

Appendix F

National Type Evaluation Program (NTEP) Weighing Sector Meeting Summary

August 26-27, 2014
Atlanta, Georgia

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, *Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices*, 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, *Specifications, Tolerances, and Other Technical 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.

Proposed revisions to the handbook(s) are shown as follows: 1) deleted language is indicated with a **bold face font using strikeouts** (e.g., ~~this report~~), 2) proposed new language is indicated with an **underscored bold faced font** (e.g., **new items**), and 3) nonretroactive items are identified in *italics*. There are instances where the Sector will use **red** text and/or **highlighted** text to bring emphasis to text that requires additional attention. When used in this report, the term “weight” means “mass.”

Note: It is the policy of the National Institute of Standards and Technology (NIST) to use metric units of measurement in all of its publications; however, recommendations received by NCWM technical committees and regional weights and measures associations have been printed in this publication as submitted. Therefore, the report may contain references in inch-pound units.

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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	NTEP	National Type Evaluation Program
AWS	Automatic Weighing Systems	OIML	International Organization of Legal Metrology
CC	Certificate of Conformance	OWM	Office of Weights and Measures
DES	Digital Electronic Scales	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 2014 NCWM Annual Meeting

Source:

Mr. Richard Harshman, National Institute of Standards and Technology (NIST), Office of Weights and Measures (OWM) Technical Advisor provided the Sector with specific recommendations for incorporating test procedures and checklist language based upon actions of the 2014 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. DES Section 70. – Performance and Permanence Tests for Railway Track Scales Used to Weigh In-Motion

Source:

Mr. Ed Luthy, Schenck Process, LLC (2011, 2012, and 2013 Weighing Sector Agenda Items 6, 3, and 3 respectively)

Background/Discussion:

During the 2011 NTEP Weighing Sector Meeting, the Sector discussed a weigh in-motion system using new technology that utilizes continuous rails (no “rail gaps”) on the approaches and weighing areas of the scale. The submitter stated that the manufacturer is currently unable to offer this device for sale in the United States in commercial applications because current NTEP type evaluation criteria and NIST Handbook 44 requirements are written in such a way that makes it impossible for devices incorporating this new technology to comply. For example, NIST Handbook 44, Scales Code paragraph UR.2.4. Foundations, Supports, and Clearance requires clearance be provided around all live parts to the extent that no contacts may result. NCWM Publication 14, DES Section 70, Inspect the Scale, Item 4 Rail Gaps states that “the rail gaps should be set at 3/8 inch.” The *AAR Scale Handbook* includes language that allows $\frac{1}{8}$ in to $\frac{5}{8}$ in rail gaps. The members of the Sector agreed that they were not willing to recommend deleting references to the required gaps in the rail until it is proven that the new technology complies with the tolerances in NIST Handbook 44. Thus, the Sector recommended that the applicant move forward with performance testing to confirm that the new technology complies with the tolerances in NIST Handbook 44.

Performance testing of the system had not yet been completed when the WS met in 2012. The WS agreed to retain the item on its agenda because there remained an open NTEP application for the device and testing was thought to be ongoing.

During the 2013 WS meeting, Mr. Ed Luthy provided an update on the progress of the testing that had taken place. He reported that the device had met performance requirements for static and in-motion testing and was awaiting final permanence testing. Based on Mr. Luthy’s update, the WS agreed to remove the requirement for $\frac{3}{8}$ in rail gaps specified in NCWM Publication 14, DES Section 70, “Inspect the Scale” 4. Rail Gaps (Page DES-115, 2013 Edition) and renumber subsequent sections.

See the Interim Report of the 2014 NCWM S&T Committee Agenda Item 320-2 for additional background information on the item to amend NIST Handbook 44, Scales Code paragraph UR.2.4. Foundation, Supports, and Clearance.
(http://www.ncwm.net/resources/dyn/files/1025938z8fff0401/_fn/2013_ST_Pub16.pdf).

Conclusion:

No action was recommended nor taken by the Sector on this item. The Sector agreed in 2014 to amend NCWM Publication 14 by removing the requirement for rail gaps in DES Section 70, “Inspect the Scale” 4. Rail Gaps and renumbering subsequent sections.

This item was carried over on the Sector's 2014 agenda because of the existence of a current proposal to amend NIST Handbook 44, which related to this Sector item. The following update was provided by the NIST Technical Advisor to make members of the WS aware of the action taken during the 2014 NCWM Annual Meeting on that proposal:

During the 2014 NCWM Annual Meeting, the Conference voted in favor of amending NIST Handbook 44, Scales Code paragraph UR.2.4. Foundations, Supports, and Clearance. The changes that were adopted provide an exception of having to provide clearance using rail gaps and applies only to in-motion railway track scales designed to be installed and operated using continuous rail.

The adoption of the proposal to amend Scales Code paragraph UR.2.4. by the NCWM concludes this item. It will not appear on the Sector's 2015 agenda.

2. Acceptable Symbols/Abbreviations to Display the CC Number Via a Device's User Interface

Sources:

- 2009 NTETC Software Sector Agenda Item 3 and 2010 S&T Item 310-3 G-S.1. Identification. (Software)
- 2010 Final Report of the S&T Committee: [ncwm.net/content/annual-archive](http://www.ncwm.net/content/annual-archive)
- 2010 Software Sector summary: <http://www.ncwm.net/committees/ntep/sectors/software/archive>
- 2011 Software Sector summary: <http://www.ncwm.net/committees/ntep/sectors/software/archive>
- 2011 Final Report of the S&T Committee (Publication 16 and addendum sheets):
[ncwm.net/content/annual-archive](http://www.ncwm.net/content/annual-archive)
- 2012 Software Sector summary: <http://www.ncwm.net/committees/ntep/sectors/software/archive>
- 2012 Final Report of the S&T Committee:
http://www.ncwm.net/resources/dyn/files/1025938z8fff0401/_fn/2013_ST_Pub16.pdf
- 2013 Software Sector Summary:
http://www.ncwm.net/resources/dyn/files/981560z45f7a5f5/_fn/12_Software_Sector_Activity.pdf
- 2013 Final Report of the S&T Committee: <http://www.nist.gov/pml/wmd/pubs/sp1171.cfm>
- 2014 Final Report of the S&T Committee:
<http://www.nist.gov/pml/wmd/pubs/upload/08-st-14-annual-final.pdf>

Background:

Local weights and measures inspectors need a means to determine whether equipment discovered in the field has been evaluated by NTEP. If so, the inspector needs to know at a minimum the CC number. From this starting point, other required information can be ascertained (e.g., the software version or revision identifier of the software installed in an electronic device at the time it was evaluated). NIST Handbook 44 currently includes three options for marking of the CC:

1. permanent marking;
2. continuous display; and
3. recall using a special operation.

Additional background information relative to this item can be found in 2014 NCWM Publication 16 at:

http://www.ncwm.net/resources/dyn/files/1217541z1019c056/_fn/4-ST-Pub16-2014-CORRECTED-06-12-2014.pdf

During its 2013 meeting, the WS, at the request of the SS, reviewed and provided feedback on the following SS proposal to amend NIST Handbook 44, General Code Paragraphs G-S.1. Identification and G-S.1.1. Location of Marking Information for Not-Built-for-Purpose, Software-Based Devices:

NIST Handbook 44 – Proposed changes:

G-S.1. Identification. – All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect, shall be clearly and permanently marked for the purposes of identification with the following information:

- (a) the name, initials, or trademark of the manufacturer or distributor;
- (b) a model identifier that positively identifies the pattern or design of the device;
 - (1) *The model identifier shall be prefaced by the word “Model,” “Type,” or “Pattern.” These terms may be followed by the word “Number” or an abbreviation of that word. The abbreviation for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., No or No.). The abbreviation for the word “Model” shall be “Mod” or “Mod.” Prefix lettering may be initial capitals, all capitals, or all lowercase.*
[Nonretroactive as of January 1, 2003]
(Added 2000) (Amended 2001)
- (c) a nonrepetitive serial number, except for equipment with no moving or electronic component parts and ~~not built for purpose software based software devices~~ **software**;
[Nonretroactive as of January 1, 1968]
(Amended 2003)
 - (1) *The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.*
[Nonretroactive as of January 1, 1986]
 - (2) *Abbreviations for the word “Serial” shall, as a minimum, begin with the letter “S,” and abbreviations for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., S/N, SN, Ser. No., and S. No.).*
[Nonretroactive as of January 1, 2001]
- (d) the current software version or revision identifier ~~for not built for purpose software based electronic devices~~, which shall be directly linked to the software itself;
[Nonretroactive as of January 1, 2004]
(Added 2003) (**Amended 20XX**)
 - (1) *The version or revision identifier shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision.*
[Nonretroactive as of January 1, 2007]
(Added 2006)
 - (2) *Abbreviations for the word “Version” shall, as a minimum, begin with the letter “V” and may be followed by the word “Number.” Abbreviations for the word “Revision” shall, as a minimum, begin with the letter “R” and may be followed by the word “Number.” The abbreviation for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., No or No.).*
[Nonretroactive as of January 1, 2007]
(Added 2006)
 - (3) **The version or revision identifier shall be accessible via the display. Instructions for displaying the version or revision identifier shall be described in the CC. As an exception, permanently marking the version or revision identifier shall be acceptable under the following conditions:**
 - 1. The user interface does not have any control capability to activate the indication of the version or revision identifier on the display, or the display does not technically allow the version or revision identifier to be shown (analog indicating device or electromechanical counter) or**
 - 2. the device does not have an interface to communicate the version or revision identifier.**

(e) an NTEP CC number or a corresponding CC Addendum Number for devices that have a CC.

- (1) *The CC Number or a corresponding CC Addendum Number shall be prefaced by the terms “NTEP CC,” “CC,” or “Approval.” These terms may be followed by the word “Number” or an abbreviation of that word. The abbreviation for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., No or No.) [Nonretroactive as of January 1, 2003]*

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device.

(Amended 1985, 1991, 1999, 2000, 2001, 2003, ~~and~~ 2006 and 201X)

G-S.1.1. Location of Marking Information for ~~Not-Built-For-Purpose~~ All Software-Based Devices. —For ~~not-built-for-purpose~~ software-based devices, either:

- (a) *The required information in G-S.1. Identification. (a), (b), ~~(d)~~, and (e) shall be permanently marked or continuously displayed on the device; or*
- (b) *The CC Number shall be:*
- (1) *permanently marked on the device;*
- (2) *continuously displayed; or*
- (3) *accessible through an easily recognized menu and, if necessary, a submenu. Examples of menu and submenu identification include, but are not limited to, “Help,” “System Identification,” “G-S.1. Identification,” or “Weights and Measures Identification.”*

Note: *For (b), clear instructions for accessing the information required in G-S.1. (a), (b), and (d) shall be listed on the CC, including information necessary to identify that the software in the device is the same type that was evaluated. [Nonretroactive as of January 1, 2004]*

(Added 2003) (Amended 2006 and 20XX)

See the 2013 WS Final Report to view the feedback provided by the WS on the SS’s proposal to amend paragraphs G-S.1. and G-S.1.1. and for additional background information relating to this item.

This item was also a “Developing” item on the 2014 S&T Committee’s agenda and remains so on the 2015 S&T Committee’s agenda. During the 2014 NCWM Annual Meeting, NIST OWM provided the following comments concerning the SS’s proposal:

The following two concerns and suggestions were provided concerning the changes proposed to subparagraph G-S.1.(d):

1. Deleting the words “for not-built-for-purpose software-based electronic devices” creates the implication that all equipment manufactured as of January 1, 2004, except weights and separate parts necessary to the measurement process but not having any metrological effect, would be required to be permanently marked with a current software version or revision identifier. OWM questions whether or not it is the Software Sector’s intent to require a software version or revision identifier be marked on equipment that is not electronic. If not the intent, OWM suggests that the Sector consider adding text to better clarify the type of equipment intended to be addressed by this proposed change and offers the following additional text for consideration:

- (d) the current software version or revision identifier **for software-based electronic devices**, which shall be directly linked to the software itself;

2. The proposed changes, if adopted, would require a current software version or revision identifier be marked on both built-for-purpose and not-built-for purpose software based equipment manufactured as of January 1, 2004. If it is the intent of the Sector to require that a current software version or revision identifier be marked on built-for-purpose software based equipment, then the Sector might consider proposing that such a requirement be non-retroactive or that it become enforceable at some future date considering the time and cost involved in updating equipment already in service.

