INSTRUCTIONS

For items designated **Voting** by NCWM:

- Express regional support as written
- Express regional support with recommended modifications
- Express regional opposition or concern and a recommendation to downgrade to Informational, Developing, or Withdrawn, **OR**
- Take no regional position on the item.

For items designated **Informational**, **Assigned** or **Developing**:

- Provide comments and suggestions to improve the item and, if appropriate, recommend a status change,
- Recommend the item be withdrawn with justification, **OR**
- Indicate that the item was reviewed and there were no comments.

For **New Items** which have no assigned status:

- Forward the item to NCWM with comments and recommended status of Voting, Informational, Assigned, Developing, **OR**
- Do not forward to NCWM and provide justification for this action. In this instance, you will recommend a Withdrawal of the item in case it was forwarded to NCWM by another region, **OR**
- Select the final option of "No Recommendation". This option is used when the region lacks insight on whether the proposal has merit. The proposal will not be forwarded to NCWM by your region.

1

CWMA Specifications and Tolerances (S&T) Committee
2023 Interim Meeting Agenda

Mr. Daniel Walker, Committee Chair
Ohio

INTRODUCTION

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

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

Subject Series List

Table A
Table of Contents

Appendices

Table B
Glossary of Acronyms and Terms

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

Details of All Items
(In order by Reference Key)

1 **SCL – SCALES**

2 **SCL-24.1 D S.1.7. Capacity Indication, Weight Ranges, and Unit Weights.**

SCL-24.1
Regional recommendation to NCWM on item status: ☐ Recommend as a Voting Item on the NCWM agenda ☐ Recommend as an Information Item on the NCWM agenda ☐ Recommend as an Assigned Item on the NCWM agenda *(To be developed by an NCWM Task Group or Subcommittee)* ☒ Recommend as a Developing Item on the NCWM agenda *(To be developed by source of the proposal)* ☐ Recommend Withdrawal of the Item from the NCWM agenda *(In the case of new proposals, do not forward this item to NCWM)* ☐ No recommendation from the region to NCWM *(If this is a new proposal, it will not be forwarded to the national committee by this region)*
Comments and justification for the regional recommendation to NCWM: *(This will appear in NCWM reports)*
Greg VanderPlaats from Minnesota stated that the terms 'Retail Scale', ECR, and POS are not defined in NIST Handbook 44. Steve Peter from Wisconsin agreed with Greg's Comments. He also suggested adding the word 'Price' to the term Electronic Computing Scales. The committee recommends that this item is a developing item.

3 **SCL-24.2 D Multiple Sections Regarding Tare**

SCL-24.2
Regional recommendation to NCWM on item status: ☐ Recommend as a Voting Item on the NCWM agenda ☐ Recommend as an Information Item on the NCWM agenda ☐ Recommend as an Assigned Item on the NCWM agenda *(To be developed by an NCWM Task Group or Subcommittee)* ☒ Recommend as a Developing Item on the NCWM agenda *(To be developed by source of the proposal)* ☐ Recommend Withdrawal of the Item from the NCWM agenda *(In the case of new proposals, do not forward this item to NCWM)* ☐ No recommendation from the region to NCWM *(If this is a new proposal, it will not be forwarded to the national committee by this region)*
Comments and justification for the regional recommendation to NCWM: *(This will appear in NCWM reports)*
No comments were heard.

The committee recommends this item as developing and seeks input from industry stakeholders.

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

SCL-22.3

Regional recommendation to NCWM on item status:

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

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

No comments were heard.

The committee recommends this item as a voting item.

SCL-23.3 A Verification Scale Division e: Multiple Sections Including, T.N.1.3., Table 6., T.N.3., T.N.4., T.N.6., T.N.8., T.N.9., T.1., T.2., S.1.1.1., T.N.1.2., Table S.6.3.a., Table S.3.6.b., Appendix D, S.1.2.2., Table 3., S.5.4., UR.3., Table 8.

SCL-23.3

Regional recommendation to NCWM on item status:

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

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

No comments were heard.

The committee recommends this item remain as assigned.

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

SCL-22.2

Regional recommendation to NCWM on item status:

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

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

No comments were heard.

The committee recommends this item remain as assigned.

2 **AWS – AUTOMATIC WEIGHING SYSTEMS CODE**

3 **AWS-24.1 D N.1.5. Test Loads,**

AWS-24.1

Regional recommendation to NCWM on item status:

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

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

No comments were heard.

The committee recommends this item as developing and seeks input from industry stakeholders.

AWS-24.2 D N.1.6. Influence Factor Testing.

AWS-24.2

Regional recommendation to NCWM on item status:

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

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

No comments were heard.

The committee recommends this item as developing and seeks input from industry stakeholders.

AWS-24.3 D <u>N.22.3. Shift Test (Dynamic)</u>

AWS-24.3

Regional recommendation to NCWM on item status:

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

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

No comments were heard.

The committee recommends this item as developing and seeks input from industry stakeholders.

1 WIM – WEIGH-IN-MOTION SYSTEMS – TENTATIVE CODE

2 WIM-23.1 V Remove Tentative Status and Amend Numerous Sections Throughout

WIM-23.1
Regional recommendation to NCWM on item status: ☒ Recommend as a Voting Item on the NCWM agenda ☐ Recommend as an Information Item on the NCWM agenda ☐ Recommend as an Assigned Item on the NCWM agenda *(To be developed by an NCWM Task Group or Subcommittee)* ☐ Recommend as a Developing Item on the NCWM agenda *(To be developed by source of the proposal)* ☐ Recommend Withdrawal of the Item from the NCWM agenda *(In the case of new proposals, do not forward this item to NCWM)* ☐ No recommendation from the region to NCWM *(If this is a new proposal, it will not be forwarded to the national committee by this region)*
Comments and justification for the regional recommendation to NCWM: *(This will appear in NCWM reports)* Tanvi Pandya and Chaekuk Na presented on behalf of the submitters outlining the changes that have been made to address previous concerns. Mike Harrington from Iowa supports this item and recommends it moving forward as voting. Greg VanderPlaats from Minnesota commented that the submitters have done a lot of work and have made changes per the feedback received at the National Conference. He supports this item as voting. The committee recommends this item moving forward as a voting item with the proposed changes by the submitter which are attached to the end of this report. [APPENDIX B]

3 VTM – VEHICLE TANK METERS

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

VTM-20.2
Regional recommendation to NCWM on item status: ☐ Recommend as a Voting Item on the NCWM agenda ☐ Recommend as an Information Item on the NCWM agenda ☒ Recommend as an Assigned Item on the NCWM agenda *(To be developed by an NCWM Task Group or Subcommittee)* ☐ Recommend as a Developing Item on the NCWM agenda *(To be developed by source of the proposal)* ☐ Recommend Withdrawal of the Item from the NCWM agenda *(In the case of new proposals, do not forward this item to NCWM)* ☐ No recommendation from the region to NCWM *(If this is a new proposal, it will not be forwarded to the national committee by this region)*
Comments and justification for the regional recommendation to NCWM: *(This will appear in NCWM reports)*

No comments were heard.

The committee recommends this item be blocked with MLK 23.2 and remain as assigned with the task group so that a chair can be assigned and established concerns continued to be addressed.

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

LPG-23.1 W S.2.5. Zero-Set-Back Interlock

LPG-23.1

Regional recommendation to NCWM on item status:

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

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

No comments were heard.

The committee recommends this item as withdrawn as we believe the attempted revision of this item was actually a resubmission listed under item LPG 24.2. The committee recommends that the discussion history for this item be moved to LPG 24.2. These recommendations are intended to clean up what we perceive to be an administrative error in that LPG 24.2 should not have been created, but should have been an update to this item (LPG 23.1).

LPG-24.1 V *S.1.5.7. ~~Retail Motor Fuel Dispenser~~Liquefied Petroleum Gas Retail Motor Fuel Device., S.2.6.1. Electronic Stationary (Other than Stationary ~~Retail Motor Fuel Dispensers~~Liquefied Petroleum Gas Retail Motor Fuel Device). S.6.2. Automatic Timeout Pay-at-Pump ~~Retail Motor Fuels Devices~~Liquefied Petroleum Gas Retail Motor Fuel Device.* **and,** *S.4.3. Location of Marking Information: ~~Retail Motor Fuel Dispensers~~Liquefied Petroleum Gas Retail Motor Fuel Device.*

LPG-24.1

Regional recommendation to NCWM on item status:

- ☒ Recommend as a Voting Item on the NCWM agenda
- ☐ Recommend as an Information Item on the NCWM agenda
- ☐ Recommend as an Assigned Item on the NCWM agenda
  (To be developed by an NCWM Task Group or Subcommittee)
- ☐ Recommend as a Developing Item on the NCWM agenda

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

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

Greg VanderPlaats from Minnesota asked if LPG 23.1 needs to pass before this item can be considered.

The committee recommends this item as a voting item blocked with item OTH 24.1.

1 **LPG-24.2 V ~~*S.2.5. Zero-Set-Back Interlock.*~~ S.2.5. Zero-Set-Back Interlock.**

LPG-24.2

Regional recommendation to NCWM on item status:

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

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

Greg VanderPlaats from Minnesota asked if there is a concern with one of the LPG items passing and not the others. Should they be blocked together?

The committee recommends this item as a voting item.

The committee believes that this item is an attempted revision of item LPG 23.1 and should not have been submitted. Now that this item has been submitted, the committee recommends that the discussion history for LPG 23.1 be moved to LPG 24.2. These recommendations are intended to clean up what we perceive to be an administrative error in that LPG 24.2 should not have been created but should have been an update to item LPG 23.1.

2 **MLK – MILK METERS**

3 **MLK-23.2 A Table T.1. Tolerances for Milk Meters**

MLK-23.2

Regional recommendation to NCWM on item status:

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

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

No comments were heard.

The committee recommends this item be blocked with VTM 20.2 and remain as assigned with the task group so that a chair can be assigned and established concerns continued to be addressed.

1 # HGM – HYDROGEN GAS-MEASURING DEVICES

2 ## HGM-23.1 W UR.3.8. Safety Requirement

HGM-23.1

Regional recommendation to NCWM on item status:

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

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

No comments were heard.

The committee recommends this item be withdrawn. The committee questions the merit of this information being provided in Handbook 44, and have not received answers to questions outlined in the historical comments for this item.

3 # EVF – ELECTRIC VEHICLE FUELING SYSTEMS

4 ## EVF-24.1 D S.1.3. Mobile Device as Indicating Element for AC Chargers.

