# National Type Evaluation Program (NTEP)
# Belt-Conveyor Scale (BCS) Sector Meeting Agenda

February 20, 2014 / Pittsburgh, PA

## Introduction

The charge of the BCS Sector is important in providing appropriate type evaluation criteria based on specifications, tolerances and technical requirements of *NIST Handbook 44* Sections 1.10. General Code and 2.21. BCS Systems. The sector's recommendations are presented to the National Type Evaluation Program (NTEP) Committee each January for approval and inclusion in *NCWM Publication 14 Technical Policy, Checklists and Test Procedures* for national type evaluation.

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

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

## Table of Contents

## Glossary of Acronyms and Terms

| Acronym | Term | Acronym | Term |
|---|---|---|---|
| BCS | Belt-Conveyor Scale | NTEP | National Type Evaluation Program |
| MTL | Minimum Test Load | NTETC | National Type Evaluation Technical Committee |
| NCWM | National Conference on Weights and Measures | OWM | Office of Weights and Measures |
| NIST | National Institute of Standards and Technology | USNWG | U.S. National Work Group |

## 1). Details of All Items

*(In order by Reference Key)*

# I. Carry-over Items

## A. Belt-Conveyor Scale NTEP Checklist

**Source:**

**USNWG on Belt-Conveyor Scales**

**Proposal:**

Amend *NCWM Publication 14 Belt-Conveyor Scales* by incorporating recommended changes that primarily were intended to allow for the evaluation of master weight totalizers (MWT) as a component of a belt-conveyor scale system. This was intended to facilitate the certification of MWT's as replacement instruments and would not necessarily testing on the entire belt-conveyor scale system.

**Background / Discussion:**

Prior to the 2009 BCS Sector meeting, Mr. Bill Ripka, Chair submitted a draft of an amended *NCWM Publication 14* Belt-Conveyor Scales Technical Policy, Checklists, and Test Procedures to the sector members for review. The proposed changes in this draft related primarily to Master Weight Totalizers intended to be installed as substitutions within a BCS system in addition to a number of other minor editorial changes. Among the recommended changes that were included in this draft were changes involving procedures used when evaluating semi-automatic and automatic zero-setting mechanisms.

This proposed draft has not been sufficiently vetted yet. It had been offered to be used on a trial basis by NTEP labs when evaluating manufacturer's replacement instruments (Master Weight Totalizers) that are scheduled to undergo NTEP evaluation. Some manufacturers within the sector have indicated that they may have instruments ready to be submitted to NTEP for evaluation.

The NTEP program has been provided with the draft of proposed changes to *NCWM Publication 14* Belt-Conveyor Scales Technical Policy, Checklists, and Test Procedures and the NTEP laboratories have agreed to use the amended checklist in order to identify gaps or necessary changes within the draft. Feedback from evaluators who have used this amended checklist is needed so that sector members are able to determine the need for further development of the proposed changes.

During the 2012 NTEP Belt-Conveyor Scale Sector meeting, the members agreed to request that a report be provided to the sector by NTEP evaluator(s) that have used the draft of proposed changes that would detail any gaps in the draft and recommend further amendments if necessary. Any input and additional comments from NTEP evaluators that are available will be discussed.

## B. Linearization Feature for BCS:

**Source:**

**USNWG on Belt-Conveyor Scales**

**Proposal:**

Develop recommended test procedures for *NCWM Publication 14 Belt-Conveyor Scales* to evaluate the use of any linearity correction feature when used in a belt-conveyor scale system.

**Background / Discussion:**

Manufacturers and service agents of belt-conveyor scales have voiced support for the use of electronic instruments equipped with a linearity correction feature (i.e. multiple point calibrations) to reduce span errors that deviate from a linear pattern. It has been reported by some sector members that this practice may be considered as non-compliant in some jurisdictions with established weights and measures requirements. Some members of the sector have asked for clarification from the National Institute of Standards and Technology (NIST), Office of Weights and Measures (OWM) on the use of this type of feature and question whether it is (or should be) permitted under existing U.S. standards.

