Association

EPO

Examination Procedure Outline

EV

Electric Vehicle

EVFE

Electric Vehicle Fueling Equipment

EVSE

Electric Vehicle Supply Equipment

FHWA

Federal Highway Administration

HB

Handbook

LMD

Liquid Measuring Devices

LPG

Liquified Petroleum Gas

MMA

Meter Manufacturer Association

NCWM

National Conference on Weights and Measures

NEWMA

Northeastern Weights and Measures Association

NIST

National Institute of Standards and Technology

NTEP

National Type Evaluation Program

OWM

Office of Weights and Measures

OIML

International Organization of Legal Metrology

PUB

Publication

RMFD

Retail Motor Fuel Dispenser

S&T

Specification and Tolerances

SD

Secure Digital

SI

International System of Units

SMA

Scale Manufacturers Association

SWMA

Southern Weights and Measures Association

USNWG

U.S. National Work Group

VTM

Vehicle Tank Meter

WIM

Weigh-in-Motion

WWMA

Western Weights and Measures Association