EVF-24.1

Regional recommendation to NCWM on item status:

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

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

No comments were heard.

The committee recommends this item as developing and seeks input from industry stakeholders.

1

EVF-24.2 V S.2.7. Indication of Delivery, N.5.2. Accuracy Testing., and T.2.1. EVSE Load Test Differences.

EVF-24.2
Regional recommendation to NCWM on item status: ☒ Recommend as a Voting Item on the NCWM agenda ☐ Recommend as an Information Item on the NCWM agenda ☐ Recommend as an Assigned Item on the NCWM agenda *(To be developed by an NCWM Task Group or Subcommittee)* ☐ Recommend as a Developing Item on the NCWM agenda *(To be developed by source of the proposal)* ☐ Recommend Withdrawal of the Item from the NCWM agenda *(In the case of new proposals, do not forward this item to NCWM)* ☐ No recommendation from the region to NCWM *(If this is a new proposal, it will not be forwarded to the national committee by this region)*
Comments and justification for the regional recommendation to NCWM: *(This will appear in NCWM reports)* Perry Lawton from TESCO spoke in support of the change of the date stating that the equipment will be available at the end of this year. Theo Brillhart from Fluke support this modification in anticipating the equipment will be sufficiently available to inspectors using this timeline. Scheleese Goudy from Electrify America is concerned that there is nothing beyond a prototype available at this time. Items should not be added to the Handbook in hopes we might be able to have equipment in the future because we might be creating a law that cannot be complied with. This item does not address legacy equipment. Electrify America recommends making this a developing item so that the submitter can address these concerns. Mike Harrington from Iowa stated that he can be swayed either way and he believes the test equipment will be ready. He would not mind leaving the 2028 date in place. Recommend developing or informational while we await feedback from other regional meetings. Does not support voting status. The committee recommends this item as a voting item.

EVF-23.4 V S.5.2. EVSE Identification and Marking Requirements, S.5.3. Abbreviations and Symbols, and N.5. Test of an EVSE System.

EVF-23.4
Regional recommendation to NCWM on item status: ☒ Recommend as a Voting Item on the NCWM agenda ☐ Recommend as an Information Item on the NCWM agenda ☐ Recommend as an Assigned Item on the NCWM agenda *(To be developed by an NCWM Task Group or Subcommittee)* ☐ Recommend as a Developing Item on the NCWM agenda *(To be developed by source of the proposal)* ☐ Recommend Withdrawal of the Item from the NCWM agenda *(In the case of new proposals, do not forward this item to NCWM)*

☐ No recommendation from the region to NCWM
(If this is a new proposal, it will not be forwarded to the national committee by this region)

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

The committee heard comments on this item and item EVF 23.7 concurrently. Comments made about this item will also be found in the comments section on item EVF 23.7.

Theo Brillhart from Fluke presented material regarding the merge of EVF 23.4 and EVF 23.7 by the submitters as well as the passing of item EVF 23.1 at the 2023 Annual NCWM Meeting. The passing of item EVF 23.1 has forced a renumbering of sections within this current proposal. The submitters of EVF 23.4 and EVF 23.7 have reflected those changes in their proposal. With these changes (letter submitted), the submitter recommends this item as voting.

Scheleese Goudy from Electrify America agrees with the proposal because it makes testing easier. Language regarding '10 amps or above' fixes the concerns between item EVF 23.4 and item EVF 23.7.

Perry Lawton from TESCO applauds the work achieved between EVF 23.4 and EVF 23.7.

Steve Peter from Wisconsin supported this item.

The committee recommends this item moving forward as a voting item with the proposed changes by the submitter which are attached to the bottom of this report. [APPENDIX C]

EVF-23.6 V S.5.2. EVSE Identification and Marking Requirements., and T.2. Tolerances.

EVF-23.6
Regional recommendation to NCWM on item status: ☒ Recommend as a Voting Item on the NCWM agenda ☐ Recommend as an Information Item on the NCWM agenda ☐ Recommend as an Assigned Item on the NCWM agenda *(To be developed by an NCWM Task Group or Subcommittee)* ☐ Recommend as a Developing Item on the NCWM agenda *(To be developed by source of the proposal)* ☐ Recommend Withdrawal of the Item from the NCWM agenda *(In the case of new proposals, do not forward this item to NCWM)* ☐ No recommendation from the region to NCWM *(If this is a new proposal, it will not be forwarded to the national committee by this region)*
Comments and justification for the regional recommendation to NCWM: *(This will appear in NCWM reports)*

Scheleese Goudy from Electrify America presented on this item. Scheleese recommends this as a voting item with revisions.

Mike Harrington from Iowa supports item with changes and that we should not put accuracy markings regarding tolerances on the meter because we might need to then do that for all devices. Tolerances are currently public information and consumers can find them if needed. Accuracy class marking will help inspectors know what tests/tolerances to apply and should be on the devices. Mike supports this item as voting.

Greg VanderPlaats from Minnesota supported this item at the 2023 NCWM Annual Meeting. The language in this updated proposal is better than the previous version. Greg supports as a voting item.

The committee recommends this item as a voting item with the following changes:

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

(a) voltage rating;
(b) maximum current deliverable;
(c) type of current (AC or DC or, if capable of both, both shall be listed);
(d) minimum measured quantity (MMQ); and
(e) temperature limits, if narrower than and within – 40 °C to + 85 °C (− 40 °F to + 185 °F).

S.5.2.1. Marking of Accuracy Class, DC EVSEs Placed in Service Prior to 2024. - A DC EVSE that was placed into service prior to 2024 and is subject to the tolerances of T.2.2(a) is an accuracy Class 5 EVSE, and shall be marked with Class 5. The marking shall be conspicuously and legibly displayed in a position plainly visible to a person accessing a charging port of the EVSE. The indicating element may be used for the marking, provided the marking is visible to the customer prior to the beginning of the transaction.

(Added 202X)

T.2. Test Tolerances.

T.2.1. EVSE ~~Load~~ **Accuracy** Test Tolerances for **AC Systems**. – The tolerances for EVSE load tests **for AC systems** are:
(a) Acceptance Tolerance: 1.0 %; and
(b) Maintenance Tolerance: 2.0 %.

T.2.2 EVSE Accuracy Test Tolerances for DC Systems. -- The tolerances for EVSE load tests on DC systems shall be as follows:

(a) For a DC system that was placed in service prior to January 1, 2024, and that is marked Class 5, acceptance and maintenance tolerances are: 5.0 %. This paragraph T.2.2(a) shall expire on January 1, 2034; after that date, all DC EVSEs shall be subject to the tolerances of paragraph T.2.2(b).

(b) For any DC system not subject to paragraph T.2.2(a), tolerances are:
(1) Acceptance Tolerance: 1.0 %; and
(2) Maintenance Tolerance: 2.0 %.

All DC EVSE are exempt from this requirement until January 1, 2028.

EVF-23.7 V ~~N.1. No Load Test, N.2. Startin Load Test.~~, N.5.2. Accuracy Testing, And Appendix D: <u>maximum deliverable amperes.</u>

EVF-23.7
Regional recommendation to NCWM on item status: ☒ Recommend as a Voting Item on the NCWM agenda ☐ Recommend as an Information Item on the NCWM agenda ☐ Recommend as an Assigned Item on the NCWM agenda *(To be developed by an NCWM Task Group or Subcommittee)* ☐ Recommend as a Developing Item on the NCWM agenda *(To be developed by source of the proposal)* ☐ Recommend Withdrawal of the Item from the NCWM agenda *(In the case of new proposals, do not forward this item to NCWM)* ☐ No recommendation from the region to NCWM *(If this is a new proposal, it will not be forwarded to the national committee by this region)*
Comments and justification for the regional recommendation to NCWM: *(This will appear in NCWM reports)* The committee heard comments on this item and item EVF 23.4 concurrently. Comments made about this item will also be found in the comments section on item EVF 23.4. Theo Brillhart from Fluke presented material regarding the merge of EVF 23.4 and EVF 23.7 by the submitters as well as the passing of item EVF 23.1 at the 2023 Annual NCWM Meeting. The passing of item EVF 23.1 has forced a renumbering of sections within this current proposal. The submitters of EVF 23.4 and EVF 23.7 have reflected those changes in their proposal. With these changes (letter submitted), the submitter recommends this item as voting. Scheleese Goudy from Electrify America agrees with the proposal because it makes testing easier. Language regarding '10 amps or above' fixes the concerns between item EVF 23.4 and item EVF 23.7. Perry Lawton from TESCO applauds the work achieved between EVF 23.4 and EVF 23.7. Steve Peter from Wisconsin supported this item. The committee recommends this item moving forward as a voting item with the proposed changes by the submitter which are attached to the bottom of this report (same proposal referenced in item EVF 23.4). [APPENDIX C]

GMA – GRAIN MOISTURE METERS 5.56 (A)

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

GMA-19.1
Regional recommendation to NCWM on item status: ☐ Recommend as a Voting Item on the NCWM agenda ☐ Recommend as an Information Item on the NCWM agenda ☐ Recommend as an Assigned Item on the NCWM agenda *(To be developed by an NCWM Task Group or Subcommittee)* ☒ Recommend as a Developing Item on the NCWM agenda *(To be developed by source of the proposal)* ☐ Recommend Withdrawal of the Item from the NCWM agenda *(In the case of new proposals, do not forward this item to NCWM)* ☐ No recommendation from the region to NCWM *(If this is a new proposal, it will not be forwarded to the national committee by this region)*
Comments and justification for the regional recommendation to NCWM: *(This will appear in NCWM reports)* No comments were heard. The committee recommends this item as developing to allow time to collect additional data.

OTH – OTHER ITEMS

OTH-16.1 I Electric Watthour Meters Tentative Code

OTH-16.1
Regional recommendation to NCWM on item status: ☐ Recommend as a Voting Item on the NCWM agenda ☒ Recommend as an Information Item on the NCWM agenda ☐ Recommend as an Assigned Item on the NCWM agenda *(To be developed by an NCWM Task Group or Subcommittee)* ☐ Recommend as a Developing Item on the NCWM agenda *(To be developed by source of the proposal)* ☐ Recommend Withdrawal of the Item from the NCWM agenda *(In the case of new proposals, do not forward this item to NCWM)* ☐ No recommendation from the region to NCWM *(If this is a new proposal, it will not be forwarded to the national committee by this region)*
Comments and justification for the regional recommendation to NCWM: *(This will appear in NCWM reports)* No comments were heard. The committee recommends this item as informational.