The U.S. National Work Group (USNWG) on BCS has deliberated on the use of a linearization feature for enhancing the performance of belt-conveyor scale systems and considered whether there is a need to develop additional requirements in *NIST Handbook 44* to address its use. At the 2011 BCS Sector Meeting, some members agreed to participate in a sub-group to develop a draft of recommended test procedures that would be submitted to the NTEP Committee as proposed changes within *NCWM Publication 14*. This group was to also consider the scope for the application of any newly developed test procedures (i.e. whether the test procedures will be applied retroactively to devices that have already received NTEP approval).Following the February 2012 NTEP Sector meeting the sub group met via teleconference. During this conference (conducted on June 7, 2012) the sub-group agreed that any testing of a linearity correction feature could be performed either in controlled laboratory conditions or in a field installation. The group agreed that if the function of this feature was verified under controlled conditions during type evaluation, it should then be clearly noted on the Certificate of Conformance (CC) for the device. The sub-group also concluded that verification of this feature during field testing, could be accomplished through material tests such as those typically performed during routine official examinations.

In addition, the sub-group agreed that this feature would need to be a sealable function within the instrument. Other points regarding this issue that were discussed at the sub-group's teleconference in June 2012 included:

- The correction factor (linearization factor) must be applied at a minimum of three points or flow rates.
- It is to be determined if there is to be a limitation on the amount of correction permitted. If there is to be a limit established, the sub-group suggests that a limit of +/- 0.4% of scale capacity may be appropriate.
- The group determined that lab testing should be performed at pre-specified percentages of device capacity to ensure the feature is capable of performing correctly throughout the operating range of the device.
- The group recommended that testing be performed using predetermined correction factors. For instance:
    - flow rates equal to 25%, 50%, 75% and 90% of full scale;
    - tests for loading of +/- 0.5%, +/-1%, +/-1.5% and +/-2% of full scale at each flow rate.

The work group will be asked to update on any progress that has been made in this effort.

## C. Conveyor Belt Profiling:

**Source:**

**USNWG on Belt-Conveyor Scales**

**Proposal:**

Develop recommended test procedures for *NCWM Publication 14 Belt-Conveyor Scales* to evaluate the use of a belt profiling feature to provide a zero-load reference when used in a belt-conveyor scale system.

**Background / Discussion:**

This method of establishing a zero-condition for a totalization operation enables the belt-conveyor scale to synchronize the application of an individual "tare" weight values associated with distinct segments of the belt to the movement of those belt segments over the scale portion of the conveyor. If this alternative to averaging the weight of segments of the belt carcass is used there is a potential need to establish a procedure to evaluate its effectiveness, to ensure that it functions as intended, and is maintained during operation of the BCS.

NISTOWM has received inquiries seeking guidance on whether this type of feature is permitted under U.S. standards. It is also being reported by some members of the USNWG BCS that some regulatory field officials will not issue an approval for devices equipped with this feature when it is not listed as a standard feature or an option on the NTEP Certificate of Conformance.

During the February 2011 meeting the sector members were asked to consider if there is there is a need for procedures to evaluate the effectiveness of belt profiling and to ensure that correct operation is maintained during totalization. A majority of sector members voiced their opinion that this feature should receive some level of evaluation, and that at a minimum the ability to enable or disable any belt profiling feature should be protected by some form of security seal.

Sector members at the 2011 BCS Meeting also concluded that it may be preferable to have the analysis and necessary action(s) for the consideration of belt profiling features taken on by the same work group formed under the previous agenda item. This sub-group will be asked to provide the sector with an update on any work on this item.

## D. Field Test Procedures for Reference Scales

**Source:**

**NIST/OWM**

**Proposal:**

To amend test procedures outlined in *NCWM Publication 14 Belt-Conveyor Scales* with regard to minimum test weights required to certify hopper scales as a reference scale to be used in a materials test. And to align the values provided for minimum test weights with those values as stated in *NIST Handbook 44 Scales Code.*

**Background / Discussion:**

Procedures listed in *NCWM Publication 14* for conducting evaluations of belt-conveyor scale systems using material tests, include the following statements:

**13. Field Test Procedure**

**Test of the Reference Scale**

**Hopper Scales**
Hopper scales must be tested to the used capacity using substitution tests. Test weights equal to a minimum of 10% of scale capacity are needed; more test weight is recommended. The scale must be accurate to 0.1% and adjusted if necessary.

