National Type Evaluation Program (NTEP)
Weighing Sector Meeting Agenda

August 21-23, 2018 / Louisville, KY

INTRODUCTION

The charge of the NTEP Weighing Sector is important in providing appropriate type evaluation criteria based on specifications, tolerances and technical requirements of NIST Handbook 44 Sections 1.10. General Code, 2.20 Scales, 2.22 Automatic Bulk Weighing Systems, and 2.24 Automatic Weighing Systems. The Sector's recommendations will be presented to the National Type Evaluation Program (NTEP) Committee each January for approval and inclusion in NCWM Publication 14 *Technical Policy, Checklists, and Test Procedures* for national type evaluation.

The Sector is also called upon occasionally for technical expertise in addressing difficult NIST Handbook 44 issues on the agenda of National Conference on Weights and Measures (NCWM) Specifications and Tolerances (S&T) Committee. Sector membership includes industry, NTEP laboratory representatives, technical advisors and the NTEP Administrator. Meetings are held annually, or as needed and are open to all NCWM members and other registered parties.

Suggested revisions are shown in **bold face print** by **~~striking out~~** information to be deleted and **<u>underlining</u>** information to be added. Requirements that are proposed to be nonretroactive are printed in ***bold faced italics***.

Table A
Table of Contents

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
ABWS	Automatic Bulk Weighing Systems	NCWM	National Conference on Weights and Measures
AREMA	American Railway Engineering Maintenance-of-Way Association	NIST	National Institute of Standards and Technology
AWS	Automatic Weighing Systems	NTEP	National Type Evaluation Program
CC	Certificate of Conformance	OIML	International Organization of Legal Metrology
DES	Digital Electronic Scales	OWM	Office of Weights and Measures
HB 44	NIST Handbook 44	R	Recommendation
IZSM	Initial Zero-Setting Mechanism	SS	National Type Evaluation Program Software Sector
LMD	Liquid Measuring Device	S&T	Specifications and Tolerances Committee
MC	Measurement Canada	SMA	Scale Manufacturers Association
MRA	Mutual Recognition Agreement	WS	National Type Evaluation Program Weighing Sector

Details of All Items
(In order by Reference Key)

CARRY-OVER ITEMS

1. Recommended Changes to NCWM Publication 14 Based on Actions at the 2018 NCWM Annual Meeting

Source:
Mr. Richard Harshman, National Institute of Standards and Technology (NIST) Technical Advisor will provide the Sector with specific recommendations for incorporating test procedures and checklist language based upon actions of the 2018 NCWM Annual Meeting. The Sector is asked to briefly discuss each item and, if appropriate, provide general input on the technical aspects of the issues.

1.a. SCL-6 S.1.2.2.3. Deactivation of a "d" resolution

Source:
2018 S&T Committee Final Report

Background/Discussion:
In 2017, OWM received indication there exists in the commercial marketplace some Accuracy Class II scales equipped with a "d" value that differs from "e," which fail to round properly (i.e., to the nearest increment) if the "d" value is deactivated such that only the "e" value is displayed. OWM was made aware of this concern while researching a proposal on the 2017 S&T Committee's agenda which would require the value of "e" to be equal to "d" on Class I and Class II scales used in a direct sale application (i.e., one in which both parties are present when the quantity is determined). That proposal, shown below, was later adopted and added to the Scales Code in 2018.

> ***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."***
>
> **(Added 2017)** ***(Nonretroactive as of January 1, 2020. To become retroactive as of January 1, 2023***

The adoption of new paragraph S.1.2.2.2. in 2017 along with having learned of the possible round off problem resulting from the deactivation of the "d" resolution on some scales prompted OWM to propose adding a new specification paragraph to the Scales Code in 2018 to make officials and scale technicians aware of this concern.

At its 2018 Annual meeting, the NCWM voted to add OWM's proposed new paragraph S.1.2.2.3. Deactivation of a "d" Resolution, which prohibits the deactivation of a "d" resolution on a Class I or II scale equipped with a scale division value "d" that differs from the scale verification interval "e" if such action causes the scale to round improperly (i.e., to a value other than the closest "e" interval). The following paragraph was adopted at the 2018 NCWM Annual Conference:

> **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.**
> **(Added 20XX)**

Recommendation:
There are two suggested recommendations for the Sector to consider as follows:

1. Provide an explanation in the appropriate section of NCWM Publication 14 DES of how NTEP evaluators can readily determine if the "d" value on a Class I and Class II scale (in which the values of d and e are different) can be disabled (deactivated). Regarding this first recommendation, the Sector may also want to recommend the checklist portion of NCWM Publication 14 DES include an area for an evaluator to enter the values of "d" and "e" for Class I and Class II scales.

   Technical Advisor's note: As mentioned in last year's Weighing Sector Agenda for item 1.a. 3200-2 Verification Scale Interval, OWM checked with one U.S. scale manufacturer concerning whether or not the Class I and II scales it currently produces would round properly if the "d" resolution were disabled (or deactivated) on those Class I and II scales in which the value of "d" differed from "e." The manufacturer reported that there was no possible means of disabling the "d" resolution on any of the models of Class I and II scales it manufactures in which the value of "d" and "e" are different.

2. Add new type evaluation criteria to NCWM Publication 14 DES that establishes whether a Class I and Class II scale rounds properly should the "d" value be deactivated.