OTH-24.1 V Appendix D, Definitions: liquefied petroleum gas retail motor-fuel device.

OTH-24.1

Regional recommendation to NCWM on item status:

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

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

No comments were heard.

The committee recommends this item as voting item blocked with item LPG 24.1.

OTH-24.2 V Appendix D, Definitions: National Type Evaluation Program (NTEP) and Certificate of Conformance (CC)

OTH-24.2

Regional recommendation to NCWM on item status:

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

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

Greg VanderPlaats from Minnesota stated that Jerry Buendel proposed this item because in developing tests for service agents on the national level it was discovered that those terms are not defined in Handbook 44. Service people will have questions on these definitions. Recommend voting status for this item.

The committee recommends this item as voting.

ITEM BLOCK 1 (B1) TRANSFER STANDARD

B1-LMD-24.1 V ~~***N.3.5.X. Field Standard Meter Test***~~**N.3.5.X. Transfer Standard Test.**

B1-VTM-24.1 V ~~***N.3.5.X. Field Standard Meter Test***~~**N.3.5.X. Transfer Standard Test.**

B1-LPG-24.3 V **N.3.2. ~~Field Standard Meter~~Transfer Standard Test.**

B1-MLK-24.1 V ~~***N.3.2. Field Standard Meter Test.***~~**N.3.2. Transfer Standard Test.**

B1-MFM-24.1 **~~.~~N.3.2. ~~Field Standard Meter~~Transfer Standard Test.**

ITEM BLOCK 1
Regional recommendation to NCWM on item status: ☒ Recommend as a Voting Item on the NCWM agenda ☐ Recommend as an Information Item on the NCWM agenda ☐ Recommend as an Assigned Item on the NCWM agenda *(To be developed by an NCWM Task Group or Subcommittee)* ☐ Recommend as a Developing Item on the NCWM agenda *(To be developed by source of the proposal)* ☐ Recommend Withdrawal of the Item from the NCWM agenda *(In the case of new proposals, do not forward this item to NCWM)* ☐ No recommendation from the region to NCWM *(If this is a new proposal, it will not be forwarded to the national committee by this region)*
Comments and justification for the regional recommendation to NCWM: *(This will appear in NCWM reports)*
No comments were heard. The committee recommends this block as voting.

Mr. Daniel Walker, Ohio | Committee Chair
Mr. Eric Rauch, Iowa | Member
Mr. Tim Peterson, Minnesota | Member
Mr. Brett Willhite, Minnesota | NCWM Representative

Specifications and Tolerances Committee

APPENDIX A

Item SCL-23.3 – Final Report of the Verification Scale Division Task Group

*Note: This appendix originally appeared for **Item Block 2 - Define True Value For Use In Error Calculations**, which was withdrawn and replaced by **SCL-23.3 - Verification Scale Division e: Multiple Sections Including, T.N.1.3., Table 6., T.N.3., T.N.4., T.N.6., T.N.8., T.N.9., T.1., T.2., S.1.1.1., T.N.1.2., Table S.6.3.a., Table S.3.6.b., Appendix D, S.1.2.2., Table 3., S.5.4., UR.3., Table 8.** The Committee decided to preserve the appendix, since it remains relevant to item SCL-23.3.*

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

The mission of the task group, as defined by the S&T Committee, is to review Handbook 44, Section 2.20. Scales and relevant portions of OIML R76, using the items included in S&T Agenda Items: Block 2 as a reference point, and recommend changes as necessary to:

1. Clarify how the error is determined in relation to the verification scale division (e) and the scale division (d)
2. Clarify which is the proper reference; the verification scale division (e) or the scale division (d) throughout this section
3. Ensure proper selection of a scale in reference to the verification scale division (e) and the scale division (d)
4. Clarify the relationship between the verification scale division (e) or the scale division (d)

This report is divided into three sections:
1. Clarify the relationship between e and d, i.e., ensure we understand the terms. (Mission items 4 and1)
2. Propose changes to the Scales Code, if necessary, to ensure the code correctly identifies e or d as appropriate to the code paragraph. (Mission items 2 and 3)
3. Address other issues that arose as potential problems that might require additional investigation beyond the scope of this workgroup.

PART 1. Clarify the Relationship Between e and d.

We begin by looking at current HB44 definitions. The verification scale division e is used to express tolerance values and it is used in classification. The designations of e and the accuracy class are made by the manufacturer. The scale division d is a function of the actual scale function and display. Note that for weight classifiers, the weighing instrument may never display quantity at the resolution of e, and for ungraduated devices there is no scale division d to permit comparison to e.

verification scale division, value of (e). – A value, expressed in units of weight (mass) and specified by the manufacturer of a device, by which the tolerance values and the accuracy class applicable to the device are determined. The verification scale division is applied to all scales, in particular to ungraduated devices since they have no graduations. The verification scale division (e) may be different from the displayed scale division (d) for certain other devices used for weight classifying or weighing in pre-determined amounts, and certain other Class I and II scales.[2.20]

scale division, value of (d). – The value of the scale division, expressed in units of mass, is the smallest subdivision of the scale for analog indication or the difference between two consecutively indicated or printed values for digital indication or printing. (Also see "verification scale division.") [2.20, 2.22]

scale division, number of (n). – Quotient of the capacity divided by the value of the verification scale division. [2.20]

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

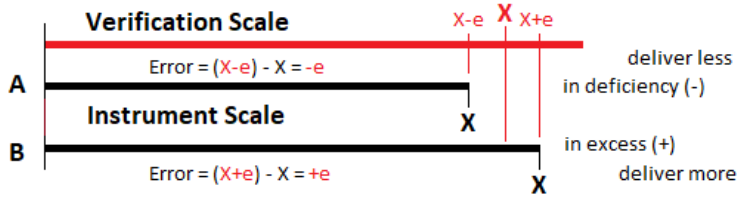
The values of e and d must be understood as referring to different things. The verification scale refers to the scale of measurement for the reference (or true value), think of the reference standard. The instrument scale refers to the scale of measurement of the instrument under test. Consider this assortment of instruments in the table below. It should be clear that the divisions of the verification scale do not always equal those on the instrument scale and may not even be in the same units. In addition, when we employ an artifact, like a test weight or slicker plate measure, the divisions of the verification scale are not visible since the artifact represents a single point on the measurement scale of the reference.

Instrument Scale	Scale div d	Verification "True Value" Scale	Scale div e	Relation e to d
Rule	1/16 in	Standard Rule or Tape	1/16 in	e = d
Taximeter	1/10 mi	Road Course	2 ft	e << d
LMD's	0.1 gal	Prover indication	5 cu in	e > d
Mass Flow Meter	1 lb	Reference Scale	0.01 lb	e < d
Weighing Devices	0.01 lb	Test Weight (artifact)	mfr choice	e < d, e = d, e > d
Test Measure	1 cu in	Slicker Plate (artifact)	?	e ? d

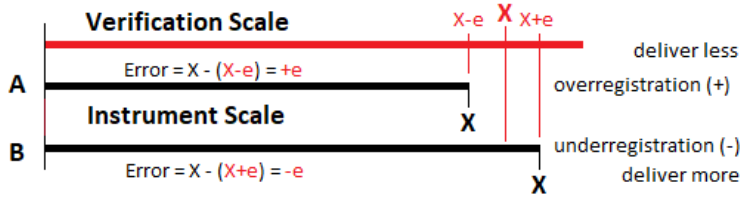
For weighing instruments, it turns out that e and d have no fixed relationship. It is different for weight classifiers (e < d), for most instruments (e = d), and for high resolution instruments (e>d). The critical point is that the instrument scale and the verification scale are independent of each other. Once you have disconnected e (declared by the manufacturer) from d (displayed on the instrument), it may now become evident that much of our confusion arose because we thought of them as connected in some way.

In the graphics below both error and tolerance are always expressed in terms of the divisions (e) of the verification scale. The primary assumption is that the verification scale is constant, and it is the displayed scales of the instruments we test that move. The scales in black are depicted as in error by +1 e or –1 e.

Error of delivery =
verification scale – instrument scale
+ in excess
– in deficiency

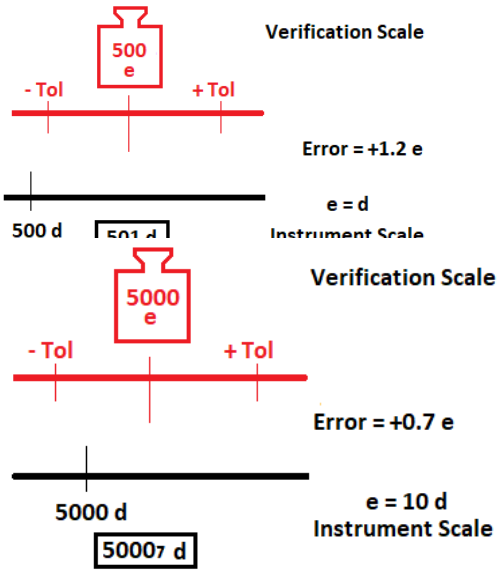


Error of Indication =
instrument scale – verification scale
+ over registration
– underregistration



Much of our confusion arises because scales are tested using artifacts with no visible scale divisions. We could mirror this in the test of a fuel dispenser. Normally you stop the test at 5 gallons on the instrument scale and read the error as – 3 cu in from the test measure (verification) scale. Now change that procedure and stop the test at the zero mark on the test measure. How would you determine the error? Assume the instrument now reads 5.012 gal. The error is -0.012 gal (-3 cu in), and we calculate it as verification scale – instrument scale. We determined the error from the instrument scale. The verification scale division, however, did not switch from the test measure to the instrument simply because we changed the procedure. The verification scale division remains 1 cu in and is still on the test measure, the reference.

Consider the Class III scale at right where e = d. Technically you can't see divisions on either scale since the artifact has no visible divisions and the instrument is digital. The correct instrument indication of 500 d is 1.2 e short of 500 e on the verification scale. You could mirror this by applying 498.8 e of test weights to get indication of 500 d. It is not in tolerance, but only if you apply error weights in your test.



Consider the Class II scale at right where e = 10 d. You can't see divisions on either scale because the test weight is an artifact and the instrument are digital. The correct instrument indication of 50,000 d is short of the 5,000 e on the verification scale by 7 d. Thus, we say the error is +0.7 e. Error = instrument scale – verification scale. This instrument is clearly in tolerance. No error weights are necessary to see to finer than 1 e.