During the 2012 BCS Sector meeting, it was noted that the minimum test weight amount of 10% of scale capacity as stated in *NCWM Publication 14* is in conflict with *NIST Handbook 44* Scales Code, Table 4 where it is required that, for scales of greater than 3000 lb capacity the minimum test weight required is 12.5% of scale capacity. The sector was asked to consider whether these values should be reconciled. The sector originally agreed that the statement of 10% minimum test weight required in *NCWM Publication 14* should be amended to coincide with the minimum test weight required under Table 4 – *NIST Handbook 44* Scales Code (e.g., 12% of scale capacity).

Further deliberation on this item at the 2012 meeting addressed the fact that *NIST Handbook 44* contains no requirement to specify a minimum capacity for a reference scale used and that the only specific requirement related to the reference scale is that the scale used must produce weighments within 0.1% accuracy. Consequently, the members agreed to recommend that *NCWM Publication 14* be amended to delete the reference to a 10% minimum test weight and simply specify that no more than three substitutions can be used during the testing of a hopper scale used a reference scale, and that the hopper scale be tested according to *NIST Handbook 44* procedures. These recommended changes are shown below.

**13. Field Test Procedure (page BCS-17)**

**Test of the Reference Scale**

**Hopper Scales**
Hopper scales must be tested to the used capacity using **a maximum of three** substitution tests **according to NIST Handbook 44 procedures**. ~~**Test weights equal to a minimum of 10% of scale capacity are needed; more test weight is recommended.**~~ The scale must be accurate to 0.1% and adjusted if necessary.

After the 2012 NTEP BCS Sector Meeting, the NIST Technical Advisor received comments from the former technical advisor to the sector regarding concerns about this item and the conclusions of the sector. These comments were related to the proposed deletion of a stated minimum required test weight and expressed concern that this type of scale may be tested using test weight in amounts that are smaller than what has been established as minimum. Mr. Ripka, Chair and Mr. Truex, NTEP Administrator were consulted with regard to the concerns expressed, and a decision was reached that these concerns have merit and that since this item is not a critical issue currently preventing a manufacturer from completing an NTEP evaluation, it would be best to table this issue as a carry-over item to be further addressed at the next sector meeting.

The Sector will be asked to re-evaluate the conclusions made during the 2012 meeting and to consider concerns expressed over the proposal to eliminate any statement of required minimum test weights needed.

# II. New items

## A. 2014 NIST Handbook 44 Changes

**Source:**

**USNWG on Belt-Conveyor Scales**

**Proposal:**

Amend *NCWM Publication 14 Belt-Conveyor Scales* to correspond with changes that have occurred in the most recent edition of *NIST Handbook 44.*

**Background/Discussion:**

These changes were adopted through the NCWM and are now incorporated into the 2014 edition of *NIST Handbook 44*. The changes to *NIST Handbook 44* will also impact the content of *NCWM Publication 14 for BCS*. The Sector is asked to review the recommended changes shown under 1.A. and 1.B. to *NCWM Publication 14*.

### 1) Appendix C – Units of Mass (ton)

**Source:**
**Mr. Paul Lewis, Rice Lake Weighing Systems, Inc./NTEP Weighing Sector**

**Background/Discussion:**

Adopted changes to the 2014 edition of HB44 include the results of efforts to standardize abbreviations used for the term "short ton." These changes affected the Units of Mass Table appearing on pages C-19 and C-20 of Appendix C. This change resulted in the elimination of abbreviations for the term "short ton" other than "tn" when used on equipment manufactured after the effective date of January 1, 2014. Equipment manufactured between January 1, 2008 and December 31, 2013 may use an abbreviation other than "tn."

The amendment also included the addition of a footnote to the Table mentioned above intended to clarify that abbreviations for "net" or "short" ton other than "tn" are considered appropriate for use with older equipment as follows:

| Units of Mass | |
|---|---|
| 1 ton, metric (t) | 2204.623 pounds<br>0.984 gross ton<br>1.102 net tons |
| 1 ton, net or short (**tn**)[21] | 2000 pounds (exactly)<br>0.893 gross ton<br>0.907 metric ton |

**[21]As of January 1, 2014, "tn" is the required abbreviation for short ton. Devices manufactured between January 1, 2008 and December 31, 2013 may use an abbreviation other than "tn" to specify short ton.**

An additional change associated with this item was made in NIST Handbook 44 in the Avoirdupois Units of Mass heading on page C-6 of Appendix C as shown below.