Discussion/Conclusion:

2. NCWM Publication 14 DES Section 31 Multi-Interval Scales

Source:
Measurement Canada/Canada (2015)

Background:
This item appeared as Agenda Item 10 on the 2015 NTEP Weighing Sector Agenda. During the 2015 Weighing Sector Meeting, Mr. Pascal Turgeon (MC) identified conflicts in various parts of NCWM Publication 14, DES Section 31. Multi-Interval Scales and suggested some changes be made to NCWM Publication 14 based on the type evaluation criteria developed and used by MC in their evaluation of a tare feature on a multi-interval scale. The conflicts identified by MC were disclosed during a routine general maintenance of the Canadian documents, and in particular, the requirements pertaining to multi-interval scales. Noting the importance of being careful not to change something that could conflict with Handbook 44 or NCWM Publication 14 because of the US and Canadian Mutual Recognition Agreement, MC requested an interpretation of the following sections of NCWM Publication 14, which it viewed as conflicting:

- The preamble to Section 31 contains examples and clauses that conflict with the requirements set out in 31.1. and 31.2. For example, the tare calculation example shows a net weight value that is not consistent with the scale interval of the weighing segment in which it falls, but both 31.1. and 31.2. require that it be consistent. The preamble also states that "Except for semi-automatic tare, all tare values shall not exceed the maximum capacity of the first weighing segment" whereas as 31.1.5. states "Tare may be taken to the maximum capacity of the smallest weighing range (segment) of the scale," leading to another contradiction

- Another issue with Section 31 is the applicability of 31.1. vs 31.2. It seems to be implied that either one or the other applies, depending on how the device operates, but it is not clear. It seems that 31.1. applies to devices that display all three values, while 31.2. is for devices that only display in one mode. However,

review of the sub-clauses in each section show that this isn't correct (e.g. 31.1.9. refers to scales that only show net weight). We feel that Section 31 needs to be reviewed to consolidate redundant clauses and clearly state the applicability of 31.1. and 31.2.

- A final recommendation made by Mr. Pascal at the 2015 Sector meeting was to move 31.1.9. and all its subparts to 31.2. since all of 31.1.9. applies to scales that display or record only net weight values and 31.2. applies to scales that indicate in only one mode (gross or net). This recommendation to be considered by the work group as part of their review and further development of Section 31.

At its 2015 meeting, the Sector agreed to form a small work group to further develop the checklist and eliminate inconsistencies after reviewing NCWM Publication 14 Section 31 for consistency.

The following members of the Sector volunteered to participate on the work group at the meeting:

Tom Buck (OH)
Scott Davidson (Mettler-Toledo)
Paul Lewis (Rice Lake Weighing)
Pascal Turgeon (MC) or (Justin Rae)
Rick Harshman (OWM)

Much of the Sector's discussion of this item at the 2016 WS meeting revolved around a revised draft document developed by Mr. Harshman (NIST Technical Advisor) titled, "Principles of Tare - Multi-Interval and Multiple Range Scales." This document was provided as an attachment to the Sector's 2016 agenda. Mr. Harshman reported he had developed the draft document in hopes that if agreement could be achieved on some basic principles of tare for the different types of tare operation, e.g., keyboard, push-button, etc., it might make it easier to identify in NCWM Publication 14 those requirements that deviate from the agreed upon principles that they could then be eliminated. That is, if U.S. scale manufacturers could agree on some basic principles of how tare is to operate on multi-interval and multiple range scales, these principles could quite possibly help resolve the conflicts that had been identified by MC in NCWM Publication 14. They might also be used to help establish a means of grouping together the different tare requirements in NCWM Publication 14 by tare type, should someone wish to take on this effort, so they are better organized and can be more easily followed.

Several of the scale representatives, upon being asked to provide input on the "Principles of Tare" document drafted by Mr. Harshman, indicated that they were not familiar enough with how their scales determined net weight under the different conditions outlined and would therefore need to consult with engineering staff and report back at some later date. Consequently, it was agreed this item could not be concluded during the 2016 meeting because it required additional input from the US scale manufacturers. As a result, the Sector agreed this item would remain on its agenda in 2017 as a carryover item.

Mr. Robert Meadows (KS) and Mr. Eric Golden (Cardinal Scale Manufacturing, LLC) were added as new participants to the tare work group in 2016. Additionally, Mr. Darrell Flocken (NTEP Specialist) offered to assume lead of the work group after Mr. Harshman requested to step down due to a staffing shortage within the Legal Metrology Devices Program of OWM.

See the Sector's 2015 and 2016 Meeting Summary for additional details.

During the Sector's 2017 meeting, members received an update from Mr. Flocken on this item. He reported that he had been able to contact a few U.S. scale manufacturers to discuss with them the operational characteristics of tare taken on single range, multiple range, and multi-interval scales. This contact was made to try and determine if US scale manufacturers are consistent in how tare is designed to operate for the different kinds of tare offered (e.g., semi-automatic, manually-entered, etc.) on scales manufactured by US companies. Mr. Flocken noted that based upon those discussions, he did not believe, US scale manufacturers are consistent in how they've designed tare to operate for the different kinds of tare and particularly as an operational feature on multi-interval and multiple range scales. He further reported that he didn't believe scale manufacturers necessarily needed to agree on the specifics of how tare should operate to be able to resolve the conflicts identified by MC.

Mr. Flocken suggested the Sector consider splitting the item into two separate and distinct parts and trying first to resolve the more immediate concern of the two; that being, the existence of conflicts in NCWM Publication 14 DES associated with the taking of tare on multi-interval scales. The second part, which would likely take longer to resolve and could be worked on as time permits and at a less accelerated pace, is for the weights and measures community to agree on some basic principles of how different types of tare are to function on multi-interval and multiple ranges scales. Once basic principles of tare have been established, the Sector could then propose additional changes, as needed, to NIST HB 44 and NCWM Publication 14 DES. Members of the Sector agreed to the approach suggested my Mr. Flocken.