The following additional feedback was provided by OWM concerning the Software Sector's proposed changes to paragraphs G-S.1. and G-S.1.1.:

- It is not clear what equipment would be affected by the proposed changes to G-S.1.(c). By proposing that the word "software" be added, is the exception intended to apply to the software itself or to equipment in which the software is installed?
- In the proposed additions to G-S.1.(d)(3)(a), it is not clear what is meant by the phrase "or the display does not technically allow the version or revision identifier to be shown." The examples "analog indicating device" and "electromechanical counter" do not provide enough information to lead one to conclude that the intent is to address such things as numeric-only displays. That is, numeric-only displays that don't have the capability of displaying abbreviations for "version" or "revision" as noted in earlier comments originating from the Sector.
- OWM recommends adding some examples to clarify the types of devices described in paragraph G-S.1.(d)(3)(b).
- OWM agrees with the Software Sector's assertion that it may be possible to eventually eliminate G-S.1.1. at some future date.

OWM noted that a joint meeting of the Software and Weighing Sectors is planned in August 2014 to consider the current proposal and to try and reach agreement on the changes necessary to paragraph G-S.1. OWM encouraged the two Sectors to consider its comments and feedback when considering any changes to the language currently proposed for G-S.1. The approach used in the past has been for the Sectors to review the proposal in separate meeting sessions; however, this has not resulted in a proposal amenable to all Sectors. OWM believes that it might be more expedient for all of the Sectors to collaborate in a single joint meeting to try and reach agreement on the changes needed.

Following the 2014 NCWM Annual Meeting, members of OWM's Legal Metrology Devices Program (LMDP) were requested to provide additional input on the proposal to modify G-S.1. and G.S.1.1. in consideration of the goals of the SS and the comments provided during the 2014 Open Hearings of the S&T Committee relating to this item.

The following is a list of the goals provided by the SS in modifying G-S.1. and G.S.1.1. as communicated to the members of OWM's LMDP:

1. Remove the existing distinction between software identification requirements for built-for-purpose and not-built-for-purpose devices.
2. To require that all software-based devices have a software version or revision identifier for metrologically significant software.
3. Require that certified software versions or revision identifiers for metrologically significant software is recorded on the CC for access by inspectors.
4. Software itself does not require serial numbers.

5. Require that software-based devices version or revision identifier shall be accessible via the display and user interface and only if device's display is incapable of displaying the identifier or has no display and/or interface; then permanently marking the version or revision identifier shall be acceptable (e.g., digital load cell).
6. Nonretroactive as of January 1, 2016, if passed by the NCWM in July 2015.

OWM's LMDP developed the following proposed draft alternative changes to G-S.1. based on the SS's request for additional input on how best to meet its goals and forwarded them to the Chairman of the SS for consideration at the 2014 WS/SS joint meeting:

Amend NIST Handbook 44: G-S.1. Identification and G-S.1.1. Location of Marking Information for Not-Built-For-Purpose, Software-Based Devices as follows:

G-S.1. Identification. – All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect, shall be clearly and permanently marked for the purposes of identification with the following information:

- (a) the name, initials, or trademark of the manufacturer or distributor;
- (b) a model identifier that positively identifies the pattern or design of the device;
 - (1) *The model identifier shall be prefaced by the word "Model," "Type," or "Pattern." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The abbreviation for the word "Model" shall be "Mod" or "Mod." Prefix lettering may be initial capitals, all capitals, or all lowercase.*
[Nonretroactive as of January 1, 2003]
(Added 2000) (Amended 2001)
- (c) *a nonrepetitive serial number, except for equipment with no moving or electronic component parts and ~~not built for purpose software based devices~~ software;*
[Nonretroactive as of January 1, 1968]
(Amended 2003)
 - (1) *The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.*
[Nonretroactive as of January 1, 1986]
 - (2) *Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No., and S. No.).*
[Nonretroactive as of January 1, 2001]
- (d) the current software version or revision identifier for not-built-for-purpose software-based devices; **manufactured as of January 1, 2004 through December 31, 2015, and all software based devices or equipment manufactured as of January 1, 2016;**
~~[Nonretroactive as of January 1, 2004]~~
(Added 2003) **(Amended 20XX)**
 - (1) *The version or revision identifier shall be:*

- i. *prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision;*
[Nonretroactive as of January 1, 2007]
(Added 2006)
- ii. ***directly linked to the software itself; and***
[Nonretroactive as of January 1, 2016]
(Added 20XX)
- iii. ***continuously displayed* or be accessible via the display menus. Instructions for displaying the version or revision identifier shall be described in the CC. As an exception, permanently marking the version or revision identifier shall be acceptable providing the device does not have an integral interface to communicate the version or revision identifier.***
[Nonretroactive as of January 1, 2016]
(Added 20XX)

****The version or revision identifier shall be displayed continuously on software-based equipment with a digital display manufactured as of January 1, 20XX and all software-based equipment with a digital display as of January 1, 20XX.***

- (2) *Abbreviations for the word “Version” shall, as a minimum, begin with the letter “V” and may be followed by the word “Number.” Abbreviations for the word “Revision” shall, as a minimum, begin with the letter “R” and may be followed by the word “Number.” The abbreviation for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., No or No.).*
[Nonretroactive as of January 1, 2007]
(Added 2006)
- (e) *a National Type Evaluation Program (NTEP) Certificate of Conformance (CC) number or a corresponding CC Addendum Number for devices that have a CC.*
- (1) The CC Number or a corresponding CC Addendum Number shall be prefaced by the terms “NTEP CC,” “CC,” or “Approval.” These terms may be followed by the word “Number” or an abbreviation of that word. The abbreviation for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., No or No.).***
[Nonretroactive as of January 1, 2003]

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device. (Amended 1985, 1991, 1999, 2000, 2001, 2003, ~~and~~, 2006 **and 20XX**)

G-S.1.1. Location of Marking Information for ~~Not-Built-For-Purpose~~ All Software-Based Devices. – For ~~not-built-for-purpose~~, software-based devices, either:

- (a) *The required information in G-S.1. Identification. (a), (b), ~~(d)~~, and (e) shall be permanently marked or continuously displayed on the device; or*
- (b) *The CC Number shall be:*
 - (1) *permanently marked on the device;*
 - (2) *continuously displayed; or*

(3) *accessible through an easily recognized menu and, if necessary, a submenu. Examples of menu and submenu identification include, but are not limited to, “Help,” “System Identification,” “G-S.1. Identification,” or “Weights and Measures Identification.”*

Note: For (b), clear instructions for accessing the information required in G-S.1. (a), (b), and (d) shall be listed on the CC, including information necessary to identify that the software in the device is the same type that was evaluated.

[Nonretroactive as of January 1, 2004]

(Added 2003) (Amended 2006 **and 20XX**)

No changes to subparagraph G-S.1.1. were proposed by OWM’s LMDP since the SS had indicated earlier that it may be possible to eventually eliminate G-S.1.1. Thus, the proposed changes to subparagraph G-S.1.1. shown above in OWM’s draft alternative changes are those originating from the SS’s 2013 proposal.

In providing feedback to the SS, OWM’s LMDP noted that the shaded portion of G-S.1.(d)(1)iii. of their draft alternative changes was developed solely by OWM (i.e., does not reflect any of the goals communicated by the SS) and was being offered for consideration with the understanding that:

1. this change will make it easier in the future for inspectors to be able to identify software installed in equipment;
2. a reasonable amount of time for the changes to take effect can be specified; and
3. it is probable that improvements in technology over time will make it easier for equipment manufacturers to comply.

In addition to the alternative changes proposed by OWM’s LMDP, a member of the SS submitted the following definition of “software-based devices” for discussion during the joint meeting of the Weighing and Software Sectors and possible future inclusion into Appendix D of NIST Handbook 44:

software-based devices. – devices used to compute and control processes using software, where software is a general term for the programs and data used to operate the computers and/or related electronic devices. Software-based device may also consist of just software (e.g., weigh in/weigh out software).

Discussion/Conclusion:

During the joint meeting of the Weighing and Software Sectors, the Chairman of the SS led a discussion on the identification of software; more specifically, the changes that have been proposed or that are needed to G-S.1. and G-S.1.1. and the reasons why these changes are important. He reviewed the SS’s 2013 draft proposal to amend G-S.1. and G-S.1.1. and the comments that had been received since its distribution. Very few constructive comments had been received except for some comments provided by NIST, OWM, which the Chairman reviewed one by one; requesting additional clarification from the NIST Technical advisor as needed.

Once the review of the Sector’s draft proposal had been completed, it was then pointed out that NIST OWM’s LMDP had developed some suggested alternative changes to the SS’s proposal at the request of the SS. Members of both Sectors were asked to review and consider the alternative changes proposed by OWM’s LMDP, which were provided in a handout to members of both sectors and displayed on screen.

The NIST Technical Advisor to the WS, also a member of OWM’s LMDP, explained the reasons for OWM’s proposed alternative changes to G-S.1. Identification. Initial discussions of the group regarding OWM’s draft changes mostly concentrated on three main issues/concerns as follows:

1. Why is it necessary to retain the term “not-built-for-purpose software-based devices” and add enforcement dates to G-S.1.(d) when it is the Sector’s intention to treat built-for-purpose and not-built-for-purpose devices the same with respect to identifying software?
2. Consideration of the text that OWM had developed and was proposing for addition to G-S.1.(d) iii.
3. What would be the effective dates of any changes agreed upon by the group?

The following is a brief summary of the discussions and actions taken by the two Sectors relative to these three issues/concerns:

1. With regard to the changes proposed to G-S.1.(d), the NIST Technical Advisor to the WS indicated that it was OWM’s view that a separation between built-for purpose and not-built-for-purpose software-based devices needed to be maintained within the paragraph because the current requirement (i.e., G-S.1.(d)) only applies to not-built-for-purpose software-based devices. Although the SS’s intention is to expand the requirement to apply to all electronic devices, it would not be appropriate to require existing built-for-purpose-equipment, which is already in service, to comply with the proposed changes to G-S.1. since this equipment has not had to do so previously. Updating existing equipment, in order to make it comply with new requirements, could be costly to both manufacturers and device owners. Additionally, it may not be possible for some built-for-purpose devices to provide an indication of the current software version or revision identifier. Although marking of the version or revision identifier using a label affixed to the device might be an option, how would officials be able to tell if the version of software installed in the device actually matched the marking on the device? By adding effective dates, as proposed, the separation can be maintained and still provide a means of requiring all new electronic equipment to comply. The NIST Technical Advisor also acknowledged that it may be possible at some future date to remove the reference to “not built for-purpose” in the paragraph. Members of the two Sectors agreed, although it was decided that the words “through December 31, 2015” in the lead-in sentence of G-S.1.(d) should be deleted because the inclusion of this date is not necessary and its removal does not in any way change the proposal.
2. There were significant concerns raised by equipment manufacturers regarding OWM’s suggested proposal to require the continuous display of the version or revision identifier on software-based equipment having a digital display. It was stated that some displays; specifically referenced were “seven-segment digital displays of simple design,” do not have the capability of complying with the proposed note that had been developed by OWM. It was also stated that customer demand for these simple displays remains steady among the different scale manufacturers because of their low cost in relation to other digital displays that incorporate more current and complex technology. That is, some customers aren’t willing to pay the extra money for a more complex display that can be made to comply with OWM’s proposed note, such as one of the graphic types, when all that’s needed is a simple basic display. Manufacturers did not see this situation changing and stated that sales of these displays are driven by their low cost. Another concern was the valuable “real estate” that the version or revision identifier would take up if it were continuously displayed.
3. In consideration of the fact that the proposed changes, if adopted, would require both built-for-purpose and not-built-for-purpose software-based equipment to continuously display the current software version or revision identifier or that this information be accessible via the display menus, members of the two Sectors felt that the 2016 effective date proposed by OWM did not provide enough lead-in time for equipment manufacturers. Thus, the Sectors agreed to extend the date to 2020 by amending OWM’s proposal to reflect this new date.