**Avoirdupois Units of Mass**

[The "grain" is the same in avoirdupois, troy, and apothecaries units of mass.]

| | |
|---|---|
| 1 μlb | = 0.000 001 pound (lb) |
| $27^{11}/_{32}$ grains (gr) | = 1 dram (dr) |
| 16 drams | = 1 ounce (oz) |
| | = 437½ grains |
| 16 ounces | = 1 pound (lb) |
| | = 256 drams |
| | = 7000 grains |
| 100 pounds | = 1 hundredweight (cwt)[6] |
| 20 hundredweights | = 1 ton ~~**(t)**~~**(tn)**[x] |
| | = 2000 pounds[7] |

In "gross" or "long" measure, the following values are recognized:

| | |
|---|---|
| 112 pounds (lb) | = 1 gross or long hundredweight (cwt)[7] |
| 20 gross or long hundredweights | = 1 gross or long ton |
| | = 2240 pounds[7] |

[6] When necessary to distinguish…
[7] When the terms "hundredweight" and……

**[x]As of January 1, 2014, "tn" is the required abbreviation for short ton. Devices manufactured between January 1, 2008 and December 31, 2013 may use an abbreviation other than "tn" to specify short ton.**

To align *NCWM Publicaiton 14* for *Belt-Conveyor Scales* (BCS) with the changes above, it is recommended that sections 1.8 and 2.5 in the *NCWM Publication 14 for BCS* Checklists and Test Procedures be amended as follows.

**1 Indicating and Reording Elements**
**…**

.

1.8 The scale division shall be in increments of 1, 2, or 5 times 10k where k is an integer and shall not be greater than 0.125 % (1/800) of the minimum totalized load.
What is a scale division? ☐ Yes ☐ No ☐ N/A

| Unit | Abbreviation |
|---|---|
| pounds | lb or LB |
| U.S. short ton | ton or ~~T~~**tn** |
| U.S. long ton | LT |
| Metric ton | t |
| kilograms | kg |

**2 Recording Element**
**.**
**.**
**.**

2.5 Information required on the ticket ☐ Yes ☐ No ☐ N/A

| | |
|---|---|
| MASTER START TOTAL | 05 06 92 |
| MASTER STOP TOTAL | 15:30 |
| QUANTITY | 44113.5 ~~T~~**tn** |
| | 44300.5 ~~T~~**tn** |
| | 187.0 ~~T~~**tn** |

Sector members will be asked to review these changes and provide additional input.

While considering this item, the NTEP Weighing Sector reviewed the list of acceptable abbreviations/symbols found in Appendix C of Publication 14 - Digital Electronic Scales (DES). The Weighing Sector proposed changes to this document and forwarded those proposed changes to the Belt-Conveyor Scale Sector for additional input recognizing that these proposed changes might impact BCS manufactures more significantly than manufacturers of other types of scales.

The Weighing Sector has recommended changes to the *NCWM Publication 14 for DES* Appendix C – Acceptable Abbreviations/Symbols as follows:

*From NCWM Publication 14 for DES:*
*[Note: the following excerpt from NCWM Publication 14 has been edited to include only the portions relevant to this agenda item. Recommended changes are highlighted.]*

In addition the Weighing Sector considered the appropriate use of the entire word “ton” under this item. It is now being recognized that the word “ton,” when used by itself should be used only in conjunction with

the unit “short ton” and  should not be intended, nor should it be permitted, to represent any other version of the ton unit (e.g. long ton, metric ton).

The NTEP BCS Sector will be asked to review these changes and provide comments.