Mr. Flocken then shared his understanding of how single range scales, multiple range scales, and multi-interval scales typically function when different types of tare is taken. The following are some significant points made by Mr. Flocken relating to the conflicts identified by MC:

- There is an exception in HB 44 to requiring the value of a scale division to be expressed as 1, 2, or 5, (or a decimal multiple or submultiple of 1, 2, or 5) for net weight indications and recorded representations calculated from the gross and tare weight indications when the scale division of the gross weight is different from the scale division of the tare weight(s) on multi-interval or multiple range scales. For example, a tare may be taken in a lower weighing segment or range and then subtracted from the gross indication in a higher weighing segment or range and the net weight result be mathematically correct and expressed to a value other than 1, 2, or 5 (or a decimal multiple or submultiple of 1, 2, or 5). This exception is provided in Scales Code paragraph S.1.2.1. Digital Indicating Scales, Units. MC requirements provide no such exception; so, in this regard, MC requirements are different than U.S.

- A rounding problem occurs on a multiple range scale having three ranges when the scale division values of the three ranges are 1 lb, 2 lb, and 5 lb, when the scale user enters a 1 lb tare and the applied load is in the 5 lb range. The problem created from this scenario is that the scale will zero the tare, which isn't permitted.

- Hand-entered tare cannot be taken above the capacity of weighing segment one on a multi-interval scale, however, semi-automatic tare (i.e., push-button tare) can be taken in any weighing segment.

Mr. Flocken acknowledged that different scale manufacturers may design tare to operate somewhat differently than he had described, especially with respect to multi-interval scales.

Mr. Flocken then requested Mr. Turgeon identify the different conflicting sections of Publication 14 DES. He also asked members of the Sector to consider possible solutions to those conflicts as Mr. Turgeon identified and described each one. The following three conflicts were identified, and possible solutions discussed:

1. The preamble to Section 31 contains examples and clauses that conflict with the requirements set out in subsections 31.1. and 31.2. For example, the tare calculation example shows a net weight value that is not consistent with the scale interval of the weighing segment in which it falls, but both 31.1. and 31.2. require that it be consistent.

   Possible Solution: Identify within subsections 31.1. and 31.2. an appropriate location to add a sentence, similar to the following, appearing in HB 44 Scales Code paragraph S.1.2.1:

   The requirement that the value of the scale division be expressed only as 1, 2, or 5, or a decimal multiple or submultiple of only 1, 2, or 5 does not apply to net weight indications and recorded representations that are calculated from gross and tare weight indications where the scale division of the gross weight is different from the scale division of the tare weight(s) on multi-interval or multiple range scales.

2. The preamble to Section 31 also states that "Except for semi-automatic tare, all tare values shall not exceed the maximum capacity of the first weighing segment (WS1);" whereas, 31.1.5. states "Tare may be taken to the maximum capacity of the smallest weighing range (segment) of the scale," leading to another contradiction.

Possible Solution: Consider adding the words, "Except for semi-automatic tare" as a lead in to the sentence in 31.1.5.

3. Another issue with Section 31 is the applicability of 31.1. versus 31.2. It seems to be implied that either one or the other applies, depending on how the device operates, but it is not clear. It seems that 31.1. applies to devices that display all three values, while 31.2. is for devices that only display in one mode. However, review of the sub-clauses in each section show that this isn't correct (e.g., 31.1.9. refers to scales that only show net weight). We feel that Section 31 needs to be reviewed to consolidate redundant clauses and clearly state the applicability of subsections 31.1. and 31.2.

   Discussion/Possible solution: It is believed that subsection 31.1., at the time when first added to Publication 14 was intended to apply to scales equipped with a separate display for gross-, tare-, and net-weight indications and that subsection 31.2. was intended to apply to single display scales. Most computing scales are equipped with only a single display and because 31.1.9. identifies "most computing scales" as the example of a scale that displays or records only net weight values, it is believed that 31.1.9. and all its subparts, should be part of subsection 31.2. rather than subsection 31.1. Consequently, the agreed upon solution for this conflict is to move 31.1.9. and all its subparts to subsection 31.2.

There was general agreement amongst Sector members that the possible solutions discussed for each of the conflicts identified by MC seemed appropriate. Mr. Flocken, acknowledging the fact that members seemed to agree on the solutions to these issues, suggested that a new proposal to amend the pertinent sections of Publication 14 be drafted and presented for consideration at next year's Sector meeting. Members of the Sector agreed with his suggestion and Mr. Turgeon offered, at Mr. Flocken's request, to draft a proposal that would address each of the conflicts.

In concluding the discussion on this item, the NIST Technical Advisor shared the following concern: Any agreement on the principles of how tare is to function on multi-interval and multiple range scales needs to take into consideration the weights and measures model law. The law prohibits a person, by himself, or by his servant or agent, to sell, offer, or expose for sale less than the amount represented of any commodity or object. In the case of a multi-interval or multiple range scale having to change a tare entered in a lower weighing range or segment in which the net weight happens to fall, if by changing the tare value (e.g., the scale rounds the tare down because the net result is in a higher weighing range) it causes customers to receive less product than the amount represented, might the manufacturer of that scale be held responsible? Mr. Flocken and others agreed this concern needed to be part of the discussion on tare for multi-interval and multiple ranges scales.

