

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

February 22, 2016 / 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 **underlining** information to be added. Requirements that are proposed to be nonretroactive are printed in ***bold faced italics***.

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## Glossary of Acronyms and Terms

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| <u>Acronym</u> | <u>Term</u>                                    | <u>Acronym</u> | <u>Term</u>                                  |
|----------------|--|----------------|--|
| 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 |                |  |

## I. Carry-over Items

### A. 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 (Office of Weights and Measures) 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 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 2014 meeting, the BCS Sector was informed that a sub-group from within the Sector membership 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. 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 however, no draft procedures had been developed at the time of the 2014 BCS Sector meeting. The sub-group assigned to develop test procedures for the evaluation of this type of feature was asked to continue work on this issue and to have a draft available to be presented to the sector at its next meeting for review.

Those in attendance at the February 2015 meeting, 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 use of a belt profiling feature has been supported by some Sector members and opposed by others. Many who expressed opposition for the use of this feature on commercial devices 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 participants of the 2015 meeting recognized that some Sector members that are supporters of the use of belt profiling were not present at the 2015 meeting and therefore their input was not part of 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 who are considered to be experts on the operation of this particular feature. It was agreed that this issue should be tabled until a future meeting when additional members are present who are considered experts in this area.

Provided that there is sufficient representation of all perspectives, the Sector will be asked to conclude discussions on this issue.

## II. New Items

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

#### 1). **NCWM Publication Section: General (Multiple locations)**

**Ref: NIST Handbook 44 (HB44) BCS Code Paragraph: A.1. General.**

This adopted change to the HB44 BCS Code simply adds wording in paragraph A.1. to indicate that weigh-belt systems will also be included under the existing code as shown below.

**A.1. General.** – This code applies to belt conveyor scale systems **and weigh-belt systems** used for the weighing of bulk materials.

The primary change that occurred to the HB44 Belt-Conveyor Scale Systems Code in 2015 was the amendments made to a number of sections that allowed weigh-belt systems to be included under this code. There are numerous locations in *NCWM Publication 14* where the terminology “belt-conveyor scale(s)” is used but the terminology “weigh-belt systems” is not included.

It is recommended that since amendments to HB44 have been adopted to include weigh-belt systems within the Belt-Conveyor Scale Systems Code, that the BCS Code would now be applied to weigh-belt systems submitted for type evaluation. To ensure that weigh-belt systems may also be evaluated under this *Publication 14*, the Sector is asked to determine whether or not the phrase “weigh-belt systems” must also be included wherever the term “belt-conveyor scales” is used in *NCWM Publication 14*.

One alternative to making this type of change in numerous locations in the *Publication 14* could be to add an informational statement in the “Technical Policy” section of *Publication 14* that would inform the reader that, while not always specifically stated, weigh-belt systems shall also be evaluated using this same *Publication 14*. If this approach is favored, it must also be recognized that there will be specific amendments needed to indicate where requirements or procedures will differ in the evaluation of these two types of conveyor weighing systems.

If the Sector concludes that individual references to “belt-conveyor scales” in *NCWM Publication 14* should be amended to also refer specifically to “weigh-belt systems”, the following listing of text locations in the current *NCWM Publication 14* have been identified that are not explicitly inclusive of “weigh-belt systems.”