Appendix C
Acceptable Abbreviations/Symbols
This list does not standardize the abbreviations/symbols that must be used, rather, it identifies abbreviations/symbols that are routinely acceptable. This list is not limiting or all-inclusive; other abbreviations/symbols may be acceptable.
Additionally, the following lists of abbreviations and symbols should be used as a guide; style differences are acceptable (e.g. shapes of arrows,)

| **Device Application** | **Term** | **Acceptable** | **NOT Acceptable** |
|---|---|---|---|
| General | value of scale division (displayed) | d | |
| | value of verification scale division | e | |
| | number of scale divisions | n | |
| | gross | gross, G, GR | |
| | Semi-automatic (push-button) tare | tare, T, TA | |
| | Keyboard, Programmable and Stored tare | tare, T, TA, PT | |
| | net | net, N, NT | |
| | pieces | pieces pc, pcs | |
| | count | count cnt or pc(s)<br>*is encouraged or ct symbol for pieces ct is acceptable NIST Handbook 130* | C |
| | carat or carat troy – 200 mg | c<br>*NIST Handbook 44 and NIST Guide for the Use of International System of Units (SI)* | ct<br>*not permitted if used as the abbreviation for carat and count on a scale with an enable count feature* |
| | **short ton** | **ton or tn** | |
| *Exceptions to General Tables of *NIST Handbook 44* | carat or carat troy – 200 mg | ct<br>*common jewelry industry abbreviation and is the only acceptable abbreviation in Canada* | ct<br>*not permitted if used as the abbreviation for carat and count on a scale with an enable count feature* |
| | U.S. short ton | ~~**ton,**~~ TN~~**, or tn**~~ -<br>*for belt-conveyor scales the abbreviation "T" is acceptable* | |
| | U.S. long ton | LT | |
| | Grain | grain, GRN, grn, GN | |
| Belt-Conveyor Scales | U.S. short ton (different from "General" application) | T | |

**2) Deletion of required maximum/minimum conveyor lengths**

The 2014 edition of *NIST Handbook 44* BCS code has also been amended by deleting paragraph UR.1.2.(h). This deleted maximum and minimum conveyor length requirements. It is recommended that section 9.7 in *NCWM Publication 14* be changed to reflect this change as shown below:

**Code Reference: UR.2.2.1.**

9.7. The design and installation of the conveyor leading to and from the belt-conveyor scale …

. . .

~~**9.7.1. The conveyor shall be no longer than 1000 ft (300 m) or shorter than 40 ft (12 m) from head to tail pulley. [Nonretroactive as of January 1, 1986]**~~ ☐ ~~**Yes**~~ ☐ ~~**No**~~ ☐ ~~**N/A**~~

## B. Proposals recommended by the NTEP Software Sector

**Source:**

**NTEP Software Sector**

**Proposal:**

Amend *NCWM Publication 14* to address perceived gaps in the identification, protection/security, and the maintenance of software used in electronic weighing systems.

**Background/Discussion:**

The NTEP Software Sector has made three proposals regarding the regulation of software used in electronic weighing devices. These proposals have been circulated to the other NTEP Sectors for review and comment.

**1) Identification of Certified Software**

This item originated as response to the question "How does the field inspector know that the software running in the device is the same software evaluated and approved by the lab?" It has been recognized that the international community has already addressed this issue (i.e., through WELMEC and OIML).

There was a discussion at the 2012 NTEP Software Sector Meeting, focusing on where the terminology regarding inextricably linking the software version or revision to the software itself belonged. The Software Sector recommended adding the following to *NCWM Publication 14* and forward to NTEP Weighing, Measuring, and Grain Analyzer Sectors for feedback:

Identification of Certified Software:

Note: Manufacturers may choose to separate metrologically significant software from non-metrologically significant software. Separation would allow the revision of the non-metrological portion without the need for further evaluation. In addition, non-metrologically significant software may be updated on devices without breaking a seal, if so designed. Separation of software requires that all software modules (programs, subroutines, objects, etc.) that perform metrologically significant functions or that contain metrologically significant data domains form the metrologically significant software part of a measuring instrument (device or sub-assembly). If the separation of the software is not possible or needed, then the software is metrologically significant as a whole. The conformity requirement applies to all parts and parts shall be marked according to Section G-S-X.X.

The manufacturer must describe and possibly demonstrate how the version or revision identifier is directly and inseparably linked to the metrologically significant software. Where the version revision identifier is comprised of more than one part, the manufacturer shall describe which portion represents the metrological significant software and which does not.

The BCS Sector is being asked to review and comment on a proposal developed by the NTEP Software Sector. This proposal recommends that marking requirements be established for software-based electronic equipment that will enable field verification of the appropriate version or revision for metrological software. This proposal would include changes to language in *NIST Handbook 44* so that U.S. standards would be more closely aligned with international requirements found in standards published by WELMEC (European Cooperation in Legal Metrology) and OIML (International Organization of Legal Metrology).

