Combined Agenda
USNWG Belt Conveyor Scales
NTETC Belt Sector
February 24-25, 2010

I. USNWG on Belt-Conveyor Scales Meeting

A. Review of S&T Items adopted into 2010 HB44

1. **HB-44, UR.3.2 (321-1)**

Zero-Load and Materials or Simulated-Load testing is required to be performed between official testing now at intervals determined by the statutory authority or by the manufacturer. These tests are also required after maintenance to the conveyor system is performed. The actions to be taken based on the results of these tests are now provided in a tabular form for both Zero-Load and Materials/Simulated-Load tests.

2. **HB-44, S.1.3.1 (321-3)**

S.1.3.1. For Scales Installed After January 1, 1986. *– The value of the scale division shall not be greater than 0.125 % (1/800) of the minimum totalized load. [Nonretroactive as of January 1, 1986]*

*(*Added 1985) (Amended 2009)

Value was changed to coincide with the value provided for the minimum test load in paragraph N.2.3.

3. **HB-44 N.2., N.2.1. (321-5)**

Changes reflected the need to clarify the specific number of test runs required for an official test. These changes also reflect the notion that it is considered by many experts that it is an unfair performance standard that a BCS will maintain a stable zero reference under changing temperature conditions. N.2. was to require checking zero and, if necessary, make adjustments.

Paragraph N.2.1. was amended to clarify that a minimum of two test runs at the different flow rates are required and to allow testing at initial installation to a single flow rate if it can be verified that the flow rate is within a +/- 10% band during 80% of its operational time. This is intended to expedite the testing of systems that do not have variable flow rates in that they may now be tested with a minimum of four test runs at a single rate.

4. **HB-44, T.1.1 (321-6)**

In light of the changes above to N.2. it was determined that officials performing tests needed guidance for establishing limits on allowable changes in zero reference and the ability for those officials to establish the interval between zero-load testing. Previous versions of HB-44 simply indicated that zero must return to within +/- 0.12% after material has been run. The revision defines the need to check and adjust zero between test loads and that after each test load it should return to within 0.12%, but now allows a total zero change over the course of the testing to be +/- 0.18% based on any changes that may have been made during the full range of testing. Where zero stability may be a concern, the statutory can require maximum times between zero testing.

5. **HB-44, Sections N.3.1.2., N.3.1.3., and S.3.3.1**

Paragraphs N.3.1.2. and N.3.1.3. were combined to eliminate redundancy and renumbered as N.3.1.2. Section S.3.3.1. was revised due to the recognition that any action by an automatic zero setting mechanism that is present will shield or "mask" slight changes in the beginning zero reference setting. It now requires that changes in zero reference by AZT must be displayed or recorded.

B. Two carry-over items from 2009 USNWG Meeting

1. Item 321-1 N.3.1.4. Check for Consistency of the Conveyor Belt Along Its Entire Length:

It is recognized that the use of + or – 3 divisions as a limitation on change to the totalizer indication during a zero-load test may result in excessive allowances for devices using larger division sizes and, conversely excessively restrictive allowances for devices with smaller division sizes. It was recommended that +/- 3 divisions be replaced with 0.18% of the minimum test load. Paul Chase suggests that the value should be a percent of the Minimum Totalized Load because that is the only situation in which a non-uniformity would be significant. Yet to be determined are these points:

- 0.18% the correct value to use or is it too generous?
- Should the final determined percentage value from the previous question be the percentage of minimum totalized load or the percentage of load totalized at maximum flowrate for duration of test?

In addition it is recognized inconsistency and non-uniformity of the belt may result in significant error in testing using smaller totalized loads that are the result from other than complete revolutions of the belt. The variation during a revolution of the belt is most important and will exhibit the most impact for BCS applications that may use a portion of a belt revolution to deliver a weighment (e.g., 2.5 belt revolutions). This

could occur when loading individual trucks or railcars or in some cases could occur with the quantity for verification testing. For large quantities such as loading a unit train the error becomes insignificant.

Another concern was identified regarding the correctness of using the term "totalizer" in the first sentence of the requirement. It was recognized that when conducting a zero-test; the indication that is of concern may be displayed not by the MWT but by other instrumentation.

At the conclusion of the February '09 meeting the group agreed that the 0.18% applied to total scale capacity, should instead be applied to the Minimum Test Load. The work group recommended that the amendment in its current form not go forward as a Voting item

After the meeting adjourned an extended session of the meeting took place with a smaller group. Paul Chase presented calculations which demonstrated that 0.18% of the MTL would be more appropriate than the same percentage of the capacity at maximum flow rate, and that 0.18% of the capacity at maximum flow rate should not be applied as a tolerance for a change in zero reference. This smaller group also concluded that the variability of the belt may not always be able to be checked during a zero-load test unless there are large portions of the belt that are heavier than the rest.