A fourth issue/concern, which was raised by an equipment manufacturer somewhat later in the discussions, is that some built-for-purpose equipment have limited capability of displaying letters of the alphabet, and therefore, unable to comply with the prefacing requirements specified in G-S.1.(d)(1) and G-S.1.(d)(2). The example provided was a seven-segment display. It is not able to display a “V” or an “R,” which are the current acceptable abbreviations for “version” and “revision,” respectively. A “U” could be considered a symbol; however, it is not currently a symbol included in the list of acceptable abbreviations found in some NCWM Publication 14 device checklists. Alternatively, a lower-case “r” could be displayed on such an indicator. In consideration of this concern, it was suggested that a “note” be added to G-S.1.(d) permitting the NTEP evaluators to specify a different method of indication if the device

is incapable of prefacing the software version/revision with a “V” or “R.” The Sectors agreed to propose a “note” be added and let the S&T Committee decide whether the “note” is necessary or appropriate. An additional change agreed upon by the Sectors relating to this issue/concern was to add the last sentence of G-S.1.(b) to the end of G-S.1.(d)(2). In discussing this issue/concern, it was also stated that some built-for-purpose devices only indicate the software version or revision identification during power up. That is, in order to view the software identification, it is necessary to shut off and then return power to the device. It was noted that some officials have been instructed not to power down equipment they are inspecting for liability reasons. There were no solutions to this (power down/power up) concern offered by members of either Sector.

Although the SS had earlier proposed changes to G-S.1.1., it was decided during the meeting that no changes to G-S.1.1. were necessary since the sectors had agreed to retain the term “not-built-for-purpose software-based devices” in G-S.1.(d). Thus, no changes are proposed to paragraph G-S.1.1. The following reflects all of the changes to paragraph G-S.1. that were agreed upon by the two Sectors during the joint meeting:

Amend NIST Handbook 44: G-S.1. Identification as follows:

G-S.1. Identification. – All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect, shall be clearly and permanently marked for the purposes of identification with the following information:

- (a) the name, initials, or trademark of the manufacturer or distributor;
- (b) a model identifier that positively identifies the pattern or design of the device;
 - (1) *The model identifier shall be prefaced by the word “Model,” “Type,” or “Pattern.” These terms may be followed by the word “Number” or an abbreviation of that word. The abbreviation for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., No or No.). The abbreviation for the word “Model” shall be “Mod” or “Mod.” Prefix lettering may be initial capitals, all capitals, or all lowercase.*
[Nonretroactive as of January 1, 2003]
(Added 2000) (Amended 2001)
- (c) *a nonrepetitive serial number, except for equipment with no moving or electronic component parts and ~~not built for purpose software-based software devices~~ software;*
[Nonretroactive as of January 1, 1968]
(Amended 2003)
 - (1) *The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.*
[Nonretroactive as of January 1, 1986]
 - (2) *Abbreviations for the word “Serial” shall, as a minimum, begin with the letter “S,” and abbreviations for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., S/N, SN, Ser. No., and S. No.).*
[Nonretroactive as of January 1, 2001]
- (d) the current software version or revision identifier for not-built-for-purpose software-based devices; **manufactured as of January 1, 2004, and all software-based devices or equipment manufactured as of January 1, 2020;**
[Nonretroactive as of January 1, 2004]
(Added 2003) (**Amended 20XX**)
 - (1) *The version or revision identifier shall be:*

- i. *prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision;*
[Nonretroactive as of January 1, 2007]
(Added 2006)

Note: If the equipment is capable of displaying the version or revision identifier but is unable to meet the formatting requirement, through the NTEP type evaluation process, other options may be deemed acceptable and described in the CC.

(Added 20XX)

- ii. **directly linked to the software itself; and**
[Nonretroactive as of January 1, 2020]
(Added 20XX)

- iii. **continuously displayed or be accessible via the display. Instructions for displaying the version or revision identifier shall be described in the CC. As an exception, permanently marking the version or revision identifier shall be acceptable providing the device does not have an integral interface to communicate the version or revision identifier.**
[Nonretroactive as of January 1, 2020]
(Added 20XX)

- (2) *Abbreviations for the word “Version” shall, as a minimum, begin with the letter “V” and may be followed by the word “Number.” Abbreviations for the word “Revision” shall, as a minimum, begin with the letter “R” and may be followed by the word “Number.” The abbreviation for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., No or No.). **Prefix lettering may be initial capitals, all capitals, or all lowercase.***
[Nonretroactive as of January 1, 2007]
(Added 2006)

- (e) *a National Type Evaluation Program (NTEP) Certificate of Conformance (CC) number or a corresponding CC Addendum Number for devices that have a CC.*

- (1)** *The CC Number or a corresponding CC Addendum Number shall be prefaced by the terms “NTEP CC,” “CC,” or “Approval.” These terms may be followed by the word “Number” or an abbreviation of that word. The abbreviation for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., No or No.)*
[Nonretroactive as of January 1, 2003]

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device.

(Amended 1985, 1991, 1999, 2000, 2001, 2003, **and,** 2006 **and 201X)**

Members of the two Sectors also reviewed the draft definition of “software-based devices.” The draft definition had been developed by a member of the SS in consideration of a comment that had been received by the S&T Committee during one of the 2014 NCWM Conferences. The Sectors agreed that no action was currently necessary other than that the definition be retained for future consideration should the need develop.

An additional issue that was discussed during the joint meeting is whether or not the updating of metrological software should be considered a sealable event or sealable parameter. It was agreed that an update to metrological software is a sealable event and needs to be protected using an approved means of security. The Sectors then considered whether it would be appropriate to include the updating of metrological software in the list of sealable parameters in NCWM Publication 14 or to provide for its security by proposing a new General Code requirement be added to NIST Handbook 44. The Sectors decided that the updating of metrological software can affect multiple sealable parameters,

and, therefore, it is appropriate to address its security in the General Code of NIST Handbook 44. Consequently, the Sectors decided to complete and submit an NCWM Form 15 proposing there be a new General Code requirement added to the handbook to address the security of software updates.

The two Sectors agreed that much progress had been made during the joint meeting, but that paragraph G-S.1., as revised during the meeting, is not likely to be considered for vote by the NCWM. In consideration of the progress that was made, the Sectors agreed to recommend that the “Developing” status of the item be changed to “Informational” and forward the revised draft of G-S.1. to the different regional associations for their consideration at their next meeting.

3. NCWM Publication 14 DES Checklists and Test Procedures Section 1 Marking – Applicable to Indicating, Weighing/Load-Receiving Elements and Complete Scales

Source:

NTEP Labs – 2013 Weighing Sector Agenda Item 7.

Background/Discussion:

A “Note” in Section 1 of the Checklists and Procedures of NCWM Publication 14 Digital Electronic Scales specifies that for consistency purposes the NTEP labs use an Eberhard Faber ink eraser type #110 to verify the permanence of the lettering used to mark required information on a device. It has been reported that this particular eraser may no longer be available in the marketplace. The NTEP lab evaluators had been asked to try and identify a suitable replacement for this eraser; but none had been suggested as of the 2013 WS meeting.

During the 2013 WS meeting, members of the Sector were asked to help identify a suitable replacement eraser; one that could be readily acquired by all the NTEP labs at a reasonable cost so that the NTEP labs could continue testing the permanence of lettering used to mark required information on a device using the same testing medium. An ink eraser called “black pearl” was identified by the WS as a possible replacement and Mr. Jim Truex (NTEP Administrator) agreed to look into the possibility of using the “black pearl” eraser as replacement for the Eberhard Faber ink eraser.

Conclusion:

This item has been completed. The Sector was updated on the selection of some suitable replacement erasers for testing permanence of marking. Mr. Truex reported that all appropriate sections of the 2014 edition of NCWM Publication 14 had been amended to reflect the acceptance of the “Papermate Black Pearl” and “Papermate Union #110” as suitable alternatives to the Eberhard Faber ink eraser type #110 in the testing of permanence of marking.

NEW ITEMS

4. NIST Handbook 44 Scales Code Paragraph S.5.4 Relationship of Load Cell Verification Interval Value to the Scale Division

Source:

NCWM/NTEP

Background:

NTEP has identified two different interpretations of how to apply the formula specified in NIST Handbook 44, Scales Code paragraph S.5.4. Relationship of Load Cell Verification Interval Value to the Scale Division; specifically, to bulleted item (a). The formula determines the suitability of the v_{\min} value of a load cell in relationship to the value of the scale division (d) for scales without lever systems. The different interpretations occur only when applying the formula to a scale having multiple platforms (Weighing/Load Receiving Elements [W/LRE]) where the output of each W/LRE has its own weight display and is capable of operating as an independent scale in a commercial application.

Consider the number of load cells in each W/LRE of the following example scale and how the formula is to be applied:

Platform	Number of Load Cells
1	4
2	4
3	6

The first interpretation applies the formula to the three W/LREs as a single platform using the total of all load cells (14) for the value of “N” in the formula.

The second interpretation applies the formula to each of the three W/LRE’s individually using only the number of load cells (4, 4 and 6) in the W/LRE for the value of “N” in the formula.

Recommendation:

The submitter believes that the second interpretation is correct and suggests the follow actions:

The WS consider completing an NCWM Form 15 and submitting it to the S&T Committees of the Regional Weights and Measures Associations proposing the following “Note” be added below the opening paragraph of Section S.5.4. in the 2015 edition of NIST Handbook 44 as follows:

NIST Handbook 44 - 2.20. Scales Code Paragraph S.5.4.

S.5.4. Relationship of Load Cell Verification Interval Value to the Scale Division. – The relationship of the value for the load cell verification scale interval, v_{\min} , to the scale division, d , for a specific scale installation using National Type Evaluation Program (NTEP) load cells shall comply with the following formulae where N is the number of load cells in the scale (such as hopper or vehicle scale weighing/load-receiving elements):

Note: When the scale installation contains two or more W/LREs where the output of each W/LRE produces its own independent weight display and is thus capable of operating as an independent NTEP certificated scale in a commercial application, the value of “N” should be the number of load cells in each individual W/LRE.

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

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

[*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)

Upon NCWM adoption of this recommendation, the Weighing Sector will need to revise *Publication 14*, Digital Electronic Scales, Section 22. *Relationship of v_{\min} to d and Load Cells*, Section F. *Multiple Load Cell Systems* by adding the same “Note.”

Conclusion:

There was no action taken on this item. Due to conflicting NCWM announcements of the Weighing Sector (WS) meeting start time for Tuesday, August 26, not all stakeholders were in attendance when this item was first introduced during the 2014 WS meeting. Consequently, the NCWM agreed to reintroduce this item on the 2015 Weighing Sector Agenda in the interest of fairness to all.

5. NCWM Publication 14 DES Section B. Certificate of Conformance Parameters, Subsection 8. Weighing Systems, Scales or Weighing/load-receiving elements Greater than 30 000 lb Capacity, Paragraph 8.3.2. Range of Parameters for Modular Scales

Source:

NCWM/NTEP

Background:

Current Technical Policy, page DES-8, Section B.8.3.2., of the Digital Electronic Scales (DES) Code states:

"The following range of parameters will be used to establish the sizes and capacities of modular load cell vehicle scales that will be covered on a CC based upon the test of a single scale."