The principles of classification are found in the following HB44 paragraphs. In principle, the manufacturer tells the official what accuracy is to be applied to the instrument.

T.N.1. Principles.

T.N.1.1. Design. – The tolerance for a weighing device is a performance requirement independent of the design principle used.

T.N.1.2. Accuracy Classes. – Weighing devices are divided into accuracy classes according to the number of scale divisions (n) and the value of the scale division (d).

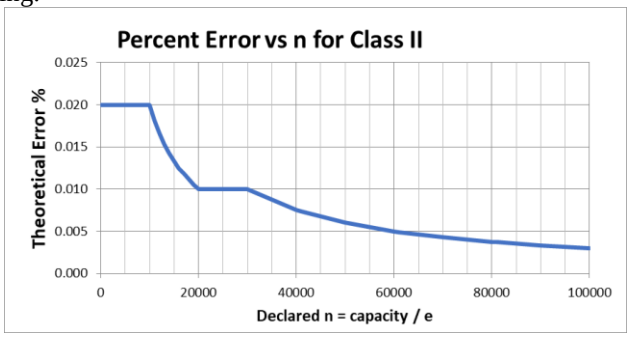
T.N.1.3. Scale Division. – The tolerance for a weighing device is related to the value of the scale division (d) or the value of the verification scale division (e) and is generally expressed in terms of d or e.

Yet, the T.N.1.2. and T.N.1.3. paragraphs conflict with the definitions. According to the definition of e, it is e "by which the tolerance values and the accuracy class applicable to the device are determined." When the Scales Code was drafted prior to adoption in 1984, it appears some things were lost in translation from the OIML R76 on which it was based. What was lost can be expressed as those things not included in HB44 and those things incorrectly translated in HB44.

For example, R76 expresses the classification information in four required markings, and one auxiliary marking. R76 requires marking of Class, Max, e, and Min, and requires marking of d if different from e. Those markings describe the maximum and minimum loads and the relative accuracy. In contrast, HB44 requires marking of Class, capacity, and d, and requires marking of e if different from d. HB44 does not require marking of minimum load. While R76 considers minimum load part of the class structure, HB44 does not.

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

Some additional confusion comes from the stepped tolerance structure. For example, it is common to think that the instrument gets 1 division of error over the first tolerance step (maintenance). The correct interpretation of the code requires the instrument maintain a % accuracy based on the number of divisions of load at the break points. The space under the step riser is not supposed to be used by the instrument provided you eliminate the rounding error.



Between 1 division and 10,000 divisions for Class II in R76, this is 0.02%. At 10,000 e, 0.02% is 2 e. At 1,000 e, 0.02% is 0.2 e, and at minimum load of 50 e, 0.02% is 0.01 e. The principle is: the larger the number of verification scale divisions (n) the more accurate the instrument must be, i.e. relative error. Section 2.2 of R76 makes this clear by stating that e represents absolute accuracy and n represents relative accuracy. The Scales Code has no parallel section. It is the relative accuracy that should be our focus, but that's not found in HB44.

PART 2. Proposed changes to the Scales Code (related issues are grouped for convenience)

Group 1. Changes to clarify definitions relating to e.

verification scale division, value of (e). – A value, expressed in units of weight (mass) and specified by the manufacturer of a device, by which the tolerance values and the accuracy class applicable to the device are determined. The verification scale division is applied to all scales, in particular to ungraduated devices since they have no graduations. ~~The verification scale division (e) may be different from the displayed scale division (d) for certain other devices used for weight classifying or weighing in pre-determined amounts, and certain other Class I and II scales.~~[2.20]
(Amended 20XX)

The last sentence is explained fully in the technical requirements in the Code. The workgroup finds it unnecessary and believe it contributes to confusion.

verification scale division, number of (n). – Quotient of the capacity divided by the value of the verification scale division. [2.20]

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

(Amended 20XX)

scale division, number of (n). – See "verification scale division, number of (n)"

The addition of the word "verification" to the definition of n is essential since without it the section refers to the scale division d. The second definition for n was added as a cross reference since the revision will move from the s section to the v section.

Group 2. Changes to ensure proper classification of instruments.

T.N.1.2. Accuracy Classes. – Weighing devices are divided into accuracy classes according to the number of verification scale divisions (n) and the value of the verification scale division ~~(d)~~ (e).
(Amended 20XX)

T.N.1.3. Verification Scale Division. – The tolerance for a weighing device is ~~related to the value of the scale division (d) or the value of the~~ in the order of magnitude of the verification scale division (e) and is generally expressed in terms of ~~d or~~ e.
(Amended 20XX)
These changes bring the principles in the T.N. section in agreement with the definitions. Classification is exclusively based on e.

Table 3.
Parameters for Accuracy Classes

Class	*Value of the Verification Scale Division (~~d or~~ e[1])*	*Number of Verification Scale[4] Divisions (n)*	
		Minimum	*Maximum*
SI Units			
I	*equal to or greater than 1 mg*	*50 000*	--
II	*1 to 50 mg, inclusive*	*100*	*100 000*
	equal to or greater than 100 mg	*5 000*	*100 000*
III[2,5]	*0.1 to 2 g, inclusive*	*100*	*10 000*
	equal to or greater than 5 g	*500*	*10 000*
III L[3]	*equal to or greater than 2 kg*	*2 000*	*10 000*
IIII	*equal to or greater than 5 g*	*100*	*1 200*

[1] ~~For Class I and II devices equipped with auxiliary reading means (i.e., a rider, a vernier, or a least significant decimal differentiated by size, shape, or color), the value of the verification scale division "e" is the value of the scale division immediately preceding the auxiliary means.~~ The verification scale division e does not always equal the displayed scale division d. To ensure the correct value for e is used, refer to required markings on the device (see also notes 3 and 4 in Table S.6.3.b.).

[2] A Class III scale marked "For prescription weighing only" may have a verification scale division (e) not less than 0.01 g.
(Added 1986) (Amended 2003)

[3] The value of a verification scale division for crane and hopper (other than grain hopper) scales shall be not less than 0.2 kg (0.5 lb). The minimum number of verification scale divisions, n, shall be not less than 1000.

[4] On a multiple range or multi-interval scale, the number of verification divisions, n, for each range independently shall not exceed the maximum specified for the accuracy class. The number of verification scale divisions, n, for each weighing range is determined by dividing the scale capacity for each range by the verification scale division, e, for each range. On a scale system with multiple load-receiving elements and multiple indications, each element considered shall not independently exceed the maximum specified for the accuracy class. If the system has a summing indicator, the n_{max} for the summed indication shall not exceed the maximum specified for the accuracy class.
(Added 1997)

[5] The minimum number of verification scale divisions, n, for a Class III Hopper Scale used for weighing grain shall be 2000.)

[*Nonretroactive as of January 1, 1986*]
(Amended 1986, 1987, 1997, 1998, 1999, 2003, ~~and~~ 2004 and 20XX)

The middle section of the table was not included for brevity. Notes continue below:

The changes to the header of Table 3 ensure the classification is based on e consistent with the definitions and the principles in T.N.1. The scale division d is not involved in classification. This change should reduce confusion. The changes to the notes at the bottom of the table again ensure e is correctly referenced instead of d or the "scale division." Referencing "n" in notes 3, 4, and 5 ensure that it is referring to e since n = capacity / e.

Table S.6.3.a.
Marking Requirements

To Be Marked With ⇓	**Weighing Equipment**				
	Weighing, Load-Receiving, and Indicating Element in Same Housing or Covered on the Same CC[1]	**Indicating Element not Permanently Attached to Weighing and Load-Receiving Element or Covered by a Separate CC**	**Weighing and Load-Receiving Element Not Permanently Attached to Indicating Element or Covered by a Separate CC**	**Load Cell with CC (11)**	**Other Equipment or Device (10)**
Manufacturer's ID (1)	X	X	X	X	X
Model Designation and Prefix (1)	X	X	X	X	X
Serial Number and Prefix (2)	X	X	X	X	X (16)
Certificate of Conformance Number (CC) (23)	X	X	X	X	X (23)
Accuracy Class (17)	X	X (8)	X (19)	X	
Nominal Capacity (3)(18)(20)	X	X	X		
Value of Scale Division, "d" (~~3~~ 4)	X	X			
Value of Verification Scale Division, "e" (~~4~~ 3)	X	X			
Temperature Limits (5)	X	X	X	X	

Note: The remainder of the table was not included for brevity.

The changes to column 1 in the 7th and 8th rows simply reverse the references to the notes in Table S.6.3.b. They reflect the primacy of e in classification, which is addressed in parallel changes to notes 3 and 4 in Table S.6.3.b. (see changes to Table S.6.3.b. below).

Table S.6.3.b.
Notes for Table S.6.3.a. Marking Requirements

1. Manufacturer's identification and model designation and *model designation prefix.**
   *[*Nonretroactive as of January 1, 2003*]
   (Also see G-S.1. Identification.) *[Prefix lettering may be initial capitals, all capitals or all lower case]*
   (Amended 2000)

2. *Serial number [Nonretroactive as of January 1, 1968] and prefix [Nonretroactive as of January 1, 1986].* (Also see G-S.1. Identification.)

3. The device shall be marked with the nominal capacity. *The nominal capacity shall be shown together with the value of the verification scale division, "e" (e.g., 15 × 0.005 kg, 30 × 0.01 lb, or capacity = 15 kg, ~~d~~ e = 0.005 kg) in a clear and conspicuous manner and be readily apparent when viewing the reading face of the scale indicator unless already apparent by the design of the device. Each verification scale division value ~~or weight unit~~ with its associated nominal capacity shall be marked on multiple range or multi-interval scales. In the absence of a separate marking of the scale division "d" (see Note 4), the value of the scale division "d" shall be equal to the value of the verification scale division "e."*
   [Nonretroactive as of January 1, 1983]
   (Amended 2005 and 20XX)

4. *Required only if different from ~~"d"~~ "e." This does not apply to an ungraduated device (equal arm scale) where the graduations do not refer to a fixed weight value.*
   [Nonretroactive as of January 1, 1986]
   (Amended 20XX)

The original Scales Code adopted 1984 made d the primary mandatory marking but this resulted in confusion. The changes make e the mandatory marking and now requires d only if different from e.

The changes regarding multiple range and multi-interval scales makes the note say what we have always been applying. The intent was for each range or subrange of the instrument to have marking of capacity and e. The "or weight unit" could refer to lb or kg, but that is clearly not the intent.

