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

February 26, 2015 / St. Louis, MO.

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***.

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
MWT	Master Weight Totalizer	OWM	Office of Weights and Measures
NCWM	National Conference on Weights and Measures	USNWG	U.S. National Work Group
NIST	National Institute of Standards and Technology		

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I. Carry-over Items

A. Revision of the Belt-Conveyor Scale NTEP Checklist

1). Evaluation Checklist for Retrofit Master Weight Totalizers

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 require testing on the entire belt-conveyor scale system.

Background:

Prior to the 2009 BCS Sector meeting, Mr. Bill Ripka, (Sector Chair) presented 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 replacement or retrofitted instruments within an existing 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 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.

At the 2014 BCS Sector meeting, it was reported that there has not been any devices submitted for type approval that could appropriately be evaluated using the proposed amended checklist.

Following the February 2014 Sector meeting, the NTEP Belt-Conveyor Scale Sector members were contacted by the Sector Chair, Mr. Bill Ripka and were asked to participate in teleconference conducted to ask the Sector to deliberate on possible additional changes to the proposed amendments of *NCWM Publication 14 Belt-Conveyor Scales Technical Policy, Checklists, and Test Procedures.*

The primary focus of that teleconference was for the members to consider a change that would eliminate the requirement for a field permanence test as part of a type evaluation outlined in these proposed changes. Most Sector members agreed that a permanence test is necessary for the proper evaluation of an entire belt-conveyor scale system when installed however, this recommended further revision of this proposal is based upon the notion that a permanence test is not warranted for a MWT that is installed as an retrofit or replacement instrument for an existing system. The additional changes would not eliminate any type of testing performed under laboratory conditions however.

Following the teleconference and several follow-up email exchanges among the Sector members, the Sector was asked to respond to a ballot indicating whether or not this revision to the original proposal was supported. The balloting of the Sector members was conducted through email and the results indicated that all active members of the Sector supported the elimination of a permanence test for replacement instruments. The Sector agreed that in addition to the removal of a required permanence testing during a type evaluation for a MWT, several minor editorial changes were also approved. The Sector Chair agreed to forward the revised proposal to the NTEP Administrator.

Discussion:

Some participants of the 2015 meeting of the BCS Sector asked for clarification whether a MWT submitted for NTEP evaluation under the conditions of this proposal would be required to be installed in a conveyor system as needed for the performance of a material test as part of that type evaluation. The members of the Sector present at the meeting agreed that the NTEP evaluation procedure for a MWT as a stand-alone instrument would not include any material test performed in the field. It was recognized however that a MWT covered under a Certificate of Conformance issued using the procedure prescribed in this proposal would need to be certified as a commercial device in the field when that particular instrument was installed as part of a BCS system. This field certification by statutory authorities would then include all elements of an examination prescribed for an initial test.

Conclusion:

The participants of the 2015 BCS Sector meeting agreed to continue to support the proposed changes to *NCWM Publication 14* that would allow the type evaluation of a MWT intended for use as a replacement or retrofit component in an existing BCS system. Mr. Darrell Flocken informed the group that the Evaluation Checklist has been included in the 2015 edition of *NCWM Publication 14*.

2). 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:

The table shown below was developed during the 2009-2010 NTETC BCS Sector meetings. The table was then incorporated in the 2011 edition of Publication 14. At that time NTEP laboratories were asked to report back to the sector with comments and recommended amendments for improvement. This item was included on the Sector's meeting agenda in 2014 and the members were informed that there had been no opportunities to use the table as part of an evaluation.

In addition during the 2014 meeting, it was recommended that the function of enabling a belt-profiling function for establishing a zero condition of a BCS system should be added as a sealable parameter in the table. Other features were considered for inclusion on this listing during that meeting however, there was no consensus among the Sector members to make further revisions.

It has been reported to NIST OWM that devices have recently been or possibly will be submitted in the near future for type evaluation which could offer an opportunity to test the usefulness of the following table.

Belt-Conveyor Scale Features and Parameters	
Typical Features to be Sealed	**Typical Features and Parameters Not Required to be Sealed**
Official verification zero reference Official verification span/calibration reference Linearity correction values Allowable range of zero (if adjustable) Selection of measurement units Division value, d Range of over capacity indications (if it can be set to extend beyond regulatory limits) Alarm limits for flow rate (high/low) Automatic zero-setting mechanism (on/off) Automatic zero-setting mechanism (range of a single step) Configuration (speed, capacity, calibrated test weight value if applicable, pulses per belt revolution, load cell configuration,)	Display update rate Baud rate for electronic data transfer 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).*	

Discussion:

At the 2015 BCS Sector meeting, this item was reviewed by the group to consider whether any additional features should be included or deleted from the above table. Participants of the meeting considered the possibility of additional features to be sealed including the function of a chart recorder. The Sector members recognized that the documentation provided by the chart recorder in a system is an important part of an official inspection and that those records should represent the actual performance of that system. Mr. Chuck Andrews added that since the chart recorder on a system is required by HB44, there is some justification for requiring the functioning of that component to be sealed.