It is believed that as this paragraph is located under Section 8.3. *Modular Load-Cell Vehicle, Livestock, or Railway Track Scales* and there is no other paragraph or section specific to livestock and railway track scales, the paragraph incorrectly limits the parameters stated in "a" thru "j" as applying to only vehicle scales.

Recommendation:

The following proposal is suggested for changing the opening paragraph of Section 8.3.2. to identify that Livestock and Railway Track Scales Certificates of Conformance (CC) have the same range of parameters:

National Type Evaluation Program Digital Electronic Scales – Technical Policy	
B. Certificate of Conformance Parameters	
...	
1. Influence Factors Requirements	
...	
8. Weighing Systems, Scales or Weighing/load-receiving elements Greater than 30 000 lb Capacity	
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.	
8.2. ...	
8.3. Modular Load-Cell Vehicle, Livestock, or Railroad Track Scales.	
<i>Note: These criteria apply if the scale is fully electronic (e.g., load cells comprise the sensors of the weighing/load-receiving element) and is of a modular design.</i>	
Modular Scale	
A vehicle, livestock, or railroad track scale made up of individual load-receiving elements of like design, which can be joined together to form a larger integral load-receiving element and can be separated at any time without structurally changing the individual load-receiving elements. This definition is to be applied for all new type evaluations and for applications to add new devices to an existing Certificate of Conformance (CC.). <i>See figure 3.</i> (Effective January 2001)	
8.3.1. Modular Scale to be Tested.	

...

8.3.2. Range of Parameters for Modular Scales.

The following range of parameters will be used to establish the sizes and capacities of modular load cell ~~vehicle~~ scales that will be covered on a CC based upon the test of a single scale.

- a. Nominal capacities not more than 1.5 times CLC for a two-section scale to 135 % of capacity of the device evaluated. The nominal capacity for the railroad track scale in a modular vehicle/railroad combination will be no greater than the capacity of the device submitted for evaluation.
- b. Platform area not less than 50 % of smallest two-section (four-cell) module incorporated in the device evaluated. Increased lengths for scales with two or more modules are not restricted as long as the width complies with 8.3.2.(e) and the load cells meet the v_{min} formula (e.g., $v_{min} \leq d / \sqrt{n}$.) Additional modules to increase length must be of the same type as those used in the device submitted for evaluation (e.g., 4-cell, 2-cell, and 0-cell.)
- c. CLCs complying with the minimum CLC rating (e.g., not less than 80 % of the capacity of one cell) but not exceeding twice the capacity of one load cell.¹
- d. Span(s) between sections which is (are) not more than 20 % greater than the span of the largest two-section, four load-cell module evaluated.
- e. Widths up to 120 % of the width of the platform tested.²
- f. Nominal capacity equal to or less than CLC times the number of sections minus one-half.
- g. Platform construction and material similar to that of the device evaluated. See Section 8.e.
- h. Scale division values equal to or greater than the value of the scale division used in the scale that was evaluated.
- i. Number of divisions (n_{max}) the number of scale divisions that would exist for scales included in the range of capacities provided it does not exceed the n_{max} of the load cells and indicator for the installed system.
- j. Module connection type will be limited to the original type evaluated. The manufacturer may choose to submit a special hybrid design including more than one type of module connection. For example, one module can be connected using welded connections and another can be connected using bolted connections. The resulting CC will cover all the types submitted if the evaluation is successful.

Alternatively, the Sector might consider amending the lead-in sentence of paragraph 8.3.2. to read as follows:

The following range of parameters will be used to establish the sizes and capacities of modular load cell vehicle, livestock, or railway track scales that will be covered on a CC based upon the test of a single scale.

Conclusion:

The WS agreed with the submitter of this item that all parts of paragraph 8.3.2. in Section B of NCWM Publication 14 DES, including lettered subparts (a) thru (j) are intended to apply to vehicle, livestock, and railroad track scales. To clarify the application of this paragraph, the Sector elected to amend its lead-in sentence (i.e., the submitter's alternative option) as follows:

8.3.2. Range of Parameters for Modular Scales.

The following range of parameters will be used to establish the sizes and capacities of modular load cell vehicle, **livestock, or railway track** scales that will be covered on a CC based upon the test of a single scale.

a. ...

6. NCWM Publication 14 DES Section 10. Provision for Metrological Sealing of Adjustable Components or Audit Trail

Source:

Maryland Weights and Measures/NTEP Labs

Background:

The Maryland NTEP lab was recently performing an evaluation on a device that was subject to the United States/Canada Mutual Acceptance Agreement (MRA) and the manufacturer of the device had designed it to be sealed using a pressure sensitive seal. The design of the sealing mechanism on the device being evaluated complied with existing sealing requirements found in NIST Handbook 44 (i.e., paragraph G-S.8. Provisions for Sealing Electronic Adjustable Components) and current type evaluation criteria in NCWM Publication 14, but did not meet MC's laboratory evaluation manual sections 2.4.4. and 2.4.5. NIST Handbook 44 paragraph G-S.8. Provision for Sealing Electronic Adjustable Components has been copied below for reference:

*G-S.8. Provision for Sealing Electronic Adjustable Components. – A device shall be designed with provision(s) for applying a security seal that must be broken, or for using other approved means of providing security (e.g., data change audit trail available at the time of inspection), before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism.
[Nonretroactive as of January 1, 1990]*

A device may be fitted with an automatic or a semi-automatic calibration mechanism. This mechanism shall be incorporated inside the device. After sealing, neither the mechanism nor the calibration process shall facilitate fraud.

(Added 1985) (Amended 1989 and 1993)

Recommendation:

Add MC's laboratory evaluation manual requirements found in Sections 2.4.4. and 2.4.5. to NCWM Publication 14 DES Section 10 to better harmonize United States/Canadian type evaluation criteria as it relates to the use of pressure sensitive seals for sealing metrologically significant parameters. The NTEP Weighing Laboratories have discussed and endorsed adding the Canadian requirements. The following changes are suggested for consideration:

10. Provision for Metrological Sealing of Adjustable Components or Audit Trail

Code References: G-S.8.1. and S.1.11.

The current language in NIST Handbook 44 paragraph G-S.8. states: "A device shall be designed with provision(s) for applying a security seal that must be broken, or for using other approved means of providing security (e.g., data change audit trail available at the time of inspection), before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism."

Thus, for parameters protected by physical means of security, once a physical security seal is applied to the device, it should not be possible to make a metrological change to those parameters without breaking that seal. Likewise, for parameters protected by electronic means of security, it should not be possible to make a metrological change to those parameters without that change being reflected in the audit trail. Since this philosophy addresses provisions for protecting access to any metrological adjustment, the philosophy should be applied consistently to all electronic device types.

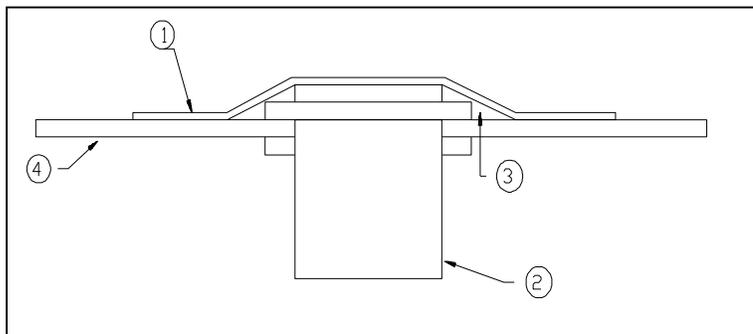
Due to the ease of adjusting the accuracy of electronic scales, all scales (except for Class I scales) must provide for a security seal that must be broken or provide an audit trail, before any adjustment that detrimentally affects the performance of the electronic device can be made. Only metrological parameters that can affect the measurement features that have a significant potential for fraud and features or parameters whose range extends beyond that appropriate for device compliance with NIST Handbook 44 or the suitability of equipment, shall be sealed.

For additional information on the proper design and operation of the different forms of audit trail, see *Appendix B for the Requirements for Metrological Audit Trails*.

The judgment of whether or not a method of access to an adjustment represents a "significant potential for fraud" and will normally require sealing for security will be made based upon the application of the *Philosophy for Sealing in Appendix A*.

Use of Pressure Sensitive Seals

Pressure sensitive seals are acceptable under certain conditions. If they cover a hole (e.g., through which a "calibration enable" switch would be activated) the hole must be covered with a suitable rigid plug. The seal must not bridge so as to leave cavities or air pockets under the seal. Cavities and air pockets are weak points that could cause the seal to be easily damaged.



Key

- 1 Pressure sensitive (paper) seal**
- 2 Keylock**
- 3 Air pocket (void space)**
- 4 Casing**

A pressure sensitive security seal is not suitable in an adverse environment (rain, cold, washdown, etc.).

Sealing - General

In addition to satisfying the physical security sealing requirement; the presence of a physical seal shall clearly indicate that the setup or configuration mode (any mode permitting access to any or all sealable parameters based upon the application of the *Philosophy for Sealing in Publication 14*) of the device cannot be accessed without additional actions (e.g., removal of a jumper, pressing a key or switch, etc.) only possible after the removal of the seal.

...

Discussion/Conclusion:

This item was withdrawn due to concerns that if the proposal were adopted, it would likely create a conflict between type evaluation and field enforcement. In discussing this item, it was noted that NIST Handbook 44 doesn't restrict the use of pressure sensitive security seals in adverse environments, such as the two environments mentioned as examples in the text of the proposal. Handbook 44 also doesn't limit their use by requiring there be a suitable rigid plug to cover the hole, beneath which exists the switch that enables adjustment to one or more metrological parameters. It was stated that field officials often seek interpretations of NIST Handbook 44 requirements using the NCWM Publication 14 checklists. The concern was that if these new criteria were added to NCWM Publication 14 DES, field officials might begin applying it in the field; when in fact, NIST Handbook 44 does not provide such stringent requirements pertaining to the use of pressure sensitive seals. Some members of the Sector also questioned whether the illustration included in the proposal represented an acceptable or unacceptable example of the use a pressure sensitive seal. MC's representative to the Sector confirmed that the illustration depicted an example of an unacceptable use of the seal and that there was some text missing from the proposal that clarified this to be true.

7. NCWM Publication 14 ABWS Technical Policy Section E. Automatic Bulk Weighing Systems – NTEP On-Site Evaluation, and ABWS Checklists Paragraph 32

Source:

NCWM/NTEP

Background:

Current Technical Policy, Section E, of the Automatic Bulk Weighing Systems (ABWS) Code states:

During laboratory evaluation, the bulk weighing controller is tested under simulated field conditions; therefore, the results of such an evaluation should not be used to determine compliance with all pertinent requirements. Compliance with all requirements shall be determined only when the bulk weighing controller, having successfully passed National Type Evaluation Program laboratory evaluation, is installed and tested under actual field conditions as part of an automatic bulk weighing system.

In addition, Paragraph 32. Performance and Permanence Tests for Automatic Bulk Weighing Systems of the ABWS Code states:

The tests described here, apply to the entire automatic bulk weighing system, (e.g., the bulk weighing scale controller interfaced with the weigh hopper, load cell(s), material handling system, etc.). It is assumed that all components of the automatic bulk weighing scale controller have already been examined and found to comply with applicable National Type Evaluation Program requirements. If the design and performance of the bulk weighing controller is to be determined during the same test, the applicable requirements for automatic bulk weighing systems must be referenced.

The wording implies that a complete evaluation of the weighing controller is not possible without connecting the weighing controller to an actual hopper. After discussing this with the NTEP Labs and a few manufacturers, it was concluded that the weighing control can receive a complete evaluation in the lab with proper simulation.