There is some concern if this might pose problems for existing equipment. If the marking is of the form "capacity 30 lb x 0.01 lb" the workgroup sees not conflict. However, markings in the form "capacity = 30 lb d = 0.01 lb" would cause a conflict as devices using that form would no longer conform with the proposed changes. The workgroup decided to refer this to the scale manufacturers to see if there are any devices in the marketplace that would be affected. We also learned that this might cause a conflict with Measurement Canada as they do see devices with markings of capacity= d=. Note this is not an issue when e ≠ d as both markings is already required by the combination of notes 3 and 4. If necessary, a note with qualification "devices manufactured before January 1, 20XX" could be added to accept existing scales marked with d = provided d = e.

S.1.2.2. Verification Scale ~~Interval~~ Division

The magnitude of the verification scale division e relative to the scale division d for different types of devices is given in Table S.1.2.2. Relative Magnitude of e to d.

Table S.1.2.2. Relative Magnitude of e to d	
Type of device (see Note)	Relative magnitude of e to d
Graduated, without an auxiliary indicating device	e = d
Graduated, with an auxiliary indicating device	e > d and e is chosen by the manufacturer according to Table 3. and S.1.2.2.1.
Graduated, and marked for use in special applications (weight classifier)	e ≤ d and e is chosen by the manufacturer according to Table 3. and S.1.2.2.4.

Note: Ungraduated devices, e.g. equal arm balances where the scale graduations do not represent a fixed weight quantity, are not included in this table since they have no scale divisions (d) to permit comparison with (e).

S.1.2.2.1. Class I and II Scales and Dynamic Monorail Scales. – If $e \neq d$, the verification scale ~~interval~~ division "e" shall be determined by the expression:

$$d < e \leq 10\ d$$

If the displayed scale division (d) is less than the verification scale division (e), then the verification scale division shall be less than or equal to 10 times the displayed scale division.

The value of e must satisfy the relationship, $e = 10^k$ of the unit of measure, where k is a positive or negative whole number or zero. This requirement does not apply to a Class I device with d < 1 mg where e = 1 mg. If $e \neq d$, the value of "d" shall be a decimal submultiple of "e," and the ratio shall not be more than 10:1. If $e \neq d$, and both "e" and "d" are continuously displayed during normal operation, then "d" shall be differentiated from "e" by size, shape, color, etc. throughout the range of weights displayed as "d."

(Added 1999) (Amended 20XX)

S.1.2.2.2. Class I and II Scales Used in Direct Sales. *– When accuracy Class I and II scales are used in direct sale applications the value of the displayed division "d" shall be equal to the value of the verification scale interval "e."*
[Nonretroactive as of January 1, 2020; to become retroactive as of January 1, 2023]

(Added 2017)

S.1.2.2.3. Deactivation of a "d" Resolution. – It shall not be possible to deactivate the "d" resolution on a Class I or II scale equipped with a value of "d" that differs from "e" if such action affects the scale's ability to round digital values to the nearest minimum unit that can be indicated or recorded as required by paragraph G-S.5.2.2. Digital Indication and Representation.

(Added 2018)

S.1.2.2.4. Class III and IIII Scales. The value of "e" is specified by the manufacturer as marked on the device. Except for dynamic monorail scales, "e" must be less than or equal to "d."

(Added 1999)

~~S.5.3.~~ S.1.2.2.5. Multi-Interval and Multiple Range Scales~~, Division Value~~. – On a multi-interval scale ~~and~~ or a multiple range scale, the value of "e" shall be equal to the value of "d."

(Added 1986) (Amended 1995 and 20XX)

S.1.2.2.6. Class IIIL Scales. On Class IIIL scales the value of "e" shall equal the value of "d." (Added 20XX)

(Add new definition)

auxiliary indicating device. – a means to increase the display resolution of a weighing device, such as a rider or vernier on an analog device, or a differentiated least significant digit to the right of the decimal point on a digital device. [2.20]

(Added 20XX)

Section S.1.2.2. is a key part of understanding application of e and d. The first change was to make references uniform to verification scale "division" as used in all other parts of the code. This section currently uses the term verification scale "interval". Several additions of the term "scale' were also added to S.1.2.2.1. for clarity. Of note, R76 exempts Class I from the e not greater than 10 d requirement when e = 1 mg or less.

A major addition is the new text and table in T.1.2.2. This would create a parallel section in HB44 to R76 section 3.1.2 and Table 2. This section describes four types of instruments:

1. Graduated without an auxiliary indicating device – most instruments e = d
2. Graduated with an auxiliary indicating device – Class I and II with high resolution e > d
3. Graduated & marked for special applications – weight classifiers (round down instruments) e < d
4. Ungraduated – equal arm balances where graduations don't refer to fixed weight quantities. No d

These four types also impact application of minimum load in Table 8.

The current S.5.3. was moved to this section as S.1.2.2.5. to keep these paragraphs dealing with the magnitude of e and d together. A new paragraph S.1.2.2.6. was added to address Class IIIL where e should always equal d. Now all classes (I, II, III, IIIL, and IIII) are covered in S.1.2.2. to clarify relative magnitude of e and d.

The addition of the definition rounds out the expansion of this section

~~S.5.4.~~ S.5.3. Relationship of Minimum Load Cell Verification Interval Value to the Verification Scale Division. *– The relationship of the value for the minimum load cell verification scale interval, v_{min}, to the verification scale division, ~~d~~ e, for a specific scale using National Type Evaluation Program (NTEP) certified load cells shall comply with the following formulae where N is the number of load cells in a single independent[1] weighing/load-receiving element (such as hopper, railroad track, or vehicle scale weighing/load-receiving elements):*

(a) $v_{min} \leq \frac{d^* e}{\sqrt{N}}$ *for scales without lever systems; and*

(b) $v_{min} \leq \frac{d^* e}{\sqrt{N} \times (\text{scale multiple})}$ *for scales with lever systems.*

~~*[*When the value of the scale division, d, is different from the verification scale division, e, for the scale, the value of e must be used in the formulae above.]*~~

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

- *the complete weighing/load-receiving element or scale has been evaluated for compliance with T.N.8.1. Temperature under the NTEP;*
- *the complete weighing/load-receiving element or scale has received an NTEP Certificate of Conformance; and*
- *the complete weighing/load-receiving element or scale is equipped with an automatic*

zero-tracking mechanism which cannot be made inoperative in the normal weighing mode. (A test mode which permits the disabling of the automatic zero-tracking mechanism is permissible, provided the scale cannot function normally while in this mode.

[Nonretroactive as of January 1, 1994]

(Added 1993) (Amended 1996, ~~and~~ 2016, and 20XX)

The renumbering resulted from the move of S.5.3. to the S.1.2.2. section as S.1.2.2.5. The other changes correctly reference e instead of d in this section. Technically, v_{min} for load cells corresponds to verification scale division e for weighing instruments. They are accuracy ratings declared by the manufacturer. There is no significant change for the inspector in properly referring to e since for scales where e = d the issue is moot and when e ≠ d the section already directed the use of e. With the change the inspector will always use e.

Group 3. Changes to clarify appropriate application of tolerances (Marked Scales)

Table 6.
Maintenance Tolerances
(All values in this table are in verification scale divisions "e")

Tolerance ~~in Scale Divisions~~								
	1		**2**		**3**		**5**	
Class	**Test Load**							
I	0 -	50 000	50 001 -	200 000	200 001 +			
II	0 -	5 000	5 001 -	20 000	20 001 +			
III	0 -	500	501 -	2 000	2 001 -	4 000	4 001 +	
IIII	0 -	50	51 -	200	201 -	400	401 +	
III L	0 -	500	501 -	1 000	(Add 1 ~~d~~ e for each additional 500 ~~d~~ e or fraction thereof)			

The proper reference in this section has always been e, and this is how it has always been interpreted. The current language says "scale divisions" which technically refers to d. This means we weren't following the Code. The removal of "in Scale Divisions" after Tolerances in the second row was made to provide parallel construction with the header for Test Load. The parenthetical at the top should be sufficient to cover both sections of the table.

The change for Class IIIL was made since e should be used to specify tolerances and we added S.1.2.2.6. requiring that d = e for this class.

T.N.3.4. Crane and Hopper (Other than Grain Hopper) Scales. – The maintenance and acceptance tolerances shall be as specified in T.N.3.1. Maintenance Tolerance Values and T.N.3.2. Acceptance Tolerance Values for Class IIIL, except that the tolerance for crane and construction materials hopper scales shall not be less than 1 e ~~d~~ or 0.1 % of the scale capacity, whichever is less.

(Amended 1986 and 20XX)

T.N.4.3. Single Indicating Element/Multiple Indications. – In the case of an analog indicating element equipped with two or more indicating means within the same element, the difference in the weight indications for any load other than zero shall not be greater than one-half the value of the verification scale division (e) ~~(d)~~ and be within tolerance limits.

(Amended 1986)

The reference to tolerances in T.N.3.4. and T.N.4.3. should follow the principle of expressing tolerances in e.

Group 4. Changes to clarify appropriate application of tolerances (Unmarked Scales)

T.1. General. – The tolerances applicable to devices not marked with an accuracy class shall have the tolerances applied as specified in Table T.1.1. Tolerances for Unmarked Scales.

Note: When Table T.1.1. refers to T.N. sections it shall be accepted that the scale division d on the unmarked scale always equals the verification scale division e.
(Amended 20XX)

Prior to 1984, tolerances were based on percentage of load for most scales. There was no concept of verification scale division e. In the T.N. section all tolerances are expressed in e. The note is added to clarify that d for the T. section is always equal to e from the T.N. section.

The workgroup noted that several specific paragraphs in the T. section for unmarked scales refer to tolerances in terms of d. Those sections are shown below. With the addition of the note to T.1. General, it was decided that it was not appropriate or necessary to change the d to e in these paragraphs.

T.2.2. General. – Except for scales specified in paragraphs T.2.3. Prescription Scales through T.2.8. Railway Track Scales: 2 d, 0.2 % of the scale capacity, or 40 lb, whichever is least.

T.2.4.2. With More Than One-Half Ounce Capacity. – 1 d or 0.05 % of the scale capacity, whichever is less.

T.2.7. Vehicle, Axle-Load, Livestock, and Animal Scales.

T.2.7.1. Equipped With Balance Indicators. – 1 d.

T.2.7.2. Not Equipped With Balance Indicators. – 2 d or 0.2 % of the scale capacity, whichever is less.

T.2.8. Railway Track Scales. – 3 d or 100 lb, whichever is less.