Recommendation:
There are two recommendations suggested by the NIST Technical advisor as follows:

Recommendation 1:

Members of the Sector are asked to consider the following proposed changes drafted and submitted by Mr. Turgeon in an effort to eliminate the existing conflicts in NCWM Publication 14 DES:

31.1. **<u>For scales that indicate in two modes (gross and net),</u>** ~~T~~the requirements for the displayed scale division and the mathematical agreement of gross, tare, and net values depend on the information that can be displayed or recorded by the weighing system and may be summarized as follows:

31.1.1.	The number of scale divisions in each weighing range (segment) must meet Table 3 of the Scales Code.	☐ Yes ☐ No ☐ N/A
31.1.2.	For all weighing segments, e must equal d.	☐ Yes ☐ No ☐ N/A
~~**31.1.3.**~~	~~**The scale division for gross and positive or negative net, weights for both increasing and decreasing loads must be**~~	~~☐ Yes ☐ No ☐ N/A~~

~~**displayed in scale divisions consistent with the weighing segment in which the weight falls.**~~

31.1.3. Weight indications at the break-over point of weighing ranges (segments) must be displayed properly. ☐ Yes ☐ No ☐ N/A

31.1.4. **Except for semi-automatic tare, ~~T~~t**are may be taken to the maximum capacity of the smallest weighing range (segment) of the scale. ☐ Yes ☐ No ☐ N/A

31.1.5. Keyboard, programmable, and digital, tare entries, and tare stored in memory for multiple transactions must be consistent with the displayed division size. Incorrect entries may be rounded to the nearest displayed scale division or rejected. ☐ Yes ☐ No ☐ N/A

31.1.6. Devices equipped with a tare capability must, at all times, indicate and record values that satisfy the equation net = gross - tare. ☐ Yes ☐ No ☐ N/A

31.1.7. Devices equipped with a semi-automatic (push-button) tare must meet the tolerances for net loads for any tare value. ☐ Yes ☐ No ☐ N/A

~~**31.1.8. Scales that display or record only net weight values (e.g., most computing scales.)**~~

~~**31.1.8.1. May take semi-automatic (push-button) tare and gross values to the internal resolution of the scale. Printed and displayed net weights shall be rounded to the nearest division. OR**~~ ~~☐ Yes ☐ No ☐ N/A~~

~~**31.1.8.2. May take all tare values to the displayed scale division. AND**~~ ~~☐ Yes ☐ No ☐ N/A~~

~~**31.1.8.3. Must always begin with the lowest weighing segment on the device regardless of the amount of tare that is taken.**~~ ~~☐ Yes ☐ No ☐ N/A~~

31.2. For scales that indicate in only one mode (gross or net) while under load, the scale division for the net weight, whether positive or negative, must be displayed in scale divisions consistent with the weighing range in which the net weight falls.

31.2.1.	The number of scale divisions in each weighing range must meet Table 3 of the Scales Code.	☐ Yes ☐ No ☐ N/A
31.2.2.	The scale divisions for both increasing and decreasing loads must be the same.	☐ Yes ☐ No ☐ N/A
31.2.3.	Devices equipped with a tare capability must indicate and record values that satisfy the equation net = gross - tare.	☐ Yes ☐ No ☐ N/A
31.2.4.	Devices equipped with semi-automatic (push-button) tare must meet the tolerances for net loads for any tare taken up to the tare capacity of the scale.	☐ Yes ☐ No ☐ N/A
31.2.5.	Whenever semi-automatic (push-button) tare is taken and a scale is equipped with only a net display mode, the net weight values must always begin with the lowest weighing range on the device.	☐ Yes ☐ No ☐ N/A
31.2.6.	Keyboard tare entries must be consistent with the displayed scale division.	☐ Yes ☐ No ☐ N/A
31.2.7.	The scale division for the net weight, whether positive or negative, must be displayed in scale divisions consistent with the weighing range in which the net weight falls.	☐ Yes ☐ No ☐ N/A
31.2.8.	Weight indications at the break-over point of weighing ranges must be displayed properly.	☐ Yes ☐ No ☐ N/A
31.2.9.	For all weighing segments, e must equal d.	☐ Yes ☐ No ☐ N/A
31.2.10.	**Scales that display or record only net weight values (e.g., most computing scales.)**	
	31.2.10.1. May take semi-automatic (push-button) tare and gross values to the internal resolution of the scale. Printed and displayed net weights shall be rounded to the nearest division. OR	**☐ Yes ☐ No ☐ N/A**
	31.2.10.2. May take all tare values to the displayed scale division. AND	**☐ Yes ☐ No ☐ N/A**
	31.2.10.3. Must always begin with the lowest weighing segment on the device regardless of the amount of tare that is taken.	**☐ Yes ☐ No ☐ N/A**

31. Multiple Range Scales

Existing Table:

Capacity x d:
WR1 = 0 – 4 kg x 2 g
WR2 = 4 – 10 kg x 5 g
WR3 = 10 – 20 kg x 10 g

	Displayed and/or Printed	
	Preferred	Acceptable
Gross	13.380 kg	13.380 kg
Tare	-3.814 kg	-3.810* kg
Net	9.566 kg	9.570 kg

Corrected Table:

Capacity x d:
WR1 = 0 – 4 kg x 2 g
WR2 = ~~**4**~~**0** – 10 kg x 5 g
WR3 = ~~**1**~~**0** – 20 kg x 10 g

	Displayed and/or Printed	
	Preferred	Acceptable
Gross	13.380 kg	13.380 kg
Tare	-3.814 kg	-3.810* kg
Net	9.566 kg	9.570 kg

Note: The example of the scale build shown in Section 32 is incorrect. Multiple range scales, by definition, are scales that have more than one range, where each range starts at 0 and finishes to max of that range. The build example should show each range starting at "0".

Recommendation 2:

Considering this item was split into two parts at last year's Sector meeting, the second recommendation is to determine if the need still exists (or do scale manufacturers find it of benefit) to try and agree on some basic principles of how different types of tare are to function on multi-interval and multiple range scales. Mr. Flocken reported last year that he did not believe US scale manufacturers are consistent in how they've designed tare to operate for the different kinds of tare and particularly as an operational feature on multi-interval and multiple range scales. An effort to develop some basic principles was started in 2016 through the drafting of the document titled, "Principles of Tare - Multi-Interval and Multiple Range Scales," which remains an attachment to this year's agenda. Is there a need to finish this effort? Might such principles be used to help establish a means of grouping together the different tare requirements in NCWM Publication 14 by tare, so they are better organized and can be more easily followed? Agreement on some basic principles might also be of use in identifying possible gaps in the evaluation of the different tare features associated with these scales.