Recommendation:

The following changes to Section E of the ABWS Technical Policy and to Paragraph 32 of the ABWS Checklist are suggested to eliminate the requirement of having to test the weighing controller under field conditions providing a complete simulated test can be conducted during lab evaluation:

E. Automatic Bulk Weighing Systems - NTEP On-Site Evaluation

During laboratory evaluation, the bulk weighing controller is tested under simulated field conditions. ~~therefore, the results of such an evaluation should not be used to determine compliance with all pertinent requirements. Compliance with all requirements shall be determined only when the bulk~~

~~weighing controller, having successfully passed National Type Evaluation Program laboratory evaluation, is installed and tested under actual field conditions as part of an automatic bulk weighing system. If the simulation is not capable of simulating all functions and operations of a complete system; the weighing controller is to be installed and all functions or operations not simulated during the laboratory evaluation are to be tested under actual field conditions as part of an automatic bulk weighing system.~~

32. Performance and Permanence Tests for Automatic Bulk Weighing Systems

Performance tests are conducted to ensure compliance with the tolerance requirements of NIST Handbook 44 and for systems used to weigh grain with additional requirements of the GIPSA.

The tests described here, apply to the entire automatic bulk weighing system, (e.g., the bulk weighing scale controller interfaced with the weigh hopper, load cell(s), material handling system, etc.) ~~It is assumed that all components of the automatic bulk weighing scale controller have already been examined and found to comply with applicable National Type Evaluation Program requirements.~~ If the design and performance of the bulk weighing controller is to be determined during the same test, the applicable requirements for automatic bulk weighing systems must be referenced.

...

Discussion/Conclusion:

There was no action taken on this item. Due to conflicting NCWM announcements of the Weighing Sector (WS) meeting start time for Tuesday, August 26, not all stakeholders were in attendance when this item was first introduced during the 2014 WS meeting. As a result, the NCWM has agreed to reintroduce this item on the 2015 Weighing Sector Agenda in the interest of fairness to all.

8. NIST Handbook 44 Scales Code Paragraph S.2.4. Level-Indicating Means and NCWM Publication 14, AWS Section 39 Level-Indicating Means - Portable Automatic Weighing Systems

Source:

Maryland NTEP Lab

Background:

When performing an NTEP evaluation on a “portable” AWS, Section 39 of the AWS checklist specifies that if the device does not have a level-indicating means then the device must be capable of meeting Scales Code paragraph S.2.4. Level Indication Means. It is assumed that any testing necessary to evaluate whether or not a level is needed on a portable AWS would be conducted in a static mode, although nowhere in Publication 14 is it specified. There is no reference in the AWS Code of NIST Handbook 44 that addresses level indicating means on a portable AWS.

Guidance is needed on what components of an AWS the requirement for level indicating means is intended to be applied. The Maryland lab has encountered AWSs that have had a bubble level built into the load receiving element and others that have had bubble levels built into both the load-receiving element and entire system.

There are also no test procedures in the AWS Checklist of Publication 14 to determine the sensitivity of the level indicating means.

Recommendation:

Two recommendations are offered as follows:

1. The Sector consider submitting an NCWM Form 15 proposal to add to the AWS Code of NIST Handbook 44 a paragraph similar to Scales Code paragraph S.2.4., which reads as follows:

S.2.4. Level-Indicating Means. – Except for portable wheel-load weighers and portable axle load scales, a portable scale shall be equipped with level indicating means if it's weighing performance is changed by an amount greater than the appropriate acceptance ~~Error! Bookmark not defined.~~ tolerance ~~Error! Bookmark not defined.~~ when it is tilted up to and including 5 % rise over run in any direction from a level position and rebalanced. The level-indicating means shall be readable without removing any scale parts requiring a tool.

2. The Sector consider adding the same type evaluation procedures that are in NCWM Publication 14, DES Section 56 to AWS Section 39. These procedures would only be applicable to "Portable" systems that are designed to weigh statically. The following was copied from DES Section 56; the first two paragraphs amended to reflect the intended application to AWS Section 39:

56. Level-Indicating Means - Portable Scales

Code Reference: S.2.4.

~~Portable wheel-load weighers and portable axle-load scales intended for law enforcement must weigh accurately when placed out of level by 5 %.*~~

A portable ~~scale~~ **Automatic Weighing System (AWS)** which is intended to be **used in static weighing and** moved must either be equipped with a readily observable level-indicating means (typically a bubble level) or the ~~scale~~ **AWS** must still weigh accurately when placed out-of-level by 5 % (**approximately 3 degrees**). *Weighing accurately means that the results must be within acceptance tolerance.

The level-indicating means shall be rigidly mounted, located where it will be protected from damage but still be easily read in normal use, mounted so that its reference point for level will not change when pressure is applied to the level-indicator, and sensitive enough to indicate an out-of-tolerance condition that might affect the accuracy of the scale. A bubble level mounted on a swing-out bracket is not adequate. Portable floor scales (generally with capacities of more than 500 lb) shall have the level-indicating means visible without removing any scale parts.

**Note: 5 % refers to 5 % rise over run.*

- 56.1.** Scales (other than wheel-load weighers and portable axle-load scales) must meet one of the following conditions:
 - 56.1.1.** The device is equipped with a level indicator as standard equipment? OR Yes No N/A
 - 56.1.2.** The device complies with the provisions of S.2.4. The test procedure is given in "Performance Tests for Digital Counter (Bench) and Computing Scales." Yes No N/A
- 56.2.** If the scale is equipped with a level-indicating means, it must be readily observable without mechanical disassembly that requires the use of tools. A bubble level placed under the scale platform of a portable floor scale mounted on wheels is not practical for the user of the scale. Yes No N/A
- 56.3.** The level-indicating means is rigidly mounted, easily read, protected from damage, and will not change its reference for level. Yes No N/A
- 56.4.** The level-indicating means is sufficiently sensitive: Yes No N/A

- Except for Scales Designated Accuracy Class I, if the scale is equipped with a level-indicating means, the level indicator must be tested to determine whether or not it's sufficiently sensitive.
- Level Sensitivity Tests (if applicable)
- Test Conditions (both analog and digital indicating scales)
- This test is performed at ambient temperature only.
- The device must be leveled using the level indicating means, and adjusted to as close to zero error as possible.

Additional Test Conditions Applicable Only to Digital Indicating Scales:

- The AZT may be activated. It must be set so that the weight value that can be tracked at once does not exceed 0.5 e.
- If the IZSM range of the device does not exceed 20 % of Max, the test will be performed with the IZSM set at the maximum of the range.
- If the IZSM range exceeds 20 % of Max, the test will be performed twice: the first test with the IZSM set to the lowest possible value; the second test with the IZSM set to the maximum of its range.

NOTE: In the case of a multi-range device, it is 20 % of Max of the lowest range; in the case of a multi-interval device, it is 20 % of max of the first weighing segment.

- If the device has an "enhance/expanded" resolution feature, perform the test with that feature activated; or use the small weight method to determine errors before rounding.

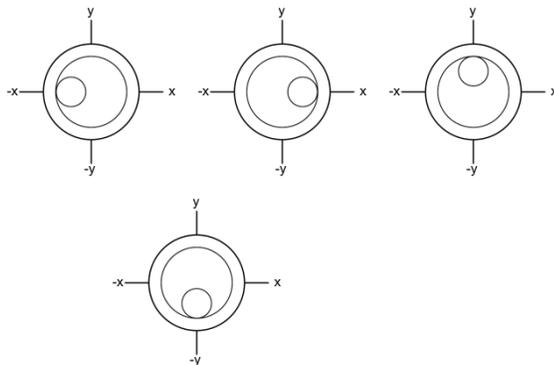
56.4.1. Incline the DUT in one direction (arbitrary referred to as - x) up to the point of limit where the level indicating means still indicates a level condition or at least $2/1000$ (0.12 degree) whichever is greater.

56.4.2. Set the device to zero if necessary; perform an increasing and decreasing load test. If necessary, use the small weight method to find errors before rounding. Record the results.

56.4.3. Record the angle with reference to the horizontal.

56.4.4. Repeat the test described above for the other three inclinations (+ x, - y, + y) (See the following illustrations).

Position of the Bubble Indicator:



Yes No N/A

56.5. Wheel-load weighing and axle-load scales must weigh accurately when placed out-of-level by 5 %.*

Discussion/Conclusion:

The Sector agreed that “out-of-level test” procedures need to be added to Publication 14, AWS Section 39. The proposal was modified to reflect AWS paragraph references since it included DES paragraph references. The Sector agreed to the following changes to AWS Section 39.

Amend Section 39 as follows:

39. Level-Indicating Means - Portable Automatic Weighing Systems

Code Reference: G-A.3. and Scales Code S.2.4.

A portable Automatic Weighing System (AWS) which is intended to be moved **and can be used for static weighing** must either be equipped with a readily observable level-indicating means (typically a bubble level) or the AWS must still weigh accurately when placed out-of-level by 5 % (approximately 3 degrees). Weighing accurately means that the results must be within acceptance tolerance.

The level-indicating means shall be rigidly mounted, located where it will be protected from damage but still be easily read in normal use, mounted so that its reference point for level will not change when pressure is applied to the level-indicator, and sensitive enough to indicate an out-of-tolerance condition that might affect the accuracy of the scale. A bubble level mounted on a swing-out bracket is not adequate. Portable AWS shall have the level-indicating means visible without removing any parts.

39.1. Scales...

39.1.1. The device is equipped with...**OR** Yes No N/A

39.1.2. The device complies with the provisions of NIST Handbook 44 Scales Codes paragraph S.2.4. The **out-of-level** test procedure is given in *NCWM Publication 14 AWS 44.4 43 "Permanence and Performance Tests for ~~Digital~~ Counter (Bench) Scales and (Including) Computing Scales.*" Yes No N/A

39.2 If the scale is equipped with a level-indicating means, it must be readily observable without mechanical disassembly that requires the use of tools. A bubble level placed under the scale platform of a portable floor scale mounted on wheels is not practical for the user of the scale. Yes No N/A

39.3 The level-indicating means is rigidly mounted, easily read, protected from damage, and will not change its reference for level. Yes No N/A

39.4 The level-indicating means is sufficiently sensitive: Yes No N/A

- **If the scale is equipped with a level-indicating means, the level indicator must be tested to determine whether or not it's sufficiently sensitive.**
- **Level Sensitivity Tests (if applicable)**
- **Test Conditions (both analog and digital indicating scales)**
 - **This test is performed at ambient temperature only.**
 - **The device must be leveled using the level indicating means, and adjusted to as close to zero error as possible.**

Additional Test Conditions Applicable Only to Digital Indicating Scales:

- **The AZT may be activated. It must be set so that the weight value that can be tracked at once does not exceed 0.5 e.**
- **If the IZSM range of the device does not exceed 20 % of Max, the test will be performed with the IZSM set at the maximum of the range.**
- **If the IZSM range exceeds 20 % of Max, the test will be performed twice: the first test with the IZSM set to the lowest**

possible value; the second test with the IZSM set to the maximum of its range.

NOTE: In the case of a multi-range device, it is 20 % of Max of the lowest range; in the case of a multi-interval device, it is 20 % of max of the first weighing segment.

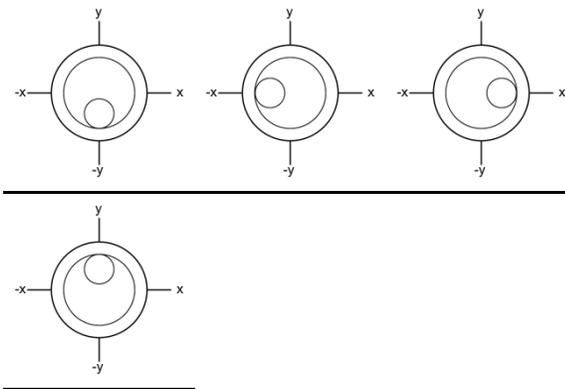
- **If the device has an "enhance/expanded" resolution feature, perform the test with that feature activated; or use the small weight method to determine errors before rounding.**

39.4.1. Incline the DUT in one direction (arbitrary referred to as -x) up to the point of limit where the level indicating means still indicates a level condition or at least $2/1000$ (0.12 degree) whichever is greater.