Group 5. Changes to clarify appropriate scale selection (reference Table 8)

Table 8.
Recommended Minimum Load

Class	Value of Verification Scale Division "e" ~~(d or e*)~~	Recommended Minimum Load in scale divisions "d" (See notes) ~~(d or e*)~~
I	equal to or greater than 0.001 g	100
II	0.001 g to 0.05 g, inclusive	20
	equal to or greater than 0.1 g	50
III	All~~**~~	20
III L	All	50
IIII	All	10

~~*For Class I and II devices equipped with auxiliary reading means (i.e., a rider, a vernier, or a least significant decimal differentiated by size, shape or color), the value of the verification scale division "e" is the value of the scale division immediately preceding the auxiliary means. For Class III and IIII devices the value of "e" is specified by the manufacturer as marked on the device; "e" must be less than or equal to "d."~~

The displayed scale division d is not always equal to the verification scale division e. To ensure the correct values are used, refer to required markings on the device (see also notes 3 and 4 in Table S.6.3.b.).

For an ungraduated device, the scale division d shall be replaced with the verification scale division e in the last column.

~~**~~A minimum load of ~~10 d~~ 5 e is recommended for a weight classifier marked in accordance with a statement identifying its use for special applications.

In the header, the change in column 2 references e and the change in column 3 references d and directs you to the notes. Currently, the Code references (d or e) in both columns which causes confusion. We're never sure which one to use. The justification for d in the last column follows below.

It is vital to understand that Table 8. is tied closely to Table 3. You will find that header to the first two columns in both tables, with these changes, will be identical. The workgroup also revised the * note to remove the * and use parallel text to revised note 1 of Table 3. The notes section contains two special exceptions to the general values in column 3 the table. The first directs you to use e in the last column for ungraduated instruments, as these have no d values. The second directs you to use a minimum load of 5 e for weight classifiers. This aligns the value with R76. Note that the use of d for weight classifiers leads to unusual situations. Two weight classifiers with 100 lb capacity and e of 0.05 lb should have the same minimum load. However, they might have very different d values, say 1 lb and 0.2 lb. Declaring minimum load as 10 d for these result in very large differences of 10 lb minimum load for the first instrument and 2 lb for the second. Since e < d for weight classifiers, the minimum load is correctly expressed in e.

Understanding Minimum Load

In R76, minimum load "Min" is included in the principles of classification, see 2.2. below. There are 4 mandatory markings; Class, Max, Min and e. When R76 was translated into HB44 a conscious decision was made to remove Min from the classification and make it a user requirement. Thus, HB44 only has 3 mandatory markings; Class, Capacity, and d. We have already proposed to change the d to e above.

> **2.2 Principles of the metrological requirements**
>
> The requirements apply to all instruments irrespective of their principles of measurement.
>
> Instruments are classified according to:
>
> - the verification scale interval, representing absolute accuracy; and
> - the number of verification scale intervals, representing relative accuracy.
>
> The maximum permissible errors are in the order of magnitude of the verification scale interval. They apply to gross loads and when a tare device is in operation they apply to the net loads. The maximum permissible errors do not apply to calculated net values when a preset tare device is in operation.
>
> A minimum capacity (Min) is specified to indicate that use of the instrument below this value is likely to give rise to considerable relative errors.

In R76, the issue of instrument accuracy is focused on Class, Max and e, parallel to HB44. Absolute accuracy in terms of e and relative accuracy in terms of n. When the load is very small, i.e. less than Min, it might appear that R76 is addressing the large relative errors resulting in 1 e tolerance for some small number of e in load. However, this is not the case. The distinction is that Min applies to use of the instrument and not to testing of the instrument.

In testing under R76 tolerances, rounding errors are eliminated (see 3.5.3.2.). In practice this usually means error weights are used to resolve the instrument errors to at least 0.2 e (NTEP generally uses 0.1 e). In addition, R76 expects that instrument divisions are relatively uniform throughout the series. In order to get a +1 e error at 1 e load and still meet the requirement that the zero division be +/- 0.5 division wide, would require the 1 e divisions be 0 e wide (i.e. be skipped). To visualize in analog, imagine an indicator that starts at zero and jumps immediately to the 2 graduation. A load of 1 e would indicate 2 e. Likewise a load of 2 e would indicate 3 e and this pattern would repeat until the tolerance breakpoint, a load of 500 e would indicate 501 e. Then the second graduation after the break point would be skipped, i.e. the 502 e graduation. A load of 501 e would indicate 503 e with a +2 e error. All the loads up to 20,000 e would now show a +2 e error. Instruments obviously should not, and DO NOT, operate that way.

If we assume instrument divisions are uniform, as R76 does, then the divisions should be accurate to about the relative % of the accuracy class. For Class II in the first step this is 0.02%. Thus at 20 e load the maximum expected error (after eliminating rounding) should be in the order of 0.004 e, and not the 1 e permitted in the tolerance structure. So, what relative error can R76 be addressing when dealing with Min?

When an instrument is used in commerce, it is the rounding of the indication to ½ scale division that results in large relative errors. Consider a cannabis sale of 1.05 g when the division size is 0.1 g. The instrument must round off to either 1.0 g or 1.1 g. Either one produces an error in the weighment of 0.05 g. That's 4.8% relative error in the weighment (0.05 g / 1.05 g) with an instrument that's supposed to be accurate to 0.02%. It is this rounding error "in use" that produces the large relative errors addressed in Min in R76 and the minimum load in HB44. This rounding error is a function of d, the displayed scale division, and not e. It is not a tolerance issue.

The confusion comes from the presentation of Min in terms of e in the last column of R76 Table 3. The table in R76 has an additional column for Min not found in HB44. In HB44 it has been relocated to Table 8. Looking closely at Table 8, you will find that the first two columns correspond to the first two columns in Table 3 in HB44. So why does R76 express this column in e instead of d? I suspect they did it because all other values in Table 3 are in e. For instruments where e = d, the issue is moot. Note however, that R76 reveals the ties to d for the Class I and II instruments with an auxiliary indicating device (differentiated least significant digit). In 3.4.3. R76 directs that d replace e in the Min column of Table 3 for instruments with an auxiliary indicating device.

On an instrument where e = 10 d, we can create the same scenario as before but now with a load of 1.005 g. The instrument must now round to either 1.00 g or 1.01 g. The rounding error is now 0.50% of the weighment (0.005 / 1.005). That is 10 times smaller at the same 20 e load.

Returning to the four types of instruments from revised S.1.2.2. and applying revised Table 8.:

1. Graduated without an auxiliary indicating device: minimum load in d
2. Graduated with an auxiliary indicating device: minimum load in d
3. Graduated and marked for special use (weight classifier): minimum load 5 e
4. Ungraduated (equal arm scales): minimum load in e

<u>Group 6. Changes to correctly reference to e or d as appropriate.</u>

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 <u>verification</u> scale division.

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

(c) For electronic cash registers (ECRs) and point-of-sale systems (POS systems) the display of measurement units shall be a minimum of 9.5 mm (3/8 inch) in height.
[Nonretroactive as of January 1, 2021]
(Added 2019)

(Amended 1992, 2008, ~~and~~ 2019<u>, and 20XX</u>)

The changes correctly reference e in this section as this is an issue of ensuring the zero indication is accurate to ¼ e. Hence it is a tolerance properly expressed in terms of e.

T.N.9. Radio Frequency Interference (RFI) and Other Electromagnetic Interference Susceptibility. – The difference between the weight indication due to the disturbance and the weight indication without the disturbance shall not exceed one <u>verification</u> scale division ~~(d)~~ <u>(e)</u>; or the equipment shall:

(a) blank the indication; or

(b) provide an error message; or

(c) the indication shall be so completely unstable that it cannot be interpreted, or transmitted into memory or to a recording element, as a correct measurement value.

The tolerance in T.N.9. Radio Frequency Interference (RFI) and Other Electromagnetic Interference Susceptibility is to be applied independently of other tolerances. For example, if indications are at allowable basic tolerance error limits when the disturbance occurs, then it is acceptable for the indication to exceed the applicable basic tolerances during the disturbance.

(Amended 1997 and 20XX)

This is a tolerance for reaction to a disturbance and is properly expressed in e.

Group 7. Identify appropriate application of code sections (in order of appearance)

When the paragraph references d it is referring to the actual scale division and the concern is how the instrument operates. When the paragraph references e it is referring to the verification scale division and the concern is in classification of the instrument or in accuracy of the displayed values.

The sections in the table below currently correctly reference e or d as appropriate. The text of each section is not included for brevity. The justification may help explain the general rules above.

Code Section	Applies to	Justification
G-S.5.2.2.(c)	d	Rounding is a function of instrument operation not accuracy
G-S.5.2.2.(d)	d	Requires "d" to be an indicated zero and all digits to the left of "d" to be zero when d<1. Requires "d" to be an indicated zero and all digits to the right of "d" to be zero when d>5.
S.1.2.	d	1, 2, or 5 refers to d which is rounded. When e ≠ d refer to section S.1.2.2. for value of e.
S.1.2.1	d	Refers to rounded values of d.
S.1.2.3.	e	This is a classification issue. It ensures accuracy of the piece counts.
S.1.7.(b)	e	This is a classification issue addressing maximum indication above capacity.
S.2.1.2.	d	They must be in terms of d since stability of zero setting applies to d.
S.2.1.3.(all)	d	These limit the window for action of AZT. They must be in terms of d since zero setting applies to d.
S.2.3.	d	Tare division must equal smallest increment displayed.
T.N.7.	d	Discrimination requires an instrument to discriminate to the displayed scale division (zone of uncertainty). This relates to the rounding of the smallest increment.
UR.3.7.	d	Minimum load is correctly expressed in d. (see Group 5 above)
UR.3.10.	e	As written, this is clearly e. (See issues for additional study)

PART 3. Issues Identified as Requiring Additional Study (outside the scope of this workgroup)

A. The workgroup was in consensus that we should expand requirements in S.2.1.2. relating to semi-automatic zero to apply to all scales and not just scales used in direct sale. In first place, suitability is a User Requirement and not a specification. Second, correct operation to set zero should be applicable to all digital instruments as it is in R76.