- Publication 14 Title “Belt-Conveyor Scales”
- Page header “Belt-Conveyor 201X” – throughout document
- Amendments Table title: “Belt-Conveyor Scales”
- Title of technical policy section, page BCS-1: “National Type Evaluation Program Belt-Conveyor Scales – Technical Policy”
- Technical Policy, page BCS-1, Section A.(b). second paragraph: “If the range of values for a particular family of belt-conveyor scales is less...”
- Title: “National Type Evaluation Program Belt-Conveyor Scales – Checklists and Test Procedures” page BCS-3
- Section 1, Indicating and Recording Elements, page BCS 3, first paragraph. “A belt-conveyor scale is required to have a MWT...”
- Section 1.1. page BCS-3: “Any component in the belt-conveyor scale system with adjustments...”
- Section 2.3 page BCS-5: ...“The belt-conveyor scale system shall record the initial indication...”
- Section 5. Design of Weighing Elements, page BCS-7: “The belt-conveyor scale system shall be designed...”
- Section 8.8., page BCS-10: “A belt-conveyor scale shall be marked with the following...”
- Section 9. Installation Requirements, page BCS-11: “...conveyor leading to and from the belt-conveyor scale is critical...”, and “...understanding of good scale design for belt-conveyor scales.”
- Section 9.1., page BCS-11: “The following parts of a belt-conveyor scale must be...”
- Section 9.7., page BCS-11: “...leading to and from the belt-conveyor scale...”
- Section 10. Material Test, paragraph 10.1., page BCS-12: “A belt-conveyor scale shall be installed...”
- Section 13.5.1. Indicating and Recording Elements, page BCS-17: “The integrator of a belt conveyor scale normally...”
- Section 13.5.5.7. page BCS-22: “The integrator of a belt conveyor scale normally...”
- Section 13.5.11. Field Test, page BCS-26: ...“for commercial use belt-conveyor scale system or in a new application.”
- Section 13.5.13. Data Sheet and Lab Test Procedure, page BCS-16: “Temperature Testing: Belt-Conveyor Scale Code paragraphs...”
- Title: “National Type Evaluation Program Belt-Conveyor Scales – Field Test Procedures”
- Section 14, N.2.1. Initial Verification, page BCS-33: “A belt-conveyor scale system shall be verified with...”
- Section 14, N.2.2., “Example”, page BCS-33: “If a belt-conveyor scale system has a maximum...”
- Section 14, N.3.1.1., second and third sentences: “For belt-conveyor scales with electronic integrators, the test must be performed over a period of at least 3 minutes and with a whole number of complete belt revolutions. For belt-conveyor scales with mechanical integrators,...”
- Section 14, Material Tests, N.3.2. Material Tests, page BCS-35 (3 locations): “...on a certified reference scale over the belt-conveyor scale in a manner...” and “...that has passed over the belt-conveyor scale.” and “...the capacity of the belt-conveyor scale and...”
- Page BCS-35, footnote 3, first sentence: “The variables and uncertainties included in the relative tolerance represent only part of the variables that affect the accuracy of the material weighed on belt-conveyor scales.”
- Section 16 Data Sheet and Laboratory Test Procedure, Temperature Testing, page BCS-36: “Belt-Conveyor Scale System Code paragraphs...”
- Section 17 Dynamic Scale Test Work Sheet and Laboratory Test Procedure No. 1, last sentence, page BCS-38: “Tolerance is from the Belt-Conveyor Scale Data Sheet and...”
- Appendix A, Table (title heading): “Belt-Conveyor Scale Features and Parameters”

The Sector will be asked to determine whether the citations noted should be changed to reflect that the HB44 Belt-Conveyor Scale Systems Code now covers weigh-belt systems as well.

## 2). NCWM Publication 14 – Section 8.8.3.

This change in the Handbook 44 Belt-Conveyor Scale Systems Code was adopted and provides latitude for marking requirements for those systems having adjustable belt speeds.

**Ref: HB44 BCS Code Paragraph S.4. Marking Requirements.**

**S.4. Marking Requirements.** – A belt-conveyor scale shall be marked with the following: (See also G-S.1. Identification)

(a)...

(b)...

(c) the belt speed in terms of feet (or meters) per minute at which the belt will deliver the rated capacity, or the maximum and minimum belt speeds for variable speed weigh-belts;

It is recommended that the *NCWM Publication 14*, Checklist, Section 8.8.3. be amended to reflect this change. The following change is suggested:

8.8.3. The belt speed in terms of feet (or meters) per minute at which the belt will deliver the rated capacity, or the maximum and minimum belt speeds for variable speed belts;

## 3). NCWM Publication 14, Section 14 - Field Test Procedure, N.2.1. Initial Verification

**Ref: HB44 BCS Code N.2.1. Initial Verification**

This change to Handbook 44 Belt-Conveyor Scale Systems Code, paragraph N.2.1. is intended to clarify the type and number of test runs needed for an official test performed during the initial verification.