39.4.2. Set the device to zero if necessary; perform an increasing and decreasing load test. If necessary, use the small weight method to find errors before rounding. Record the results.

39.4.3. Record the angle with reference to the horizontal.

**39.4.4. Repeat the test described above for the other three inclinations (+ x, - v, + v) (See the following illustrations).
 Position of the Bubble Indicator:**



39.5 Automatic weighing systems must weigh accurately when placed out-of-level by 5 %.*

Yes No N/A

***Note: 5 % refers to 5 % rise over run.**

9. NCWM Publication 14 DES Section D. Substitution of Load Cells, Load Cells Section 5.

Source:
 NCWM/NTEP

Background:

Current Load Cell Substitution Policy is outdated and needs to be revised to include the use of new load cell output technology and to make the requirements less open to interpretation.

Recommendation:

Replace the current Load Cell Substitution Policy as found in Section D. *Substitution of Load Cell in Scales* on Page DES-11 and Section 5. *Substitution of Metrologically Equivalent Load Cells in Scales* on Page LC-2 of the 2014 edition of NCWM Publication 14, Weighing Devices with the following:

In a Weighing/Load Receiving Element with a single or multiple load cells installed, the replacement of one or more load cells, from the same or a different manufacturer, is considered a metrologically equivalent replacement provided requirements (1) through (7) below are met.

- 1. The original and the replacement load cells have a Certificate of Conformance from having been evaluated individually and not as a component in a complete weighing instrument.**
- 2. Have as many or more verification scale intervals (n_{max}) as required for the scale's capacity and division size.**
- 3. Have a minimum load cell verification interval (v_{min}) that is suitable for the application.**
- 4. Are of the same load cell design as the cell being replaced. Note: load cell design defines the physical design of the load cell. e.g. canister compression, dual ended shear beam, etc...**
- 5. Have a capacity equal to or greater than 85 % of the capacity of the load cells installed during type evaluation testing.**
- 6. Can be placed in the scale without any modification, as defined in Publication 14, Digital Scales Code, Technical Policy, to the basic design of the Load Receiving Element or the load cell mounting assembly. Note: The use of spacers to compensate for differences in load cell height is permitted.**
- 7. Utilize the same output technology (e.g., analog, digital, hydraulic, etc.) as all other load cells in the system or weighing element. Note: For replacement load cells with analog output technology; the same wiring configuration must be maintained as the cells being replaced without adding jumper wires, connecting sense wires to excitation wires, or by removing the sense leads.**

In a system with multiple load cells, the replacement of ALL load cells in the system with National Type Evaluation Program (NTEP) certified and compatible load cells that have an output technology different than the original load cell is considered a metrologically equivalent replacement provided all requirements in (1) through (6) above are met.

Discussion/Conclusion:

Item 4 of the current load cell substitution policy specifies that load cells to be substituted must be of the same basic type as the cells being replaced. Thus, in order to correctly apply Item 4 of the current load cell substitution policy, one must have knowledge of the different variables that establish load cell type. No explanation of the criteria or factors that were intended to be used to establish same basic type is provided in the policy, nor are any examples of different types of load cells given. Thus, the policy leaves open for interpretation the different factors that establish load cell type.

Much of the discussion by the Sector on this item involved attempts in identifying the criteria or factors that define the “type” (or “design”) of a load cell. There was no consensus reached by the Sector regarding what those factors are or should be. Members of the Sector offered many suggestions of the different factors that they believed might or should define type to include: the method of force introduction, output characteristic, output capacity, impedance, supply voltage, material used in its construction, method of construction, shape, etc. The Sector concluded that the word “design” encompasses many characteristics of a load cell.

The Sector considered whether the load cell substitution policy is intended to apply to the replacement of all the load cells in a scale or just some of the load cells and concluded that the proposed alphabetic list of requirements is intended to apply only to the replacement of one or more load cells in a scale but not full replacement of all the cells.

The Sector agreed to recommend the following changes to the proposal based on comments heard from its members during the discussion of this item:

- Item 4. in the proposed list should read as follows:

Are of the same basic physical characteristic load cell design as the cell being replaced. Note: load cell design defines the physical design of the load cell (e.g., canister compression, dual ended shear beam, etc.).

- The following sentence is to replace the sentence in Item 5. of the proposed list:

Have a capacity that is greater than or not less than 85% of the capacity of the original cell.

- It was suggested that the following two sentences be added to the end of the proposed list:

The replacement of a load cell(s) resulting in a combination of analog, digital, or hydraulic load cells in one system is not considered a metrologically equivalent replacement.

- 1) **All load cells in a multiple load cell system must have the same type of output (e.g., all analog, all digital, or all hydraulic).**

The Sector agreed that additional work on this item is still needed and that it is to remain on next year's WS agenda. Mr. Darrell Flocken (NTEP) agreed to rewrite the proposal taking into account the changes agreed to by the Sector and to make clear the intended application of the alphabetic list of requirements that establish the load cell substitution policy.

10. NCWM Publication 14 Load Cells Section L. Procedures - Table 3.

Source:

NCWM/NTEP

Background:

Tolerances for the evaluation of Class I and II load cells are not mentioned in the load cell section of the 2014 edition of NCWM, Publication 14, Weighing Devices.

Recommendation:

Insert two new tables under the existing Table 3 heading located on page LC-10 of the 2014 edition of NCWM, Publication 14, Weighing Devices. Table 3 currently has a tolerance table for Class III load cells. This proposal would add the two tables shown. (One table for Class I tolerances and the second table for Class II tolerances.)

Table 3 Tolerances for Class I Load Cells				
NIST Handbook 44 Reference	Single Cell Requirement		Multiple Cell Requirement	
Load Cell Error Table 6., Class I; T.N.3.2. and T.N.8.1.1.	0.7 Factor Applied		1.0 Factor Applied	
	Load	Tolerance	Load	Tolerance
	0 – 50 000v	0.35v	0 – 50 000v	0.50v
	50 001 – 200 000v	0.70v	50 001 – 200 000v	1.00v
	200 001v +	1.05v	200 001v +	1.50v
Repeatability Error; T.N.5. and T.N.8.1.1.	0.7 Factor Applied		1.0 Factor Applied	
	Load	Tolerance	Load	Tolerance
	0 – 50 000v	0.70v	0 – 50 000v	1.00v
	50 001 – 200 000v	1.40v	50 001 – 200 000v	2.00v
	200 001v +	2.10v	200 001v +	3.00v
Temperature Effect on Minimum Dead Load Output; T.N.8.1.3. and T.N.8.1.1.	0.7 v_{min}/5 °C		0.7 v_{min}/5 °C	
Effects of Barometric Pressure; T.N.8.2.	Applicable only to specified load cells 1 v_{min}/1 kPA		Applicable only to specified load cells 1 v_{min}/1 kPA	

Tolerances for Class II Load Cells				
NIST Handbook 44 Reference	Single Cell Requirement		Multiple Cell Requirement	
Load Cell Error Table 6., Class II; T.N.3.2. and T.N.8.1.1.	0.7 Factor Applied		1.0 Factor Applied	
	Load	Tolerance	Load	Tolerance
	0 – 5 000v	0.35v	0 – 5 000v	0.50v
	5 001 – 20 000v	0.70v	5 001 – 20 000v	1.00v
	20 001v +	1.05v	20 001v +	1.50v
Repeatability Error; T.N.5. and T.N.8.1.1.	0.7 Factor Applied		1.0 Factor Applied	
	Load	Tolerance	Load	Tolerance
	0 – 5 000v	0.70v	0 – 5 000v	1.00v
	5 001 – 20 000v	1.40v	5 001 – 20 000v	2.00v
	20 001v +	2.10v	20 001v +	3.00v
Temperature Effect on Minimum Dead Load Output; T.N.8.1.3. and T.N.8.1.1.	0.7 v_{min}/5 °C		0.7 v_{min}/5 °C	
Effects of Barometric Pressure; T.N.8.2.	Applicable only to specified load cells 1 v_{min}/1 kPA		Applicable only to specified load cells 1 v_{min}/1 kPA	

Tolerances for Class III Load Cells (This current wording already appears beneath Load Cells Table 3 and is shown for positioning of the two new tables being proposed for addition.)

Submitter's Note: If this proposal is not supported, the WS might consider proposing the removal of all existing references and statements related to Class I and II load cells from NIST Handbook 44 and NCWM Publication 14 under the premises that no CC has been issued for a Class I or II load cell (needs confirmation) and NTEP will release a statement indicating that no CC will be issued for Class I or II load cells.

Discussion/Conclusion:

The WS considered whether there was a need to add the two proposed tables (Tolerances for Class I Load Cells and Tolerances for Class II Load Cells) to NCWM Publication 14 since it was believed that the NTEP labs have never issued any Certificates of Conformance for Class I or Class II load cells. It was noted that the labs may not have the necessary equipment or laboratory qualifications to perform evaluations on Class I or Class II load cells. Members of the Sector agreed to recommend that the two tables be added because it was concluded that there would be no harm in including them in NCWM Publication 14 and that there may come a time in the future when they would be needed.

11. VCAP Influence Testing of Weighing/Load Receiving Element with a Capacity \leq 2000 LB

Source:

NCWM/NTEP

Background:

During a VCAP device type discussion it was noted that a W/LRE with a capacity less than or equal to 2000 lb using a load cell with an NTEP CC is required to undergo influence factor testing during type evaluation. This requirement is determined by reviewing the information in the table titled "Devices to Be Tested for Influence Factors" located in the 2014 edition of NCWM *Publication 14, DES Technology Policy*, paragraph B.1. on page DES-3. The requirement is determined by the fact that there is no distinction between a W/LRE with a capacity less than or equal to 2000 lb using a load cell with an NTEP CC and those using non-NTEP load cells and the fact that W/LRE's with a capacity less than or equal to 2000 lb can be evaluated in a laboratory environment and will fit inside the labs temperature chamber.

This information supports the requirement that this device type should be included in the list of devices that are subject to the VCAP requirement of ongoing internal auditing by the manufacturer. However, several manufacturers have voiced their concern with this as they believe that a W/LRE with a capacity less than or equal to 2000 lb using a load cell with an NTEP CC should not be included in VCAP. The reason provided is that the load cell is covered by VCAP and it is the only part of the W/LRE that is influenced by temperature changes.

Recommendation/Discussion:

Before offering a proposal for consideration, the Weighing Sector should be asked to discuss this subject to provide technical support for or against adding this device type to the VCAP list. The most important but not the only question at this time is:

- Is the load cell the only part/component of the W/LRE that is influenced by changes in temperature?

It would be great if the members of the Weighing Sector could come to a consensus on this matter; because going blindly in one direction or the other could lead to significant changes in current NTEP Policy.

If consensus determines that other parts/components of the W/LRE are influenced by changes in temperature, current NTEP Policy remains intact and the device type will be added to the VCAP device list.

If consensus determines that the load cell is the only part/component of the W/LRE that is influenced by changes in temperature, the table titled "Devices to Be Tested for Influence Factors" will need to be modified to include W/LRE with a capacity less than or equal to 2000 lb using a load cell with an NTEP CC as a separate device and identify them as being exempt from influence factor testing during NTEP evaluations and the device type would not be added to the VCAP list.

1. The list of devices current listed in the 2014 edition of the *NTEP Administration Policy*, paragraph **21.1.3.1. Devices that Must Meet this Requirement Are Limited to the List Below**.
2. The table titled “Devices to Be Tested for Influence Factors,” is shown below for ready reference.