B. The application of tolerances to net loads has always been assumed, even before the Scales Code adoption in 1984. Comparing T.2. for unmarked scales and T.N.2.1. for marked scales reveals important differences particularly regarding net loads. As written, T.N.2.1. exempts calculated net, but it appears to apply to both semi-automatic tare and preset tare. A comparison to R76 shows that OIML limits applicability of tolerances. Their MPE's do not apply to calculated net values or when preset tare (keyboard or programmed tare) is in operation (section 2.2). It appears net loads have MPE's applied only when the net zero is set in compliance with S.1.1.1.(b) which requires accuracy of zero to ¼ division.

This cannot be assured with preset tare or when net is based on two gross values. This has further ramifications to any case where all three (gross, tare and net) values are indicated/recorded for a transaction. OIML requires the gross and net weights be accurate but does not apparently require that the equation gross – tare = net be in mathematical agreement due to rounding issues. Note that in most transactions, the customer only gets one or two of the gross, tare or net values. Rounding issues do not arise for this reason. This may impact a current issue before NCWM dealing with printing tare on POS transaction receipts. Consider a POS transaction where the customer saw 1.02 lb on the weight display and sees 1.00 lb net and 0.03 lb tare. These are all accurate weights (and correct per R76) but the numbers don't' add up. The customer will claim they were overcharged by 0.01 lb since 1.02 lb – 0.03 lb = 0.99 lb.

C. The resolution of errors in testing scales was identified as an issue. The original proposal included a revision requiring resolution of error to at least 0.2 e. R76 specifically declares that errors be resolved to at least 0.2 e to eliminate rounding error. HB44 has no such provision and it might appear that rounding error is included in the tolerance. Instead of tolerance steps of 1, 2, etc., it could be argued that the tolerances are 1.5, 2.5, etc. as the result of direct reading. NTEP uses the R76 approach exclusively in testing, but it has no technical basis in the Code. There are obvious issues involved in using error weights in the field. The challenge is that you either eliminate rounding in determining tolerances or you don't. We have two standards at play at present. In addition, it can be argued that Class IIIL instruments are already high resolution somewhat similar to Class I and II instrument with e >d. Class IIIL devices have enough resolution to read errors to 0.2 e or 0.1 e of the equivalent Class III instrument without using error weight.

D. The UR.3.10. requirement that transactions from dynamic monorail scales be based on e raises issues. It was discussed since it involves both e and d. The displayed scale divisions equal to e (i.e. 10 d) are not normally rounded. If e = 10 d then the rounding point is not 5 up/4 down, as it is for d, but rather 9.5 up/0.5 down. Does this requirement mean the scale design has to produce a properly rounded value for the transaction that may be different from the display, e.g. 943.7 lb to d of 0.1 lb now must be recorded for the transaction as 944 lb? In addition, in brief discussion, it seemed there were many ways this could be interpreted. The workgroup concluded it would be beneficial to open some discussions with USDA and the manufacturers to explores some of these questions. This also addresses similar issues to the proposal to delete S.1.2.2.2. where questions of using e or d are impacting high precision scales in cannabis and jeweler's sales.

APPENDIX B

Item WIM-23.1 – Recommended Language

Table of Contents

Section 2.25. Weigh-In-Motion Systems Used for Vehicle Enforcement ~~Screening~~ – Tentative Code **for Vehicle Screening and Code for Direct Enforcement**

This tentative code **for vehicle screening (Class A)** 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 2015)

The Class E systems used for direct enforcement shall follow this code.

A. Application

A.1. General . – This code applies to **fixed (not portable)** systems used to weigh vehicles, while in motion, for the purpose of screening and sorting the vehicles based on the vehicle weight to determine if a static weighment is necessary **(Class A) and direct enforcement of the weight limit of vehicles (Class E)**.

A.2. Exception. – This code does not apply to weighing systems intended for the collection of statistical traffic data.

A.3. Additional Code Requirements. – In addition to the requirements of this code, weigh-in-motion screening 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" for a Class A **and Class E**, ~~weight-in-motion~~ **weigh-in-motion (WIM)** system shall not be greater than 50 kg (100 lb).

S.1.3.1. Number of Scale Division. – The number of scale divisions for Class E shall be a minimum of 200 and a maximum of 4,000.

S.1.3.2. Minimum Capacity. – The minimum capacity in scale division for Class E 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 **that may affect the tolerance of accuracy as specified in Table T.2.2 Tolerances for Accuracy** shall be presented to the operator in a clear and unambiguous means. The following fault conditions **are recommended to** ~~**shall**~~ be identified:

(a) Vehicle speed is below the minimum or above the maximum speed as specified.

(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 is not on the load-receiving element of the sensors.

(g) Vehicle direction of travel is not valid for the installation.

(h) The amount of time all vehicle axles are simultaneously on the scale is below the minimum data acquisition time per manufacturer.

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;

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

~~**(c)**~~ **(d)** vehicle speed;

~~**(d)**~~ **(e)** number of axles;

~~**(e)**~~ **(f)** weight of each axle;

~~**(f)**~~ **(g)** identification and weight of axle groups;

~~**(g)**~~ **(h)** axle spacing;

~~**(h)**~~ **(i)** total vehicle weight;

(j) total vehicle length;

~~(i)~~ (k) all fault conditions that occurred during the weighing of the vehicle**, as identified in paragraph S.1.6. Identification of a Fault**;

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

~~(k)~~ (m) time and date.

Note: For Class E, 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, Accuracy Class.

S.4.1. Designation of Accuracy. – Weigh-in-motion systems meeting the requirements of this code shall be designated as accuracy Class A **and Class E**.

Note: This does not preclude higher accuracy classes from being proposed and added to this Code in the future when it can be demonstrated that weigh-in-motion systems grouped within those accuracy classes can achieve the higher level of accuracy specified for those devices.

S.5. Design of Temperature.

S.5.1. Operating Temperature. – The operating temperature limit shall be from -10°C (14°F) to +40°C (104°F).

S.5.2. Temperature Effect on No-Load Balance. – The zero-load indication shall not vary by more than one division per 5°C (9°F) change in temperature.

S.6. Design of Electric Power Supply.

S.6.1. Power Supply, Voltage and Frequency.

(a) AC main power: Weighing devices shall comply with Table T.2.2 Tolerances for Accuracy when tested over the range 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.

(b) DC main power (including rechargeable or non-rechargeable batteries): Weighing devices shall not indicate nor record values outside the applicable tolerance limits set forth in Table T.2.2 Tolerances for Accuracy when the battery power output is excessive or deficient.

S.6.2. Power Interruption. – A power interruption shall not cause an indicating or recording element to display or record any values outside the applicable tolerance limits.

S.7. Design of Balance for Class E.

S.7.1. Zero-Load Adjustment.

(a) An automatic zero adjustment outside the limits in S.7.1.(b) is prohibited.

(b) The maximum load that can be "re-zeroed" during normal operating conditions shall be 3.0 scale divisions.

S.7.2. Zero-Tracking Device for Class E. – A zero-tracking device shall operate only when:

(a) the indication is at zero;

(b) the instrument is in stable equilibrium;

(c) the corrections are not more than 0.5d per second; and

(d) within a range of 4% of Max around the actual zero.

S.7.3. Totalizing Device. – WIM instruments may be provided with a totalizing device which operates:

(e) automatically, in which case the instrument shall be provided with a vehicle recognition device defined in S.7.4. Vehicle Recognition/Presence Device; or

(a) semi-automatically (e.g., it operates automatically following a manual command).

S.7.4. Vehicle Recognition/Presence Device for Class E – WIM instruments 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 instruments shall not indicate or print the vehicle mass unless all of the wheels of the vehicle have been weighed.

Note: S.7.1 and S.7.2 may not be applicable to all devices.

S.8. Accidental breakdown and Maladjustment. – WIM instruments 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.~~5.~~9. Marking Requirements. – In addition to the marking requirements in G-S.1. Identification (except G.S.1.(e)), the system shall be marked with the following information:

(a) accuracy class;

(b) value of the system division "d";

(c) operational temperature limits;

(d) number of instrumented lanes (not required if only one lane is instrumented);

(e) minimum and maximum vehicle speed;

(f) maximum number of axles per vehicle;

(g) maximum change in vehicle speed during weighment; and

(h) minimum and maximum load.

S.~~5.~~9.1. Location of Marking Information. – The marking information required in Section 1.10. General Code, G-S.1. Identification and Section 2.25. Weigh-in-Motion Systems, S.5. 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.1.5 **and N.1.6** shall be performed with a minimum of ~~**two**~~ **the following** test vehicles **for Class A and Class E, respectively**.

N.1.1.1. Selection of Test Vehicles for Class A. – A minimum of two vehicles below shall be used.

(a) The first test vehicle may be a two-axle, six-tire, single-unit truck; that is, a vehicle with two axles with the rear axle having dual wheels. The vehicle shall have a maximum gross vehicle weight of 10 000 lb.

(b) The second test vehicle shall be a five-axle, single-trailer truck with a maximum gross vehicle weight of 80 000 lb.

N.1.1.2. Selection of Test Vehicles for Class E. – A minimum of three vehicles below shall be used.

(a) The first test vehicle may be 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) The second test vehicle shall be a five-axle, single-trailer truck or FHWA Class 9 3S2 Type.

(c) The third test vehicle shall be a three-axle, single-unit truck or FHWA Class 6.

(d) The gross vehicle weights shall be as stated in N.1.2.3. Dynamic Test Loads for Class E.

Note 1: Consideration should be made for testing the systems using vehicles which are typical to the system's ~~**daily operation**~~ **target vehicles**.

Note 2: Vehicles with liquid loads should be excluded from the testing and from enforcement.

N.1.1.~~1.~~3. Weighing of Test Vehicles. – All test vehicles shall be weighed on a reference scale**, meeting the requirements of Appendix A,** before being used to conduct the dynamic tests.

N.1.1.~~2.~~4. Determining Reference Weights for Axle, 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 for Class A. – Test vehicles used for dynamic testing shall be loaded to 85 % to 95 % of their legal maximum Gross Vehicle Weight **for a minimum of 20 runs per test vehicle type**. The "load" shall be non-shifting and shall be positioned to present as close as possible, an equal side-to-side load.

N.1.2.3. Dynamic Test Loads for Class E. – Test vehicles used for dynamic testing shall be loaded in two (2) different load conditions. 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; and

(b) a full load condition (> 85% of the legal load limit for the test vehicle) for a minimum of 20 runs per test vehicle type

N.1.3. Reference Scale. – Each reference vehicle shall be weighed statically on a multiple platform vehicle scale **or a single-platform vehicle scale**

N.1.3.1. Multi-Platform Vehicle Scale. – It is comprised of three individual weighing/load-receiving elements, each an independent scale. 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. Single-Platform Vehicle Scale. – Each individual axle or axle group of the reference test vehicles shall be measured on the single platform vehicle 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 GVW shall be determined by summing all the single axles and axle groups.