Other members of the Sector at the meeting questioned how the chart recorder could be sealed and stated that it is not the peripheral devices in the system that need to be sealed but instead it is only the MWT and its functions that should be sealed.

The group considered communications between the MWT and other elements in the system as sealable parameters although, to some in the Sector "communications" is a general term and its meaning in this context is vague. Mr. Flocken agreed that the term "communications" is vague and suggested that devices not having "intelligence" and that would not impact the metrological features and functions of the system would not have to be sealed.

Mr. Flocken also stated that the table lists *typical* features and that it is up to the evaluator to do a thorough examination. If anything about that system turns out to be a security risk, then sealing of the affected parameters must become an issue regarding the device's certification.

Conclusion:

The Sector agreed to propose one additional modification of the table that would aid in clarifying the statement regarding communications in the table. The participants of the 2015 meeting agreed to the addition of the wording "…with no metrological influence" at the end of the statement pertaining to communications in the right-hand column containing non-sealable features as shown in the following table. No further changes to the list were recommended at this time.

Belt-Conveyor Scale Features and Parameters

Typical Features to be Sealed	Typical Features and Parameters Not Required to be Sealed
Official verification zero reference	Display update rate
Official verification span/calibration reference	Baud rate for electronic data transfer
Linearity correction values	Communications (Configuration of input, output signal to peripheral devices~~)~~ **with no metrological influence)**
Allowable range of zero (if adjustable)	
Selection of measurement units	
Division value, d	
Range of over capacity indications (if it can be set to extend beyond regulatory limits)	
Alarm limits for flow rate (high/low)	
Automatic zero-setting mechanism (on/off)	
Automatic zero-setting mechanism (range of a single step)	
Configuration (speed, capacity, calibrated test weight value if applicable, pulses per belt revolution, load cell configuration,)	

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).*

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:

Many manufacturers and service agents of belt-conveyor scales have supported the use of electronic instruments equipped with a linearity correction feature (i.e. multiple point calibrations) to reduce errors in device indications that deviate from a linear pattern. It has been reported by some Sector members that this practice may be considered as non-compliant by some weights and measures jurisdictions.

At the 2011 BCS Sector Meeting, some members agreed to participate in a sub-committee to develop a draft of recommended test procedures that would be submitted to the NTEP Committee as proposed changes within NCWM Publication 14.

This sub-committee conducted a teleconference (June 7, 2012) and agreed that the evaluation of a linearity correction feature could be performed either in controlled laboratory conditions or in a field installation. The sub-group also agreed that this feature would need to be a sealable function within the instrument. Some of the specific points regarding this issue considered by the sub-group 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.

At the 2014 BCS Sector meeting, the members discussed specifics about this issue including what value could be established as an appropriate limit for the amount of correction that would be allowed by a linearization correction feature. It had been suggested by the sub-committee that a limit of +/- 0.4% of scale capacity would be an appropriate value. Some members agreed in general with this limit, however others suggested that this restriction is arbitrary and that it may be overly prescriptive to place any limitation on the amount of correction allowed to the linearity.

While considering what should be included as elements included in a test procedure, the sector could not agree on certain points including what tolerance should be applied to the output of a system when linearization is being corrected through the use of this feature.

It was agreed at the 2014 meeting that this item needs to be further developed. The original sub-group formed to develop this item agreed to continue work on this item and to produce a draft test procedure that would be circulated for review by the Sector.

Discussion:

At the 2015 NTEP BCS Sector meeting, the participants were informed that no draft for a test procedure has been developed at this time. The group was reminded that the Sector had generally agreed that it was possible to perform an evaluation of a linearity correction feature either in a laboratory setting or in the field, once the MWT had been installed in a system. The Sector members were asked if there was any need for further test procedures to be developed recognizing that this feature could be evaluated simply by performing a required multiple flow rate material test.

Many of the participants of the 2015 meeting agreed that the use of a software-based feature such as linearity correction will mask defects or performance problems exhibited by the BCS system it is used on and that they would prefer that the cause of the substandard performance be corrected. Other members however, pointed out that linearity correction is commonly used on other types of devices such as vehicle scales.

Mr. Peter Sirrico stated that while this feature may be an asset, he would not support a linearity correction function with no limitation to the amount of correction performed.