Devices to Be Tested for Influence Factors							
Device Type	Temperature Accuracy⁷	Temperature Zero Drifts	Barometric Pressure	Warm-up Time	Voltage⁴	Power Interruption⁵	Time Dependence
Scales ≤ 2000 lb	X	X	X ¹	X	X	X	X
Scales ≥ 2000 lb	X ²	X ²	X ²	X	X	X	X ²
ECR's Computers, Bulk-weigher Controllers (without A/D)						X	
Printers						X	
Dials (spring)	X	X					X
Leaver/beam Scales and Pendulum Dials							
Weighing/ Load-Receiving Elements	X	X	X ¹				X
Indicating Element ⁶	X	X		X	X	X	
Class II Scales	X	X		X ³	X	X	X
Load Cells							
Canister-Type	X	X	X ¹				X
Hydraulic	X	X					X
All Others	X	X					X
¹ Testing is limited to some canister load cells. ² Compliance with influence factors requirements will be determined according to existing NTEP policy. ³ Test limited to power switch only, not to initial plug-in of the device. ⁴ Voltage test is 130 and 100 VAC and low battery test on DC. <i>See Section K.60.</i> ⁵ Power interruption is pulling the plug for 10 seconds. <i>See Section K.19.</i> ⁶ Indicating elements processing only digital information do not have to be tested for compliance with the influence factors. ⁷ Compliance with temperature requirements by NTEP is limited to temperatures that are no lower than – 10 °C and no higher than 40 °C.							

Conclusion:

Mr. Flocken introduced this item to the Sector and reported that the NCWM Board of Directors (BOD) was requesting input from the Sector on a VCAP issue concerning whether or not it is necessary to conduct influence factor testing on a weighing/load-receiving element having a capacity of less than or equal to 2000 lb that uses a load cell with an NTEP CC.

Members of the Sector were asked, by show of hands, to provide a yes or no answer to the following two questions:

1. Is the load cell the only component of a weighing/load receiving element with a capacity less than or equal to 2000 lb affected by temperature?
2. Should VCAP include W/LREs with a capacity less than or equal to 2000 lb and using an NTEP certified load cell?

Results were as follows:

Question 1. *Is the load cell the only component of a weighing/load receiving element with a capacity less than or equal to 2000 lb affected by temperature?*

Answer: Three members indicated “yes,” eight members indicated “no,” and four members “abstained.”

Question 2. *Should VCAP include W/LREs with a capacity less than or equal to 2000 lb and using an NTEP certified load cell?*

Answer: Six members indicated “yes,” seven members indicated “no,” and there were no abstentions.

Mr. Flocken and Mr. Truex agreed to forward the results of the two questions to the NCWM BOD.

12. NCWM Publication 14 DES Section 43. Zero-Tracking Mechanism

Source:

Rice Lake Weighing Systems

Background:

Clarify how AZT operates in the NET mode.

Recommendation:

Add procedures in Publication 14 DES Section 43. Zero-Tracking Mechanism for testing AZT in the NET mode. The following changes are suggested:

43. Zero-Tracking Mechanism

Code Reference: S.2.1.3., S.2.1.3.1., S.2.1.3.2. and S.2.1.3.3

A scale may be equipped with an automatic zero-tracking mechanism (AZT) capability to automatically correct for weight variations near zero within specified limits. To reduce the potential for weighing errors, the AZT may operate only under limited conditions as indicated in the specific type evaluation criteria. Automatic zero-setting (setting the scale to zero after a period of time without the intervention of the operator) beyond the limits of AZT as defined in OIML R76 as an automatic zero-setting mechanism is not permitted in NIST Handbook 44 since there is no limit on the amount of zero adjustment in NIST Handbook 44.

...

For bench, counter, and livestock scales falling under S.2.1.3.1.(a) and S.2.1.3.2.(b) AZT may be operable with the device at a gross load zero, at a net load zero or at a negative net weight indication resulting from a tare weight entry having been made with the scale at zero gross load.

For scales other than bench, counter, and livestock scales falling under S.2.1.3.1.(a) and S.2.1.3.2.(b) ~~and vehicle, axle load and railway track scales,~~ AZT may be operable only at a gross load zero.

Indicate where AZT is operational:

- Gross Zero
- Net Zero
- Negative with Tare

Test Procedure for AZT

1. With the scale at zero balance, place a load in excess of the AZT range for the scale (e.g., 10d. Add error weights that are slightly in excess of the specified AZT limit for the device or the AZT setting.)

2. Remove the load (e.g., 10d) but leave the error weights on the scale.
3. Observe whether or not the scale automatically zeroes the error weights.
4. Repeat this procedure by decreasing or increasing the amount of error weights to determine the zeroing range of the AZT.
5. Perform this test in an analogous manner on the negative side of zero to determine the zero range of AZT on the negative side of zero.

Test Procedure for AZT in the NET Mode

- 1. With the scale at zero balance, place a load on the scale then TARE this weight.**
- 2. Add a ¼ of a scale division to the scale then observe that the indication stays at the center of zero.**
- 3. Repeat the operation three more time until there is one-hole division that has been zeroed off.**
- 4. Switch to Gross Mode.**
- 5. The indication should display the TARE weight plus 1 division.**

If the device has an AZT capability, record the maximum amount (in scale divisions) that can be zeroed at one time:

- Avoirdupois _____ d
- Metric _____ d
- Other Units: Specify Unit _____ d

...

Conclusion: This item was withdrawn at the submitter’s request.

13. NCWM Publication 14 DES Section D. Substitution of Load Cells, Load Cells Section 5

Source:

Mr. Henry Oppermann, Weights and Measures Consulting

Background:

The term “hydraulic compression load cell” has been used on NTEP CCs for two different types of load cells. One type of load cell has a hydraulic load sensor and hydraulically totalizes the output from multiple load cells. The other type has a hydraulic load sensor and a pressure transducer with strain gauges on each load cell to convert the output to a digital signal. The digital output is then totalized. Purchase specifications have stated that scales have “hydraulic load cells.” It is necessary to distinguish between these two types of load cells.

The NTEP CC states that the pressure transducer is considered to be part of the metrological system included in the evaluation of the hybrid load cell. If a “hybrid hydraulic/electronic load cell” in a scale fails, do both the hydraulic component and the electronic component have to be replaced to repair or replace the load cell?

Are the “hybrid hydraulic/electronic load cell” and the “hydraulic load cell” considered to be the same design and, therefore, the same type of load cell?

Under NTEP policy for the substitution of load cells in scales, can all of the “hydraulic load cells” in a scale be replaced with the “hybrid hydraulic/electronic load cells” without requiring a new type evaluation (i.e., does NTEP consider this replacement of load cells to be metrologically equivalent?). Would the proposed change in Item 9 on the Weighing Sector agenda change the interpretation?

The current practice to categorize the two types of load cells as hydraulic load cells is misleading and causes confusion. The two load cell types should be considered different types based upon their design. The load cell with hydraulic

load sensor and hydraulic output should be called a “hydraulic load cell.” The load cell with a hydraulic load sensor and electronic output should be called a “hybrid hydraulic/electronic load cell.” This terminology should be used on NTEP CCs.

The following response was received from Ms. Tina Butcher, NIST OWM, on this subject:

This is in response to your request for a definition of a “hydraulic load cell.”

As you are probably aware, there are references on the internet to the phrase, including sites such as Wikipedia and on web sites of companies that manufacture what are typically described as “hydraulic” load cells. However, I have been unable to find any formal definition that has been reviewed and agreed upon by the legal metrology community.

I did a search of the definitions section of NIST Handbook 44 as well as the Load Cells and Digital Electronic Scales Checklists in NCWM Publication 14 and found no formal definition for “hydraulic load cell.” I also did an electronic search of past summaries of the NTETC Weighing Sector from 1987 to 2013. While there were several references in the summaries to “hydraulic load cells,” I did not find any definition(s) or specific descriptions of these devices. Mr. Rick Harshman, one of our weighing experts, and I also searched through various terminology documents we have in our files, including past Scale Manufacturer Association “Terms and Definitions” and an international Basic and General Vocabulary of Metrology. Additionally, I contacted Mr. John Barton of our office who serves as Secretariat to OIML Recommendation 60, Load Cells. John indicated that previous editions of R 60 have not included any definition for “hydraulic load cells.” In addition, the current edition (now under revision) is being drafted to avoid the inclusion of definitions for specific technologies and designs. This is being purposely done to avoid any interpretation that R 60 will apply to some types of load cells, but not others.

I spoke with Mr. Kevin Chesnutwood a load cell expert in NIST’s Mass and Force Group and shared your questions with him. Kevin indicated that he is not aware of any formal definition for “hydraulic load cell.” With regard to the load cells tested by the Mass and Force Group over the years, load cells referred to as “hydraulic” have most typically channeled hydraulic fluid into a totalizing component (a totalizer) which converts the pressure of the hydraulic fluid into an electronic signal using either strain gauge or pressure technology. This description is closest to the scenario referenced in the second question in your letter “Is a load cell that has a hydraulic input and then uses strain gauges to convert the hydraulic input to an electronic output considered a hydraulic load cell....”

With regard to your specific situation in which you are preparing to place a bid with the [REDATED] in which the solicitation references “hydraulic compression stainless steel load cells,” we don’t have any way of knowing whether their use of the terminology “hydraulic” is referring to the same general understanding that we have of that term. Thus, you may wish to contact [REDATED] to determine what specific type of cell they intend to reference and the reason why this type of cell is specified to get a better understanding of what is needed to meet their requirements. Since you have noted that [REDATED] has allowed for the submission of written questions by July 2, it would seem that your questions about the term as it is used in the solicitation would be best posed to them through that process; particularly since they will be making the final decision on what constitutes a qualified bid.

Although I wasn’t able to locate a formal definition within the legal metrology community documents/materials, I hope the information provided from the search is of help to you.

With Best Regards,

Tina

Recommendation:

The Sector identify and develop a complete and unambiguous list of the different types of load cells and include it in *NCWM Publication 14* DES Section D.

When completing an NTEP CC for a hydraulic type load cell that's been evaluated, identify on the CC the type of hydraulic load cell (i.e., hydraulic load cell or hybrid hydraulic/electronic load cell) for which the CC applies.

Discussion:

Mr. Oppermann stated that, in his view, NTEP uses the term “hydraulic compression load cell” on CC’s for two different “types” of load cells. He described a number of similarities and differences in the designs of these two load cell “types” pointing out what he considered to be significant differences which, he believed, provided sufficient justification that they be classified as different load cell “types” by NTEP. He reported that the one “type” of hydraulic load cell has both hydraulic input and hydraulic output; a hydraulic totalizer sums the hydraulic output from the different load cells installed in the system. He noted that the forces summed by the hydraulic totalizer are mechanical. The other “type” of hydraulic load cell, which he referred to as a “hybrid hydraulic load cell,” has a pressure transducer with strain gauges on each load cell to convert the output to a digital signal. He indicated that the electronics in these two “types” of load cells must be different and that the two are not interchangeable within a scale. He requested that the Sector develop a list of the different variables that distinguish one type of load cell from another.

Mr. Steve Langford (Cardinal Scale Manufacturing Co.) provided a handout to members of the Sector illustrating the different components of two different versions of multiple hydraulic load cells in a weighing system. A copy of the handout provided by Mr. Langford is included in the “Attachment” section of this report. The handout also outlined some similarities and differences in the two versions. Mr. Langford took an opposing position with regard to Mr. Oppermann’s argument that the load cells illustrated in the two versions should be considered different “types.” He stated that the difference between the two versions illustrated is in the totalizer and not the hydraulic load cells and that the hydraulic load cells in the two example versions illustrated could be interchanged. He questioned why there needed to be a distinction made between the two types of totalizers when the hydraulic load cells in the two examples given are identical. He stated that no such distinction is necessary and that providing such information on the NTEP CC would be a step in the wrong direction. He also voiced opposition to developing a list of the different types of load cells noting that such a list is not needed, nor would NCWM Publication 14 be the place for such a list.