The scale shall be tested immediately prior to using it to establish reference test loads and in no case more than ~~**24 hours**~~ **4 weeks** prior. To qualify for use as a suitable reference scale, it must meet NIST Handbook 44, Class III L maintenance tolerances.

N.1.3.1. Location of a Reference Scale. – The location of the reference scale must be considered since vehicle weights will change due to fuel consumption.

N.1.4. Test Speeds. – All dynamic tests shall be conducted **at the designated speed(s).**

N.1.4.1. Test Speeds for Class A. – Speed shall be within 20% below or at the posted speed limit.

N.1.4.2. Test Speeds for Class E. – Two speeds shall be used.

(a) at a high speed – posted speed limit (Vmax); and

(b) at a low speed – site-specific minimum speed, not below manufacturer's requirement (Vmin).

N.1.5. Test Procedures for Class A.

N.1.5.1. Dynamic Load Test. – The dynamic test shall be conducted using the test vehicles defined in N.1.1.**1.** Selection of Test Vehicles. The test shall consist of a minimum of 20 runs for each test vehicle at the speed as stated in N.1.4.**1.** Test Speeds.

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

N.1.5.2. Vehicle Position Test. – During the conduct of the dynamic testing, ensure the vehicle stays within the defined roadway along the width of the sensor. The test shall be conducted with 10 runs with the vehicle centered along the width of the sensor; 5 runs with the vehicle on the right side along the width of the sensor; and 5 runs with the vehicle on the left side along the width of the sensor. Only gross vehicle weight is used for this test and the tolerance for each weighment shall be based on the tolerance value specified in T.2.3. Tolerance Value for Vehicle Position Test.

N.1.5.3. 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.

N.1.6. Test Procedures for Class E.

N.1.6.1. Dynamic Load Test. – The dynamic test shall be conducted using the test vehicles defined in N.1.1.2. Selection of Test Vehicles for Class E. The test shall consist of a minimum of 30 runs for each test vehicle. A minimum of 10 runs at half load condition and a minimum of 20 runs at full load condition.

At the conclusion of the dynamic test, there will be a minimum of 30 weight readings or 15 weight readings at each speed. The tolerance for each weight reading shall be based on the percentage values specified in Table T.2.2 Tolerances for Accuracy at 100% compliance.

- **(a) a half load condition. – The test shall be conducted with 10 runs in total or 5 runs at each speed as stated in N.1.4.2. Test Speeds for Class E along the width of the sensor.**
- **(b) a full load condition. – The test shall be conducted with 20 runs in total or 10 runs at each speed as stated in N.1.4.2. Test Speeds for Class E along the width of the sensor.**

See Table N.1.6 below to summarize the minimum number of test runs for Class E.

Table N.1.6
Minimum Number of Test Runs per Each Test Vehicle for Class E

Load Condition	Speed
Half Load (10 runs)	High Speed Vmax (5 runs)
	Low Speed Vmin (5 runs)
Full Load (20 runs)	High Speed Vmax (10 runs)
	Low Speed Vmin (10 runs)
30 runs	15 runs x 2 speeds

N.1.6.2. Vehicle Position Test. – During the conduct of the dynamic testing for Class E, ensure the vehicle stays within the defined roadway and load receiving element of the sensor. No position test shall be performed for Class E because of the natural behavior of the test truck drivers.

N.1.6.3. 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.

N.1.6.4. Reference Axle Spacing. – Before measuring the reference axle spacing, the test vehicle shall be positioned straight, and the driving axle shall also be straight. A steel tape measure shall be used to determine the reference axle spacing. 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.1.6.5 Test of Operating Speed Interlock. – To test the functioning of the operating speed interlock, test runs with one of the reference vehicles shall be made at speeds outside the range of operating speeds:

(a) at a speed of at least 5 % in excess of the maximum operating speed, OPVmax; **and**

(b) at a speed of at least 5 % below the minimum operating speed, OPVmin (if applicable).

The instrument shall detect the above conditions and not indicate or print any mass or load values unless there is a clear warning message on the indication and/or the printout.

N.1.6.6 Test of Operating Speed. – To determine and test the operating speed during an in-motion test, conduct six test runs of the unloaded two-axle rigid reference vehicle over the lateral center of the load receptor at constant speed. Three runs shall be near maximum operating speed, OPVmax, and three additional runs shall be just above minimum operating speed, OPVmin.

The reference value (conventional true value) for speed to be used in calculating the error in the indicated operating speed for each test run shall be the quotient of the measured axle spacing (to the nearest 10 mm) of the static two-axle rigid reference vehicle divided by the measured time interval (to the nearest millisecond) between arrival at a defined location (e.g., the leading edge) on the load receptor by the front and the rear axle of the moving two-axle rigid reference vehicle. No error in the indicated operating speed shall exceed 3 mph.

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 for Accuracy Class A and Class E.

T**.2.1. Tests Involving Digital Indications or Representations.** – To the tolerances that would otherwise be applied in paragraphs T.2.2. Tolerance Value for Dynamic Load Test and T.2.3. Tolerance Value for Vehicle Position Test, there shall be added an amount equal to one-half the value of the scale division to account for the uncertainty of digital rounding.

T.2.2. Tolerance Values for Dynamic Load Test. – The tolerance values applicable during dynamic load testing are as specified in Table T.2.2 **for vehicle screening as well as direct enforcement purposes**.

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

Load Description*	Tolerance as a Percentage of Applied Test Load
Axle Load	± 20 %
Axle Group Load **(including bridge formula)**	± 15 %
Gross Vehicle Weight	± 10 %

* **Class A for Vehicle Screening Purposes**: No more than 5 % of the weighments in each of the load description subgroups shown in this table shall exceed the applicable tolerance.

Table T.2.2. Tolerances for Accuracy ~~Class A~~	
Load Description*	**Tolerance as a Percentage of Applied Test Load**
*** Class E for Direct Enforcement Purposes: All weighments shall be 100% compliance. Any weighments with any fault as identified in paragraph S.1.6 Identification of a Fault shall not be included in determining tolerances for accuracy.**	

T.2.3. Tolerance Value for Vehicle Position Test for Class A. – The tolerance value applied to each gross vehicle weighment is ± 10 % of the applied test load.

T.2.4. Tolerance Value for Axle Spacing. – The tolerance value applied to each axle spacing measurement shall be ± 0.15 m (**~~0.5 ft~~6 inches**) **at 100% compliance**.

T.3. Influence Factors. – The following factor is applicable to tests conducted under controlled conditions only.

T.3.1. Temperature. – Systems shall satisfy the tolerance requirements under all operating temperature unless a limited operating temperature range is specified by the manufacturer.

T.3.2. Power Supply. – System shall satisfy the tolerance requirements 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 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.2.2. Tolerances for Accuracy Class A.

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 scale divisions, value of the scale division, or verification scale division and minimum capacity.

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

Table 1. Typical Class or Type of Device for Weighing Applications	
Class	**Weighing Application**
A	Screening and sorting of vehicles based on axle, axle group, and gross vehicle weight.
E	**Enforcing of vehicles based on axle, axle group, and gross vehicle weight.**
Note: A WIM system with a higher accuracy class than that specified as "typical" may be used.	

UR.2. User Location Conditions and Maintenance. – The system shall be installed and maintained as defined in the manufacturer's recommendation.

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 scale 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.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 user shall consult the specific jurisdictional legislation and/or protocol for additional values that may be required. 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**.

Appendix D. Definitions

The specific code to which the definition applies is shown in the [brackets] at the end of the definition. Definitions for the General Code [1.10] apply to all codes in NIST Handbook 44.

A

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. [2.25]

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. [2.25]

axle load. – The sum of all tire loads of the wheels on an axle; a portion of the gross-vehicle weight. [2.25]

axle spacing. – The distance between the centers of any two axles. When specifying axle spacing, the axels used also need to be identified. [2.25]

S

single-axle load. – The load transmitted to the road surface by the tires lying on the same longitudinal axis (that axis transverse to the movement of the vehicle and about which the wheels rotate). [2.25]

T

tandem-axle load. – The load transmitted to the road surface by the tires of two single-axles lying on the same longitudinal axis (that axis transverse to the movement of the vehicle and about which the wheels rotate). [2.25]

triple-axle load. – The load transmitted to the road surface by the tires of three single-axles lying on the same longitudinal axis (that axis transverse to the movement of the vehicle and about which the wheels rotate). [2.25]

W

weigh-in-motion (WIM). – A process of estimating 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. [2.25]

weigh-in-motion screening scale. – A weigh-in-motion system used to identify potentially overweight vehicles. [2.25]

wheel weight. – The weight value of any single or set of wheels on one side of a vehicle on a single axle. [2.25]

WIM System. – A set of sensors and supporting instruments that measure the presence of a moving vehicle and the related dynamic tire forces at specified locations with respect to time; estimate 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. [2.25]

APPENDIX C

Item EVF-23.4 + EVF-23.7 – Recommended Language

Amend Handbook 44 (2024 Edition), Section 3.4 Electric Vehicle Fueling Systems as follows:

Strike the entirety of section N.3 and replace it with the following:

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:

(i) A point between 4 A and 10 A; and
(ii) A point between 40 % and 60 % of the MDA; and
(iii) A point between 70 % and 100 % of the MDA.

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:

(i) A point between 10% and 20% of the MDA, but not less than 30 A;
(ii) A point between 40 % and 60% of the MDA; and
(iii) A point between 70 % and 100 % of the MDA.

N.3.3. Performance Verification in the Field of a DC EVSE

Accuracy tests shall be performed at any convenient voltage and the following current levels:

(i) A point between 10% and 20% of the MDA, but not less than 30 A; and
(ii) 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 equipment available.

Note: The test points (i) and (ii) 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 equipment 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 are exempt from this requirement until January 1, 2028.

(Amended 20XX)

Add these definitions to HB44 Appendix D

Maximum current deliverable: The maximum current that the EVSE can deliver as installed under optimum conditions.

Maximum deliverable amperage: The maximum current available from the EVSE at the time of the test as determined by the Control Pilot Pulse Width Modulation signal or via digital communication between the EVSE and EV or test equipment.

Change S.3.2 (b) to read.

(b) Maximum current deliverable

Add S.3.3 (e) to read.

(e) MCD = Maximum current deliverable