Discussion/Conclusion:

NEW ITEMS

3. NCWM Publication 14 DES – Section 11. Indicating and Recording Elements – General Section 11.18.

Source:
NCWM/NTEP

Background:

NCWM Publication 14 identifies a test in Section DES, paragraph 11.18. that is not being performed. This test was identified by Measurement Canada in the mutual recognition evaluation checklist. NTEP does not perform this test; however, Measurement Canada would perform the test if appropriate for the device type submitted.

Recommendation:

It is recommended that paragraph 11.18., including all subparts of 11.18., be eliminated and all remaining paragraphs/subparagraphs of Section 11 be renumbered. The following changes are suggested:

~~**11.18. In the event the indicating or recording element can be disconnected from the load cell(s) or weighing/load-receiving element (W/LRE) input(s) without the use of a tool or breaking a security seal, any weight indication or other information (error codes) that remains on the display shall not be interpreted, printed, or stored in memory as a valid weight. This should be tested and verified by disconnecting the load cell(s) or W/LRE(s) while the indicating element is displaying; a negative gross weight or error condition, a zero load condition, a positive gross weight, and an overload condition.**~~

~~**11.18.1. First remove power from the indicating element, disconnect the load cell input or W/LRE, then reapply power to the indicating element. The indicating element should display an error code or other meaningless information that cannot be interpreted, printed or stored as a correct weight.** ☐ Yes ☐ No ☐ N/A~~

~~**11.18.1.1. Perform the test with the display at a gross load zero indication.** ☐ Yes ☐ No ☐ N/A~~

~~**11.18.1.2. Repeat the test with the indicator displaying the following conditions prior to removal of the load cell input.** ☐ Yes ☐ No ☐ N/A~~

~~**11.18.1.3. A negative gross weight or behind zero error indication.** ☐ Yes ☐ No ☐ N/A~~

~~**11.18.1.4. A positive gross weight.** ☐ Yes ☐ No ☐ N/A~~

~~**11.18.1.5. An overcapacity indication.** ☐ Yes ☐ No ☐ N/A~~

~~**11.18.1.6. Reconnect the load cell. The display should indicate the correct weight or an error code or other meaningless information that cannot be interpreted, printed, or stored as a correct weight.** ☐ Yes ☐ No ☐ N/A~~

11.~~19~~**18**.

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4. NCWM Publication 14 DES – Technical Policy Section 8. Weighing Systems, Scales or Weighing/load-receiving elements Greater than 30 000 lb Capacity

Source:
Fairbanks Scales/Mr. Lou Straub

Background:

At the 2017 Weighing Sector meeting, Mr. Eric Golden (Cardinal Scales) submitted an item for consideration that would make changes to NCWM Publication 14. The Weighing Sector agreed with this proposal and platform lengths no shorter than seven feet were added to DES Technical Policy - Section 8, subsections 8.2. and 8.3. During the review of this item in 2017, I questioned NTEP's policy in § 8.2. (scales greater than 200,000 lb capacity), which specifies the platform length for vehicle scales is only 100 percent of the length evaluated; however, for railroad track and the railway track portion of combination scales, the platform length is 150 percent of device evaluated. Also, § 8.1. (scales over 30,000 lb and up to and including 200,000 lb) permits a platform length for all scale types to 150 percent of the device evaluated.

Fairbanks Scales believes there is no difference in design of a non-module scale that supports the current restriction to 100% of the platform evaluated in § 8.2. The structural design of a 200,000 lb vehicle scale is really no different when you cross the "200,000 lb threshold" and manufacture a vehicle scale with a 250,000 lb capacity. After further review of subsections 8.1. and 8.2., why is the criteria ("nominal capacities", "spans", and "lengths") for vehicle scales over 30,000 lb and up to and including 200,000 lb different than the criteria for vehicle scales over 200,000 lb?

I have reviewed the meeting notes from all previous NTEP Weighing Sector Meetings and I have discussed this item with Mr. Jim Truex (NTEP Administrator) at the NCWM Annual Meeting in July. There does not appear to be any "documented" discussion or rationale on why the restrictions exist for "nominal capacities," "spans," and "lengths" in § 8.2. for vehicle scales greater than 200,000 lb, but not for vehicle scales in § 8.1. with capacities of 200,000 lb or less.

I believe a better solution would be to have two sections in NCWM Publication 14; a section addressing criteria for non-module truck scales and a section that addresses criteria for module scales.

Recommendation:

Amend § 8.2. as follows:

8.2. Additional criteria for vehicle scales, railway track scales, combination vehicle/railway track scales, and other platform scales greater than 200 000 lb.

A CC Will Apply to All Models Having:

a. Nominal capacities **<u>up to 135% of</u>** **~~no greater than~~** the evaluated capacity.

b. Widths up to 120% of the width of the platform tested that of the device tested.[3]

c. Lengths no shorter than 7' and up to **~~100~~** **<u>150</u>**% of the length of the platform tested. [4] **~~(for railway track and railway track portion of combination scales length to 150% of device evaluated.)~~**

d. Spans between sections of not more than 20% greater than the equipment evaluated. **~~(for vehicle scale no greater than the device evaluated.)~~**

Notes For d:

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Another option would be to combine subsections 8.1. and 8.2. The requirements found in NCWM Publication 14 could be included in one section that addresses scales over 30,000 lb. The following changes are suggested should members of the sector prefer this alternative option:

8.1. Additional criteria for vehicle scales, railway track scales, combination vehicle/railway track scales and other platform scales over 30,000 lb ~~**and up to and including 200 000 lb**~~.