It is recommended that *NCWM Publication 14*, Section 14 (Field Test Procedures) be amended to reflect these changes in HB44. Under Section 14, Field Performance Field Performance Test of the Belt-Conveyor Scale, page BCS-33 the following amendments are recommended.

**N.2.1. Initial Verification.** – A belt-conveyor scale system or a weigh-belt system shall be ~~verified with tested using of~~ a minimum of two test runs performed at each ~~of the following flow rates: setting for belt speed/belt loading as indicated in Table N.2.1.~~

- ~~(a) normal use flow rate;~~
- ~~(b) 35 % of the maximum rated capacity; and~~
- ~~(c) an intermediate flow rate between these two points.~~

| <u>Table N.2.1.</u>  |   |                              |
|--|---|------------------------------|
| <u>Device Configuration</u>  | <u>Minimum of 2 test runs at each of the following settings</u>   | <u>Total Tests (minimum)</u> |
| <u>Constant belt speed/<br/>Variable loading</u>   | <ul style="list-style-type: none"> <li>– <u>belt loading: high (normal)</u></li> <li>– <u>belt loading: medium (intermediate)</u></li> <li>– <u>belt loading: low (35%)</u></li> </ul>  | <u>6</u>                     |
| <u>Variable belt speed/<br/>Constant loading</u>   | <ul style="list-style-type: none"> <li>– <u>belt speed: maximum</u></li> <li>– <u>belt speed: medium</u></li> <li>– <u>belt speed: minimum</u></li> </ul>   | <u>6</u>                     |
| <u>Variable belt speed/<br/>Variable loading</u>   | <ul style="list-style-type: none"> <li>– <u>speed: maximum / belt loading: high (normal)</u></li> <li>– <u>speed: maximum / belt loading: medium (intermediate)</u></li> <li>– <u>speed: maximum / belt loading: low (35%)</u></li> <li>– <u>speed: minimum/ belt loading: high (normal)</u></li> <li>– <u>speed: minimum/ belt loading: medium (intermediate)</u></li> <li>– <u>speed: minimum/ belt loading: low (35%)</u></li> </ul> | <u>12</u>                    |
| <p><u>Use the device configurations in the left-hand column to identify the scale being tested.</u><br/> <u>Perform 2 test runs (minimum) at each of the settings shown in the center column.</u><br/> <u>The following terminology applies:</u></p> <ul style="list-style-type: none"> <li>• <u>High: maximum (normal use) operational rate.</u></li> <li>• <u>Low: 35% of the maximum rated capacity of the system.</u></li> <li>• <u>Medium: an intermediate rate between the high and low settings.</u></li> </ul> |   |                              |

Results of the individual test runs in each pair of tests shall not differ by more than the absolute value of the tolerance as specified in T.2. Tolerance Values, Repeatability Tests. All tests shall be within the tolerance as specified in T.1. Tolerance Values.

Test runs may also be conducted at any other rate of flow that may be used at the installation. A minimum of four test runs may be conducted at only one flow rate if evidence is provided that the system is used at a ~~single flow rate constant speed/constant loading setting~~ and that rate does not vary in either direction by an amount more than 10 % of the normal flow rate that can be developed at the installation for at least 80 % of the time.

The Sector will be asked if these changes are supported and if NCWM Publication 14 should be amended to reflect those changes.

#### 4). NCWM Publication 14, Section 14 - Field Test Procedure, N.2.3. Minimum Test Load

Ref: HB44 BCS Code N.2.3.