There was additional discussion in general terms that included: how many points are used in the correction; and how much, if any influence correction at a certain point has on an adjacent correction point. It was also noted that the group had not established whether a linearity correction is applied to the output of a load cell or the totalization of material at different flow rates when considered in context of belt-conveyor scale systems. The Sector agreed that in that context, any correction in linearity would most likely be applied to the totalization of material at different flow rates. The participants of the 2015 meeting also agreed that it is the responsibility of the manufacturer of BCS to specify the conditions that must be met regarding the conveyor system that will promote satisfactory operation of the weighing device. Those specifications should be met by the owner/operator prior to the installation of the BCS.

Conclusion:

The Sector members agreed that there is no specific test procedure needed at this time for the evaluation of this type of feature and that an appropriately performed official test (including material testing at different flow rates), is needed to determine that this function is working properly. The members also agreed not to recommend any changes for the *NCWM Publication 14* unless there is a determination made that an alternative method to evaluate linearization in a lab for NTEP is needed.

Additional consideration may be given to this item in the future regarding specific test procedures needed, correction limitations, etc. if the Sector determines that it is needed in the future.

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:

This means of establishing a zero-condition prior to a totalization operation involves the ability of the weighing device to establish "tare" weight values associated with distinct individual segments of the belt and synchronizing the application of those values to the movement of the belt segments over the scale portion of the conveyor. A number of Sector members have agreed 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.

In addition, NIST OWM 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.

Members at the 2011 BCS Sector 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 (item B. Linearization Feature for BCS).

During the 2014 meeting, the BCS Sector was informed that the same sub-group which was assigned to develop procedures for verifying the operation of a linearization correction had also been assigned to develop a procedure for testing the function of belt profiling. No draft procedures have been developed at the time of the 2014 BCS Sector meeting.

Similar to the previous item (linearization correction), the sector members acknowledged that this feature could readily be tested in the field and would most likely be more costly to test in a laboratory setting. All of the sector members agreed that this feature must be one protected by a type of security seal.

At the 2014 BCS Sector meeting, the sub-group asked to develop test procedures for the evaluation of this type of feature was assigned to continue work on this and to have a draft available to be presented to the sector at its next meeting for review. Since this draft test procedure has not been finalized and distributed to the members as planned, the Sector will need to consider what additional steps are to be taken to resolve this issue.

Discussion:

The comments heard at the 2015 NTEP BCS meeting regarding this item were similar to those made during the discussion on the previous item during the meeting. The use of a belt profiling feature was supported by some participants and opposed by others within the Sector. Many who expressed opposition for the use of this feature on commercial devices cited the same concerns that were mentioned in regard to linearity correction. Those members stated their belief that the use of belt profiling to establish a zero reference condition could mask inconsistencies in the composition and condition of the conveyor belt.

The Sector members generally acknowledged that those who support the use of this feature also support the testing of BCS using a minimum test load of less than the amount of material totalized in a full belt revolution. The use of belt profiling would facilitate this practice in that a zero reference value could be established with less than a full revolution of belt travel. The participants of the 2015 meeting also acknowledged that some Sector members that are ardent supporters of the use of belt profiling were not present at the 2015 meeting and therefore their input would not be heard during this discussion. This was a concern to the participants who were reluctant to develop any conclusions without the input of those that were not present at the meeting and in the absence of those members that are considered to be experts on the operation of this type of feature.

Conclusion:

The Sector members present at the 2015 meeting agreed that this issue should be tabled until a future meeting when additional members are present who are considered experts in this area. This item will be considered during a future meeting of the Sector.

II. New Items

A. Proposed changes to *NCWM Publication 14 - Belt-Conveyor Scales*

The following amendments are being proposed for the 2015 edition of *NCWM Publication 14 Belt-Conveyor Scales* to reflect changes adopted in 2014 to the *NIST Handbook 44 Section 2.21. Belt-Conveyor Scale Systems Code*.

1). NCWM Publication 14 Section 9.7.9.

Source:

USNWG on Belt-Conveyor Scales

Proposal:

This proposed change would eliminate altogether this item currently included on the checklist and would align *NCWM Publication 14* with the most current edition of *NIST Handbook 44*.

Background:

A change to *NIST Handbook 44, Belt-Conveyor Scale Systems Code*, paragraph was adopted in 2014 as follows:

UR.1.2. Conveyor Installation. – The design and installation of the conveyor leading to and from the belt-conveyor scale is critical with respect to scale performance. The conveyor can be horizontal or inclined, but if inclined, the angle shall be such that slippage of material along the belt does not occur. Installation shall be in accordance with the scale manufacturer's instructions and the following:
…

~~***(h) Conveyor Length. The conveyor shall be no longer than 300 m (1000 ft) nor shorter than 12 m (40 ft) from head to tail pulley.***~~

~~***[Nonretroactive as of January 1, 1986]***~~

This adopted change eliminated prescribed limits on the minimum and maximum lengths for conveyors used in belt-conveyor scale systems.