A CC Will Apply to All Models Having:

a. Nominal capacities up to 135% of evaluated capacity.

b. Widths up to 120% of the width of the platform tested.[3]

c. Lengths no shorter than 7' and up to 150% of the length of the platform tested.

d. A span between sections of not more than 20% greater than the equipment evaluated.

~~**8.2 Additional criteria for vehicle scales, railway track scales, combination vehicle/railway track scales, and other platform scales greater than 200 000 lb.**~~

~~**A CC Will Apply to All Models Having:**~~

~~**a. Nominal capacities no greater than the evaluated capacity.**~~

~~**b. Widths up to 120% of the width of the platform tested that of the device tested.[3]**~~

~~**c. Lengths no shorter than 7' and up to 100% of the length of the platform tested (for railway track and railway track portion of combination scales length to 150% of device evaluated.)**~~

~~**d. Spans between sections of not more than 20% greater than the equipment evaluated (for vehicle scale no greater than the device evaluated.)[4]**~~

Notes For d:

…

Delete footnote 4 at the bottom of page DES 7 since this particular footnote appears only in § 8.2. and does not appear in § 8.1. Footnote 3 would remain because it appears in § 8.1.

Renumber all subsequent subsections.

5. Elimination of the Temperature Range that NTEP Initially Evaluates Devices From All Current and Future NTEP Certificates of Conformance (CC)

Source:
NCWM/NTEP

Background:
Compliance with temperature requirements by NTEP is limited to temperatures that are no lower than -10 °C and no higher than 40 °C. This temperature range (-10 °C to 40 °C) along with equivalent Fahrenheit values (14 °F to 104 °F) is currently being specified on completed NTEP Certificates of Conformance at the bottom of the "Standard Features and Options" box included on the CC providing the equipment for which the CC applies met the evaluation criteria when tested at the lower and higher temperatures specified by this range. Temperature limits is not a required marking on equipment meeting NTEP's (limited) temperature requirements during type evaluation. Additionally, the fact that NTEP does not perform testing at lower or higher temperatures than -10 °C and 40 °C (14 °F to 104 °F) respectively, does not restrict use of the equipment once installed into commercial service to within this limited range of temperatures.

Equipment is allowed to be installed and used outside of the limited temperature testing range of NTEP providing the equipment: 1) passed the NTEP evaluation (i.e., NTEP performance tests) when tested at -10 °C and 40 °C (14 °F to 104 °F); and 2) provides accurate results when tested in the field at temperatures outside the range in which NTEP

performed temperature testing. NIST Handbook 44 paragraph G-UR.1.2. Environment. addresses this issue by requiring equipment to be suitable for the environment in which it is used, which includes at temperatures outside the limited range that NTEP performs its evaluation.

If equipment submitted to NTEP for type evaluation fails to comply with performance requirements when tested at - 10 °C and 40 °C (14 °F to 104 °F), the applicant is given the opportunity to specify to NTEP a narrower temperature range. Note: There are also situations where the device manufacturer requests a reduced temperature range within the limits specified in NIST Handbook 44, Scales Code, paragraph T.N.8.1.2. Once the applicant provides this information, NTEP then re-evaluates the equipment at the limits of that narrower range. Providing the equipment passes those performance tests, the applicant is required to mark the temperature limits on the equipment, which then, also limits use of that equipment to the temperature limits specified. In this case, the narrower temperature range is specified on the completed NTEP Certificate of Conformance at the bottom of the "Standard Features and Options" box rather than the normal temperature range NTEP initially used. If an official observes equipment being used outside the lower or higher temperatures specified by this narrower range, the official should stop the operator from using the device because a temperature limitation has been specified by the applicant and the equipment is being used inappropriately (outside of those limits).

NTEP has received several questions and complaints providing indication that the values -10 °C to 40 °C (14 °F to 104 °F) are being misinterpreted as being the NTEP certified operating temperature. Specifying these values on a CC is not intended to limit the use of equipment to within these temperatures if testing in the field proves the equipment is accurate when tested outside of these temperatures. It is only when a narrower band has been specified and marked on the equipment that official action can be taken when that equipment is observed being used outside the range of temperatures marked.

Recommendation:

It is suggested that members of the Sector discuss the possibility of removing the "normal" temperature range values currently being listed at the bottom of the "Standard Features and Options" box on the first page of an NTEP Certificate of Conformance.

The "normal" temperature range in which NTEP evaluates equipment is: -10° to +40° C.

It is also suggested sector members discuss the possibility of only listing a reduced temperature range, if applicable, in this location on the certificate. The "normal" temperature would be mentioned in the Test Conditions portion of the CC as a test parameter.

Discussion/Conclusion:

ADDITIONAL ITEMS AS TIME ALLOWS

If time permits, OWM, NTEP and/or other groups would appreciate input from the WS on the weighing-related issues that are outlined in the remaining agenda items below. For each item in this section, the Sector is asked to review the item and consider providing input that might assist these groups.

6. Scales Designed with Primary Scale Functions Accessible from a Sub-Screen and Marking of Operational Controls, Indications, and Features

Source:
NTEP/OWM

Background:
In the Fall of 2017, NTEP requested feedback from OWM concerning the zeroing features made available by design on a small capacity retail-computing scale having three different means to zero the scale as follows:

1. The power on/off switch accessed from one of the exterior sides of the scale identified as such using an acceptable symbol. There was also an adhesive label, which specified "zero" positioned immediately above the on/off power switch.
2. A push-button (semi-automatic) zero accessible from a sub-screen (not the main screen). To access the sub-screen, it was necessary for the operator to press a hidden touchscreen key (store logo) on the main screen.
3. Pressing and hold the weight value being displayed. This semi-automatic zeroing feature was not identified anywhere on the scale itself, but step by step procedures using this method were specified in the operational instructions of the owner's manual.