The Software Sector recognized a number of points during the development of this proposal including:

- It is the opinion of the Software Sector that a specific method of identification of software version or revision should not be defined but rather that the manufacturer should utilize a method and demonstrate the selected identification mechanism is suitable for the purpose.
- A category III or some comparable means of providing a seal for metrological software would provide an indication to the weights and measures inspector that any changes have been made to the software.

The Software Sector has requested that the other NTEP Sectors review this proposal and provide feedback.

**2) Software Protection / Security**

The Software Sector is proposing that the existing audit trail and physical seal provisions used in the U.S. to provide security of the software used in software-based devices needs to be enhanced. To accomplish this, the Software Sector has referenced the international WELMEC Document as shown below:

**Protection against accidental or unintentional changes**
Metrologically significant software and measurement data shall be protected against accidental or unintentional changes.

**Specifying Notes:**
Possible reasons for accidental changes and faults are: unpredictable physical influences, effects caused by user functions and residual defects of the software even though state of the art of development techniques have been applied.

This requirement includes consideration of:

a) Physical influences: Stored measurement data shall be protected against corruption or deletion when a fault occurs or, alternatively, the fault shall be detectable.

b) User functions: Confirmation shall be demanded before deleting or changing data.

c) Software defects: Appropriate measures shall be taken to protect data from unintentional changes that could occur through incorrect program design or programming errors, e.g. plausibility checks.

**Required Documentation:**
The documentation should show the measures that have been taken to protect the software and data against unintentional changes.

**Example of an Acceptable Solution:**
- The accidental modification of software and measurement data may be checked by calculating a checksum over the relevant parts, comparing it with the nominal value and stopping if anything has been modified.
- Measurement data are not deleted without prior authorization, e.g. a dialogue statement or window asking for confirmation of deletion.
- For fault detection see also Extension I.

The Software Sector is in the process of developing a checklist for inclusion in NCWM Publication 14. This checklist is based roughly on a checklist contained in the international standard for non-automatic weighing instruments, OIML R 76 – 2. The information requested by this checklist is currently voluntary, however, it is recommended that NTEP applicants comply with these requests or provide specific information as to why they may not be able to comply. Based on this information, the checklist may be amended to better fit with NTEP's need for information and the applicant's ability to comply.
The California, Maryland and Ohio laboratories agreed to use this check list (shown below) on one of the next devices they have in the lab and report back to the sector on what the problems may be. North Carolina's laboratory was also given a copy of the check list to try.

1. **Devices with ~~Embedded~~ Software ~~TYPE P (aka built-for-purpose)~~**

   1.1. Declaration of the manufacturer that the software is used in a fixed hardware and software environment. **AND** ☐ Yes ☐ No ☐ N/A

   1.2. Cannot be modified or uploaded by any means after securing/verification. ☐ Yes ☐ No ☐ N/A

   *Note: It is acceptable to break the "seal" and load new software, audit trail is also a sufficient seal.*

   1.3. The software documentation contains:

      1.3.1. Description of all functions, designating those that are considered metrologically significant. ☐ Yes ☐ No ☐ N/A

      1.3.2. Description of the securing means (evidence of an intervention). ☐ Yes ☐ No ☐ N/A

      1.3.3. Software Identification**, including version / revision** ☐ Yes ☐ No ☐ N/A

      1.3.4. Description how to check the actual software identification. ☐ Yes ☐ No ☐ N/A

   1.4. The software identification is:

      1.4.1. Clearly assigned to the metrologically significant software and functions. ☐ Yes ☐ No ☐ N/A

      1.4.2. Description how to check the actual software identification. ☐ Yes ☐ No ☐ N/A

      1.4.3. Provided by the device as documented. ☐ Yes ☐ No ☐ N/A

      **1.4.4. Directly linked to the software itself.** ☐ Yes ☐ No ☐ N/A

2. **~~Personal Computers, Instruments with PC Components, and Other Instruments, Devices, Modules, and Elements with Programmable or~~ Loadable Metrologically Significant Software ~~TYPE U (aka not built-for-purpose)~~**