Conclusion

The Sector agreed with Mr. Langford’s position and concluded that there is no need to define the different designs of load cells, nor provide a list of the different types of load cells in NCWM Publication 14. Consequently, the Sector agreed not to develop a list of different designs, nor to provide any additional clarification on a CC concerning the type of load cell for which the CC applies.

NEXT MEETING

2015 Suggested Meeting Locations and Dates:

The following locations are being considered for the next Sector Meeting: Dallas, Texas; Charlotte, North Carolina; Atlanta, Georgia; and Denver, Colorado.

It was agreed that the Sector would meet the week prior to the 2015 Labor Day weekend.

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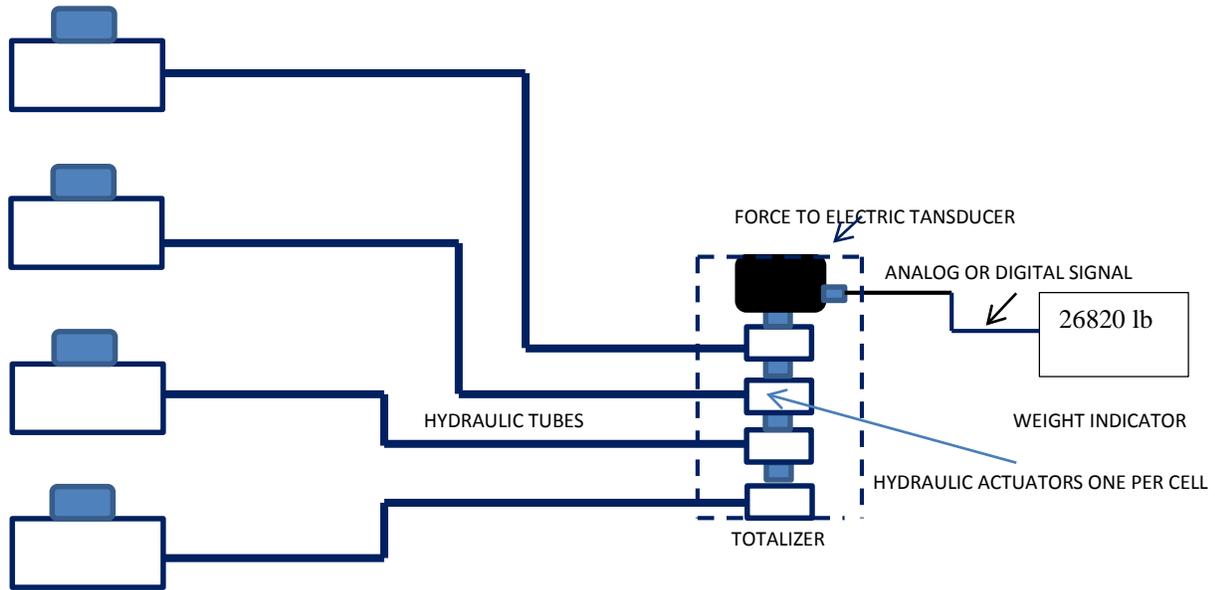
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Note:

The second day of the Weighing Sector meeting was held in conjunction with the NTEP Software Sector whose attendees were also present.

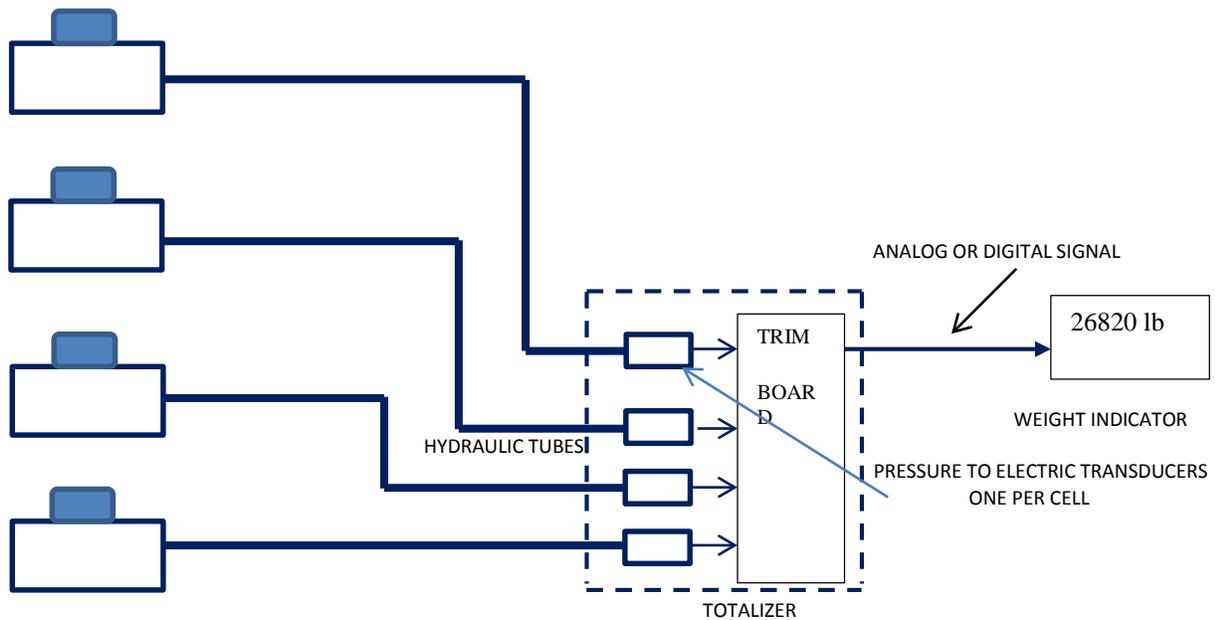
ATTACHMENTS

Attachment to agenda Item-13: NCWM Publication 14 DES Section D. Substitution of Load Cells, Load Cells Section 5 – Handout provided by Mr. Steve Langford (Cardinal Scale Manufacturing)



HYDRAULIC LOAD CELLS

Version A of a Multi-Cell Hydraulic Weighing System



HYDRAULIC LOAD CELLS

Version B of a Multi-Cell Hydraulic Weighing System

- THE DIFFERENCE BETWEEN VERSION A AND VERSION B IS IN THE TOTALIZER, NOT THE HYDRAULIC LOAD CELLS. FOR ALL PRACTICAL PURPOSES THE HYDRAULIC LOAD CELLS IN THE TWO VERSIONS ARE IDENTICAL AND CAN BE INTERCHANGED.
- IN VERSION A, THE PRESSURE SIGNALS FROM EACH HYDRAULIC LOAD CELL ARE CONVERTED TO A FORCE PROPORTIONAL TO THE WEIGHT ON THE HYDRAULIC LOAD CELL AND THOSE FORCES FROM EACH HYDRAULIC LOAD CELL ARE SUMMED MECHANICALLY. THE SUMMED FORCE IS APPLIED TO A FORCE TO ELECTRIC TRANSDUCER OR COMMONLY REFERRED TO AS A LOAD CELL WHERE IT IS CONVERTED TO AN ANALOG VOLTAGE OR DIGITAL OUTPUT.
- IN VERSION B, THE PRESSURE SIGNAL FROM EACH HYDRAULIC LOAD CELL IS CONVERTED TO A PROPORTIONAL ANALOG VOLTAGE IN A PRESSURE TO ELECTRIC TRANSDUCER. THE OUTPUTS OF THE PRESSURE TO ELECTRIC TRANSDUCERS ARE SUMMED IN A CONVENTIONAL LOAD CELL SUMMING CARD OR MULTI-CHANNEL A/D CARD THAT PROVIDES A DIGITAL OUTPUT.
- THE TOTALIZERS IN VERSION A AND VERSION B PERFORM EXACTLY THE SAME FUNCTION BY COMBINING THE PRESSURE OUTPUTS OF THE HYDRAULIC LOAD CELLS INTO A SINGLE ANALOG OR DIGITAL OUTPUT USED BY THE WEIGHT INDICATOR TO DISPLAY THE SCALE WEIGHT.
- QUESTIONS TO THINK ABOUT:
 - 1) In version B, why would you have to replace both the load cell and the pressure to electric transducer should one of them fail? In version A, why would you have to replace both the hydraulic load cell and hydraulic actuator and load cell should one of them fail? Replacing both of these components would be like replacing a lamp along with the light bulb should the light bulb fail. The two components comprise a measuring device but are unaffected by the unique characteristics of each other. The simple answer is you only have to replace the faulty component, not the entire system.
 - 2) Since the hydraulic load cells in Versions A and B are identical, why do we need to make a distinction between the two types of totalizers? The short answer is you don't. Like everything else, each type of totalizer has its own advantages and disadvantages yet they perform the same function. Extending the logic suggested would have you identifying the method of A/D conversion or providing details of the software algorithm used for temperature compensation on the NTEP certificate. NTEP is performance based not design based and adding this information to the NTEP certificate is a step in the wrong direction.
 - 3) Why does a list of the different types of load cells need to be added to NCWM Publication 14? It doesn't. The place for definitions of terms is in NIST Handbook 44 not in NCWM Publication 14. Attempting to identify all types of load cells is not a good idea as John Barton has stated. The people drafting the next version of OIML R60 have gone out of their way NOT to do this

since, as Mr. John Barton stated, they fear that it may be thought that the requirements apply to some types of load cells but not to others. Further still, since this suggested list, if it is indeed needed, is to be placed in NIST Handbook 44, the Weighing Sector is not the arena for accomplishing this. Such an addition must follow the normal course of steps beginning with submission to the regional associations then becoming an item on the Specifications and Tolerances Committee's agenda. This is not a Weighing Sector item.

Taken from the OIML R60 Work Group 3rd Committee Draft April 2014:

4. Description of Load Cells

A load cell provides an output proportional to a force resulting from applying a load. Load cells may be used as a single transducer or applied together with other load cells in a system where the design allows such application. The term "load cell" Recommendation is not limited to any particular type of technology or design principle. While many technologies are used in the design of load cells, those used in legal metrology applications are commonly designated to provide an output relative to an input stimulus based on an electrical current. Both analog and digital outputs are recognized in load cells within that category. Although strain gauge technology was a primary focus in the development of R60, it is to be understood that load cells that operate using other principles may also be evaluated under this Recommendation. Variations of transducers that operate using alternative basis of input/output may include, but are not limited to: pressure (e.g., hydraulic, pneumatic); vibratory frequency; and magnetic forces.

The term load cell may describe an elemental component/module or a somewhat more complex instrument including constituents that perform functions such as signal filtering and analog-to-digital conversion.

Note the statement that *both analog and digital outputs are recognized in load cells within that category* (load cells used in legal metrology applications). A typical definition for the word analog is *of or relating to a device or process in which data is represented by physical quantities that change continuously*. Using that definition, a hydraulic load cell can be referred to as an analog load cell since its output is indeed represented by physical quantities that change continuously. Why is any addition to that description needed?

Further, the last sentence in section 4 from the OIML R60 Committee Draft states that a load cell can describe a component or module OR a somewhat more complex instrument including constituents that perform functions such as signal filtering and analog-to-digital conversion. The device that we refer to as a hydraulic load cell is a case in point. The hydraulic load cell is used with a totalizer, a constituent component that performs the function of converting the output to an analog or digital signal. In short, the hydraulic load cell, regardless of the technology employed by its totalizer, is a load cell as defined in this OIML R60 Committee Draft. Trying to add the word "hybrid" to the description serves absolutely no purpose engineering or otherwise and only results in adding confusion to what otherwise is a simple definition for a load cell.

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