The following changes to HB44 BCS Code paragraph N.2.3. will appear in the 2016 edition and corresponding changes are recommended to the "Field Test Procedures" Section of *NCWM Publication 14*, page BCS-34, under N.2.3. Minimum Test Load.

##### **N.2.3. Minimum Test Load.**

**N.2.3.1 Weigh-Belt Systems.** - The minimum test load shall not be less than the largest of the following values.

- a. 800 scale divisions;
- b. the load obtained at maximum flow rate in one revolution of the belt; or
- c. at least ~~101~~ minute of operation.

**N.2.3.2. All Other Belt-Conveyor Scale Systems.** - **Except for applications where a normal weighment is less than 10 minutes, the minimum test load shall not be less than the largest of the following values.**

- a. **800 scale divisions;**
- b. **the load obtained at maximum flow rate in one revolution of the belt; or**
- c. **at least 10 minutes of operation.**

**For applications where a normal weighment is less than 10 minutes (e.g., belt-conveyor scale systems used exclusively to issue net weights for material conveyed by individual vehicles and railway track cars) the minimum test load shall be the normal weighment that also complies with N.2.3.2. (a) and (b).**

The official with statutory authority may determine that a smaller minimum totalized load down to 2 % of the load totalized in 1 hour at the maximum flow rate may be used for subsequent tests, provided that:

1. the smaller minimum totalized load is greater than the quantities specified in **N.2.3.2.** (a) and (b); and
2. consecutive official testing with the minimum totalized loads described in **N.2.3.2.** (a), (b), or (c) and the smaller minimum test load has been conducted that demonstrates the system complies with applicable tolerances for repeatability, acceptance, and maintenance.  
(Added 2004) (Amended 2008 **and 201X**)

In addition to recommending these changes to Section 14, Field Test Procedures on page BCS-34, an additional change is recommended to the Table T.4 on page BCS-27. The second half of Table T.4 contains the headings "Test Conditions" and "Abbrev." and rows numbered 1-3. Row 1 is subdivided into 3 rows, the last row contains the wording "Time (minutes) to deliver MTL (at least 10 minutes). It is recommended that this wording be changed to reflect the minimum operational time required for weigh-belt systems also as follows:

"Time (minutes) to deliver MTL (at least 10 minutes for belt-conveyor scales **or 1 minute for weigh-belt systems**)"

The Sector will be asked if these changes are supported and if *NCWM Publication 14* should be amended to reflect those changes.

**5). *NCWM Publication 14*, Section 14, Field Test Procedures, N.3.1.1. Determination of Zero**

**Ref: HB44 BCS Code N.3.1.1.**

Changes to HB BCS Code paragraph N.3.1.1. Determination of Zero were adopted and will appear in the 2016 edition. Corresponding changes are recommended to be used in the revision of *NCWM Publication 14*, Section 14, Field Test Procedures, page BCS-34 as shown below.

**N.3.1.1. Determination of Zero.** – A zero-load test is a determination of the error in zero, expressed as an internal reference, a percentage of the full-scale capacity, or a change in a totalized load over a whole number of complete belt revolutions. ~~For belt-conveyor scales with electronic integrators, the test must be performed over a period of at least three minutes and with a whole number of complete belt revolutions. For belt-conveyor scales with mechanical integrators, the test shall be performed with no less than three complete revolutions or 10 minutes of operation, whichever is greater.~~ A zero-load test shall be performed as follows:

- (a) For belt-conveyor scales with electronic integrators, the test must be performed over a period of at least 3 minutes and with a whole number of complete belt revolutions;
- (b) For belt-conveyor scales with mechanical integrators, the test shall be performed with no less than three complete revolutions or 10 minutes of operation, whichever is greater;
- (c) For weigh belt systems the test must be performed over a period of at least one minute and at least one complete revolution of the belt.

(Added 2002) (Amended 20XX)

The Sector will be asked if these changes are supported and if *NCWM Publication 14* should be amended to reflect those changes.