   2.1. The metrologically significant software is:

      2.1.1. Documented with all relevant (see below for list of documents) information. ☐ Yes ☐ No ☐ N/A

      2.1.2. Protected against accidental or intentional changes. ☐ Yes ☐ No ☐ N/A

      2.1.3. Evidence of intervention (such as, changes, uploads, circumvention) is available until the next verification / inspection (e.g., physical seal, Checksum, **Cyclical Redundancy Check (**CRC**)**, audit trail, etc. means of security). ☐ Yes ☐ No ☐ N/A

3. **Software with ~~Closed Shell (~~no access to the operating system and/or programs possible for the user~~)~~**

3.1. Check whether there is a complete set of commands (e.g., function keys or commands via external interfaces) supplied and accompanied by short descriptions. ☐ Yes ☐ No ☐ N/A

3.2. Check whether the manufacturer has submitted a written declaration of the completeness of the set of commands. ☐ Yes ☐ No ☐ N/A

4. **Operating System and / or Program(s) Accessible for the User**

4.1. Check whether a checksum or equivalent signature is generated over the machine code of the metrologically significant software (program module(s) subject to legal control Weights and Measures jurisdiction and type-specific parameters). ☐ Yes ☐ No ☐ N/A

4.2. Check whether the metrologically significant software will detect and act upon any unauthorized alteration of the metrologically significant software using simple software tools (e.g., text editor). ☐ Yes ☐ No ☐ N/A

5. **Software Interface(s)**

5.1. Verify the manufacturer has documented:

5.1.1. The program modules of the metrologically significant software are defined and separated. ☐ Yes ☐ No ☐ N/A

5.1.2. The protective software interface itself is part of the metrologically significant software. ☐ Yes ☐ No ☐ N/A

5.1.3. The functions of the metrologically significant software that can be accessed via the protective software interface. ☐ Yes ☐ No ☐ N/A

5.1.4. The parameters that may be exchanged via the protective software interface are defined. ☐ Yes ☐ No ☐ N/A

5.1.5. The description of the functions and parameters are conclusive and complete. ☐ Yes ☐ No ☐ N/A

5.1.6. There are software interface instructions for the third party (external) application programmer. ☐ Yes ☐ No ☐ N/A

The NTEP laboratories have used the above checklist on a limited basis and already have provided some feedback to the Software Sector. Work is ongoing on this item with the intent that it eventually will be incorporated as a checklist in NCWM Publication 14; again the laboratories are requested to try utilizing this checklist for any evaluations on software-based electronic devices. The revised checklist will be distributed to the laboratories for additional review.

The other NTEP Sectors are being asked to review and provide additional feedback.

**3) Software Maintenance and Reconfiguration**

The Software Sector has requested that the other NTEP Sectors review the recommended changes to *NCWM Publication 14* with regard to the means used by device manufacturers to insure the integrity of the software in their devices.

The Software Sector asked the question: "What do the software-based device manufacturers use to secure their software?" The following items were reviewed by the sector and passed to the other sectors for review.

1. Verification that the update process is documented (OK)
2. For traced updates, installed Software is authenticated and checked for integrity

   Technical means shall be employed to guarantee the authenticity of the loaded software (i.e. that it originates from the owner of the type approval certificate). This can be accomplished (e.g. by cryptographic means like signing). The signature is checked during loading. If the loaded software fails this test, the instrument shall discard it and either use the previous version of the software **or become inoperative**.

   Technical means shall be employed to guarantee the integrity of the loaded software i.e. that it has not been inadmissibly changed before loading. This can be accomplished e.g. by adding a checksum or hash code of the loaded software and verifying it during the loading procedure. If the loaded software fails this test, the instrument shall discard it and either use the previous version of the software **or become inoperative**.

   Examples are not limiting or exclusive.

3. Verify that the sealing requirements are met

   The sector asked, "What sealing requirements are we talking about?"

   This item is **only** addressing the **software update**, it can be either verified or traced. It is possible that there are two different security means, one for protecting software updates (software log) and one for protecting the other metrological parameters (Category I II or III method of sealing). Some examples provided by the sector members include but are not limited to:

   - Physical Seal, software log
   - Category III method of sealing can contain both means of security

4. Verify that if the upgrade process fails, the device is inoperable or the original software is restored

   The question before the group is, Can this be made mandatory?