OWM responded by noting the following deficiencies based upon its review of the information and material (photographs) provided:

1. We consider the key that is hidden behind the store logo, which calls up a second page, an operational feature of the scale. It must be clearly and definitely identified as required by paragraph G-S.6 Marking Operational Controls, Indications, and Features.
2. If pressing and holding the weight indication resets the scale to zero, it too must be clearly and definitely identified as an operational feature of the scale.

Due to these deficiencies, we don't view the scale as being acceptable in either a direct sale or self-service application.

An additional concern was the fact that one of the zeroing features could only be accessed from a sub screen rather than the main screen. The zero function is a primary operational feature and one that should be very easily accessed. OWM does not think it is appropriate for primary operational features to be behind a main screen.

Discussion/Conclusion:

7. Application of NIST Handbook 44 Requirements to Class I and II Scales Equipped with a Value of "d" that Differs from "e"

Source:
NTEP/OWM

Background:
In March 2018, NTEP received an inquiry from a scale manufacturer wanting to know which value, "d" or "e," should be used when applying HB 44 Scales Code requirements for Automatic Zero Tracking (AZT) and Center-of-Zero (CZ) on a Class II scale equipped with a value of "d" that differs from "e." Handbook 44 does not clearly identify whether the center of zero (CZ) or automatic zero tracking (AZT) requirements should be based upon "e" or "d." It is believed these requirements and others in HB 44 should always be based on the value of "e," regardless of whether

the values of "e" and "d" are different or equal. Members of the Sector are asked to share their perspective on this issue.

The following HB 44 Scales Code paragraphs apply to the CZ and AZT, respectively:

S.1.1.1. Digital Indicating Elements.

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

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

[Nonretroactive as of January 1, 1993]

(Amended 1992 and 2008)

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

(a) for vehicle, axle load, and railway track scales: 3.0 scale divisions; and

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

(Added 2005)

To try and determine the application of OIML R-76 Nonautomatic weighing systems to these operational features, the NIST Technical Advisor conducted a review of R 76 and the following requirements are thought to apply to these features:

R-76 Center of Zero requirement:

4.5 Zero-setting and zero-tracking devices

An instrument may have one or more zero-setting devices and shall have not more than one zero-tracking device.

4.5.5 Zero indicating devices on an instrument with digital indication

An instrument with digital indication shall have a device that displays a special signal when the deviation from zero is not more than ± 0.25 *e*. This device may also work when zero is indicated after a tare operation.

This device is not mandatory on an instrument that has an auxiliary indicating or a zero-tracking device provided that the rate of zero-tracking is not less than 0.25 d/second.

R -76 Automatic Zero Tracking requirement:

4.5.7 Zero-tracking devices

A zero-tracking device shall operate only when:

- the indication is at zero, or at a negative net value equivalent to gross zero;
- the equilibrium is stable; and
- the corrections are not more than 0.5 *d*/second.

When zero is indicated after a tare operation, the zero-tracking device may operate within a range of 4 % of Max around the actual zero value.

Discussion/Conclusion:

ATTACHMENTS

Attachment to Agenda Item 2. NCWM Publication 14 DES Section 31 Multi-Interval Scales

The following "Principles of Tare" document was developed in 2016 by NIST Office of Weights and Measures:

Principles of Tare – Multi-Interval and Multiple Range Scales

Multi-Interval Scales

Digital, Keyboard, and Programmable Tare

- It shall not be possible to enter or program a tare value that exceeds the capacity of WS1
- All tare values shall be equal to the value of the displayed scale division of WS1
    - If an attempt is made to enter a tare to a different value of d of WS1, the scale shall either reject the tare entry or round the tare entry to the nearest value of d of WS1
- Which of the following two bullet points in the box below is a correct statement (i.e. principle of tare) or should it be specified that either "rounding" method is appropriate?

1. A tare entered (or programmed) to the value of the displayed scale division of WS1 will automatically round to the closest value of the displayed scale division of the WS in which the net weight happens to fall once a gross load has been applied; *or*
2. A tare entered (or programmed) to the value of the displayed scale division of WS1 will be subtracted from the weight of a gross load and the net result then rounded to the closest value of the displayed scale division of the WS in which the net result happens to fall.

The example below provides indication of the difference in the net weight results depending on which value (tare or net) gets rounded.

Consider the following capacity statements marked on a multi-interval scale for this example:
WS1 0-1000 lb x 2 lb
WS2 1000 – 5000 lb x 5 lb

	Displayed and/or Printed	
	Actual	Acceptable
Gross	1010 lb	1010 lb

Tare	- 12 lb	- 12 lb
Net	998 lb	1000 lb

In this example, if the scale rounds tare to the closest value of the displayed division in the range of the resulting net weight, it would round the 12 lb tare to 10 lb and the net result would be 1 000 lb. However, if it is the net weight that gets rounded after subtraction of tare, the net weight would round to the closest 2 lb and the result would be 998 lb.

The decision is important becasuse if it decided that rounding is to the net weight (i.e., after subtraction of tare) then there is only one correct answer and that is 998 lb. If rounding of tare is permitted, then both net results would be considered correct (that is, 998 would still be considered acceptable due to the exception allowed by Scales Code paragraph S.1.2.1.)

NCWM Pub 14 DES Section 31. currently specifies the following:

In applying these principles, it is acceptable to:

- **Round the indicated and printed tare values to the nearest appropriate net weight scale division.**

In reviewing this example during the 2016 NTEP Lab meeting, Darrell indicated that the net result could be either 998 lb or 1 000 lb. For the net result to be 1 000 lb, the 12 lb tare must round to the nearest value of d in the second weighing range (10 lb). That is, rounding would have to occur before subtraction of tare from gross. If rounding occurred after subtraction, then the only acceptable answer would be 998 lb. A 2 lb rounding error is significant because it represents approximately 0.2 % of the net load. Review answers again with Darrell just to confirm he believes both answers are correct.