To align the content of *NCWM Publication 14 Belt-Conveyor Scales* with the current *NIST Handbook 44* the following change is recommended.

9.7.8. There shall be no tripper or movable head pulleys in the conveyor.

~~**9.7.9. 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]**~~

9.7.~~**10**~~**9**. Conveyor stringers at the scale and for not less than 20 ft (6 m) before and beyond the scale shall be continuous or securely joined and of sufficient size and so supported to eliminate relative deflection between the scale and adjacent idlers when under load.

… Subsequent paragraphs to be renumbered as needed.

Discussion/Conclusion:

During the 2015 NTEP BCS Sector meeting, there was a limited discussion regarding the implied result expected from the elimination of this item from the *NTEP Publication 14* checklist. Several Sector members asked for confirmation whether this action would affect a NTEP evaluation on weigh-belt type weighing systems. The Sector agreed that this change would have a significant impact on this type of device.

The Sector agreed with this suggested change, and that no further actions are necessary.

2). NCWM Publication 14 Section 9.7.1.

Source:

USNWG on Belt-Conveyor Scales

Proposal:

It is recommended that Section 9.7.1. of NCWM Publication 14 Belt-Conveyor Scales be amended as shown below.

9.7.1. ~~**If the belt length is such that a take-up device is required, this device shall be of the counter-weighted type for either vertical or horizontal travel.**~~ **Any take-up device shall provide constant and consistent tension for the belt under all operating conditions.**

9.7.1.1. Indicate the Type: **Counterweighted:** ☐ Vertical ☐ Horizontal

Other: ☐

Background:

This proposed change would align *NCWM Publication 14* with a change adopted in *NIST Handbook 44* in 2014 by removing prescriptive language from a requirement (UR.1.2.d) pertaining to the means by which a conveyor system uses to maintain tension on the conveyor belt. The change appearing in the 2015 edition of *NIST Handbook 44 BCS Systems Code is* shown below.

UR.1.2. Conveyor Installation. – …

…

(d) Take-up Device. – ~~**If the belt length is such that a take-up device is required, this device shall be of the counter-weighted type for either vertical or horizontal travel.**~~ **Any take-up device shall provide constant and consistent tension for the belt under all operating conditions.**
(Amended 2014)

Discussion/Conclusion:

The Sector was in agreement that the change proposed to NCWM Publication 14 under 9.7.1. is justified although some in the group questioned whether the changes being recommended for the sub-paragraph 9.7.1.1. is necessary. The NIST Technical Advisor to the Sector explained that NCWM Publication 14 already contains subparagraph 9.7.1.1. with check boxes included for a selection of "vertical" or "horizontal" and that this change would make these optional. Also optional with this proposal would be the use of neither vertical or horizontal "counterweighted" type of take-up, therefore a checkbox for "other" is being proposed. The Sector agreed with these recommendations and no further changes were proposed.

B. NTEP Belt-Conveyor Scale Sector Chair Position

Proposal/Background:

The current Chair of the NTEP Belt-Conveyor Scale Sector, Mr. Bill Ripka has indicated that he will no longer be able to serve in this capacity. Mr. Ripka's resignation creates a vacancy that Sector members will need to address by nominating a replacement.

Source:

NTEP Belt-Conveyor Scale Sector

Discussion/Conclusion:

Mr. Darrell Flocken (NTEP Specialist) provided the Sector members with details regarding the procedure involved in filling a vacant Sector Chair position. The Sector was informed that this procedure should include a nomination of candidates for that position by the Sector members and that this process could be done via email ballot. The NIST Technical Advisor informed the Sector members that he would initiate the balloting following the 2015 meeting. Once the balloting was completed, the results would be forwarded to the NTEP administrator for further action.

NIST Technical Advisor's note:

Following the Sector's 2015 meeting, the Sector members were asked to participate in a nomination of candidates for the position of NTEP BCS Sector Chairperson through an exchange of emails. Following the nomination process, Sector members were then asked to respond to a ballot that would identify their choice as Chair. The results of that ballot were that Mr. Peter Sirrico was identified as the Sector member's selection to fill the vacant Sector Chair position. Results were then forwarded to the NTEP Administrator.

III. Attendance:

Name	Organization	Telephone	Email
Art Amsler	Arcadia Controls	412 841-2708	artarcadia.@aol.com
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