   The manufacturer shall ensure by appropriate technical means (e.g. an audit trail) that traced updates of metrologically significant software are adequately traceable within the instrument for subsequent verification and surveillance or inspection. This requirement enables inspection authorities, which are responsible for the metrological surveillance of legally controlled instruments, to back-trace traced updates of metrologically significant software over an adequate period of time (that depends on national legislation). The statement in italics will need to be reworded to comply

with US weights and measures requirements.

The sector **agreed** that the two definitions below for Verified update and Traced update were acceptable.

**Verified Update**
A verified update is the process of installing new software where the security is broken and the device must be re-verified. Checking for authenticity and integrity is the responsibility of the owner/user.

**Traced Update**
A traced update is the process of installing new software where the software is automatically checked for authenticity and integrity, and the update is recorded in a software update log or audit trail.

*Note: It's possible that the Philosophy of Sealing section of NCWM Publication 14 may already address the above IF the definitions of Verified and Traced Updates (and the statement below) were to be added. The contrary argument was that it may be better to be explicit).*

**Use of a Category 3 audit trail is required for a Traced Update. A log entry representing a traced software update shall include the software identification of the newly installed version.**

The sector recommended consolidating the definitions with the above statement thus:

**Verified Update**
A verified update is the process of installing new software where the security is broken and the device must be re-verified. Checking for authenticity and integrity is the responsibility of the owner/user.

**Traced Update**
A traced update is the process of installing new software where the software is automatically checked for authenticity and integrity, and the update is recorded in a ~~**software update log or**~~ Category 3 audit trail. The audit trail entry shall include the software identification of the newly installed version.

In 2012, the sector recommended that as a first step, the following be added to *NCWM Publication 14*:

**The updating of metrologically significant software, including software that checks the authenticity and integrity of the updates, shall be considered a sealable event.**

Though the Software Sector is currently considering only that the single sentence (shown above) be incorporated into *NCWM Publication 14* there may be additional changes proposed in the future.

The BCS Sector will be asked to provide comments on the above information provided by the Software Sector.

## C. Review of NCWM Publication 14 List of Sealable Parameters for BCS Systems

**Source:**

USNWG on Belt-Conveyor Scales.

**Proposal:**

To review and further develop (if necessary) a list of features associated with a belt-conveyor scale system (and weigh-belt systems) that will categorize those features as either sealable or non-sealable.

**Background/Discussion:**

The list shown below was developed during the 2009-2010 NTETC BCS Sector meetings. The table was then incorporated in the 2011 edition of Publication 14. NTEP laboratories were asked to report back to the Sector with comments and recommended amendments for improvement. Since there has not been any responses received by the Sector at this point, it is not known if any manufacturers' devices have been submitted for NTEP approval to apply this list to during any evaluations.

| **Belt-Conveyor Scale Features and Parameters** | |
|---|---|
| **Typical Features to be Sealed** | **Typical Features and Parameters Not Required to be Sealed** |
| Official verification zero reference<br>Official verification span/calibration reference<br>Linearity correction values<br>Allowable range of zero (if adjustable)<br>Selection of measurement units<br>Division value, d<br>Range of over capacity indications (if it can be set to extend beyond regulatory limits)<br>Alarm limits for flow rate (high/low)<br>Automatic zero-setting mechanism (on/off)<br>Automatic zero-setting mechanism (range of a single step)<br>Configuration (speed, capacity, calibrated test weight value if applicable, pulses per belt revolution, load cell configuration, ) | Display update rate<br>Baud rate for electronic data transfer<br>Communications (Configuration of input, output signal to peripheral devices) |
| ***NOTE:*** *The above examples of adjustments, parameters, and features to be sealed are to be considered "typical" or "normal." This list may not be all inclusive, and there may be parameters other than those listed which affect the metrological performance of the device and must, therefore, be sealed. If listed parameters or other parameters which may affect the metrological function of the device are not sealed, the manufacturer must demonstrate that the parameter will not affect the metrological performance of the device (i.e., all settings comply with the most stringent requirements of Handbook 44 for the applications for which the device is to be used).* | |

In view of the proposals submitted by the NTEP Software Sector that are included in this agenda, it is recommended that the Sector review this table for completeness.