Which is correct? What is the rule or principle that applies?

- The value of the scale division for the net weight, whether positive or negative, must be displayed in scale divisions consistent with the weighing segment in which the net weight falls.
- If a tare value can be cleared when a load is on the platform, a clear indication that the tare value has been eliminated must be provided.
- In all cases, any displayed or recorded net weight value must be in mathematical agreement with the gross and tare values indicated or recorded (i.e., gross - tare = net).
    - This applies to both when a tare value and the resulting net weight value fall in the same WS (i.e., WS1) and when a tare value and the resulting net weight value fall in different WSs (e.g., tare in WS1 and the resulting net weight in WS2)

- A multi-interval scale may indicate and record tare weights in a lower weighing segment (WS) and net weights in a higher WS and provide a mathematically correct net weight result in accordance with the examples provided in HB 44 Scales Code paragraph S.1.2.1. Digital Indicating Scales, Units.

The following examples are provided to better show how these principles apply:

Consider the following capacity statements marked on a multi-interval scale for Examples A-D shown in the table below:

WS1	0-5 lb x 0.002 lb
WS2	5 – 10 lb x 0.005 lb
WS3	10 – 30 lb x 0.01 lb

Example A

Displayed and/or Printed

	Actual	Acceptable
Gross	13.38 lb	13.38 lb
Tare	- 0.122 lb	- 0.122 lb
Net	13.258 lb	13.26 lb

In the "Acceptable" column 13.258 lb has been rounded up to the nearest scale division of WS3.

Example B

Displayed and/or Printed

	Actual	Acceptable
Gross	13.38 lb	13.38 lb
Tare	-0.004 lb	-0.004 lb
Net	13.376 lb	13.38 lb

In the "Acceptable" column 13.376 has been rounded up to the nearest scale division of WS3. *In this case, the scale clears the tare value once the load is applied. The scale is required to provide a clear indication of that it has done so.*

Example C

Displayed and/or Printed

	Actual	Acceptable
Gross	13.38 lb	13.38 lb
Tare	-0.006 lb	- 0.006 lb
Net	13.374 lb	13.37 lb

In the "Acceptable" column 13.374 has been rounded to the nearest scale division of WS3.

Example D

Displayed and/or Printed

	Actual	Acceptable
Gross	10.54 lb	10.54 lb
Tare	- 0.626 lb	- 0.626 lb
Net	9.914 lb	9.915 lb

In the "Acceptable" column 9.914 has been rounded to the nearest scale division of WS2.

In each of the examples shown above, the net values shown beneath both "Actual" and "Acceptable" would be considered the only acceptable results given the principles of tare on a multi-interval scale.

Push-button (Semi-automatic) Tare

- There are no capacity limitations for semi-automatic tare. Tare may be taken to the capacity of any WS.
- A semi-automatic tare rounds the weight of the object being tared to the closest value in the range where taken.
- Entries of tare shall be to the value of the displayed scale division of the WS in which the tare is taken and then rounded to the closest value of the displayed scale division in the WS in which the net weight results once a load is applied.
- In all cases, any displayed or recorded net weight value must be in mathematical agreement with the gross and tare values indicated or recorded (i.e., gross - tare = net).
- The value of the scale division for the net weight, whether positive or negative, must be displayed in scale divisions consistent with the weighing segment in which the net weight falls.

Multiple Range Scales

- It is important to think of each weighing range of a multiple range scale as if a single scale. There are multiple range scales in which the range is manually selected and there are those in which the range changes automatically with the amount of load applied.
    - For those in which the range is manually selected, tare can only be taken to the value of the displayed scale division of the range selected. An attempt to enter a keyboard (or programmable) tare value that differs from the value of the displayed scale division can either be rejected or rounded and accepted to the closest value of the displayed scale division.
    - For those in which the range changes automatically, the scale must only accept a tare entry to the displayed scale division of the range in which the tare value falls. A tare entry accepted in a lower WR will automatically round to the nearest displayed scale division of a higher weighing range once the application of a load causes the net weight indication to breach the higher WR. However, if the applied load is then decreased, the value of the tare scale division (that was previously rounded to the higher WR) must not change, nor shall the value of the displayed net weight scale division change to that of the lower WR.
    - If a tare value can be cleared when a load is on the platform, a clear indication that the tare value has been eliminated must be provided (*What constitutes a clear indication that tare has been removed?*

Both Multi-Interval and multiple range scales

- The tare mechanism shall only operate in a backward direction with respect to the zero-load balance condition of the scale.
- Scales must provide a clear indication that tare has been taken.
- If tare is set to zero, there must be a clear indication that tare has been removed.
- If a tare value can be cleared when a load is on the platform, a clear indication that the tare value has been eliminated must be provided. What is not known is how the scale will identify the quantity being displayed once tare is erased. I believe some scales revert back to a gross. What constitutes a clear indication that tare has been removed? Under what conditions would NTEP accept the deletion of a tare entry?
- Scales designed to automatically clear tare, shall be designed to prevent the clearing of tare until a complete transaction has been indicated.
- A pre-programmed tare cannot replace a manually entered tare without obvious indication.
- The tare weight plus the net weight must always equal the gross weight. In all cases, any displayed or recorded net weight value must be in mathematical agreement with the gross and tare values indicated or recorded (i.e., gross - tare = net).
- Keyboard and programmable tare entries must be visible at some point in the transaction so the entry can be verified. (Re: DES Section 48). Do you agree that this principle also applies to multi-interval and multiple range scales?

ATTENDEE LIST 2018 MEETING

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NEXT MEETING:

The Sector agreed to hold its next meeting …TBD