The smaller group amended the proposal as shown below:

N.3.1.4. Check for Consistency of the Conveyor Belt Along Its Entire Length. – During **one revolution of an unloaded belt,** ~~a zero-load test, the total change indicated~~ **the observed change** in the totalizer ~~during one revolution of the belt~~ shall not exceed 0.18 % of the **Minimum Test Load**. ~~load that would be totalized at scale capacity for the duration of the test. The end value of the zero-load test must meet the ± 0.06 % requirement of paragraphs N.3.1.2. Initial Stable Zero and N.3.1.3. Test for Zero Stability. After a zero-load test with flow rate filtering disabled, the totalizer shall not change more than plus or minus (± 3 d) 3.0 scale divisions from its initial indication during one complete belt revolution.~~

(Added 2002) (Amended 2004 **and 2009**)

At the conclusion of the February '09 meeting, it was to recommend that this item not go forward as a Voting item, but instead be given Information status to allow more time to research the appropriate tolerance and language. When this research is completed and the full membership of the USNWG has reached consensus, the item will be presented with examples provided by Paul Chase that more clearly illustrate the effect of belt uniformity on totalized weighments.

1. **Item 321-4 *S.1.6.1. Zero-load indicator*:**

   S.1.6.1. Zero-load indicator. – The integrator shall display an indication that defines a zero-balance condition when the unloaded condition of the belt over a unit revolution or revolutions is within ± 0.12 % of the rated scale capacity. (Nonretroactive as of January 1, 2011)

   (Added 201X)

The USNWG on BCS initially supported this new proposal as shown above. The group also discussed the need for an associated user requirement to be developed that would require that the zero-balance condition be maintained during operation. Peter Sirrico, Bill Ripka, and Phil Carpentier volunteered to develop a user requirement are and present their recommendation to the USNWG.

Concerns were expressed during the February '09 meeting that the +/- 0.12% of rated scale capacity specified in the proposal would occupy a large portion of the value of the tolerance applied to the device. Paul Chase pointed out that this value was twice the allowable tolerance applied during a zero test. Alabama Weights and Measures representatives questioned what would be required of the operator when the device indicated an out-of-zero balance condition prior to the weighing process.

Steve Cook suggested that a companion **user requirement** could be developed similar to the operator responsibility in the scales code. Further discussion prompted members of the group to suggest that there could be some sort of interlock to prevent the initiation of a transaction until the scale is ready to deliver and this would then make the development of any user requirement unnecessary. Manufacturers in the group were asked as to whether or not this would present a significant change in design to overcome. The manufacturers present at the meeting felt that this would be a relatively simple change to make in software portion of their devices but could not speak for other manufacturers.

This item was withdrawn and is in need of further development prior to being resubmitted. A subgroup was formed to further develop the proposal and an associated user requirement if necessary. This subgroup includes:

Bill Ripka	Peter Sirrico
Al Page	James Hale
Richard Harshman	Todd Deitrich

C. Reference Car Weights Using CIM RR Scales

The following questions have been asked:

- Is it acceptable to obtain a reference weight for use in materials testing a BCS by using a double-draft CIM rail road scale?
- If so is it acceptable to weigh the cars coupled or should they be uncoupled at both ends?

D. Sweep Samplers

Much concern has been expressed with the application of this type of sampler. Questions that have been raised are:

- Where should these samplers be located in relation to the scale on a belt conveyor system?
- When performing a materials test, are these samplers required to be in operation?

E. BCS Draft EPO

The updated EPO will be reviewed to assess any necessary changes.

F. OIML R50 Revision Update

- Australia's proposed 0.2 accuracy class: are there reference scales available?
- Whole Belt Totalization Device.
- Permanence Testing.

II. NTETC Belt Sector Meeting

A. NCWM Publication 14 Updates

Publication 14 updates necessary to reflect changes in 2010 edition of NIST HB44.

1. HB-44, UR.3.2 (321-1)

Zero-Load and Materials or Simulated-Load testing is required to be performed between official testing now at intervals determined by the statutory authority or by the manufacturer. These tests are also required after maintenance to the conveyor system is performed. The actions to be taken based on the results of these tests are now provided in a tabular form for both Zero-Load and Materials/Simulated-Load tests.

Recommendation: This is a User Requirement and not intended for the type evaluation. No changes are recommended in Publication 14.

2. **HB-44, S.1.3.1 (321-3)**

S.1.3.1. For Scales Installed After January 1, 1986. *– The value of the scale division shall not be greater than 0.125 % (1/800) of the minimum totalized load. [Nonretroactive as of January 1, 1986]* *(*Added 1985)(Amended 2009)

Value was changed to coincide with the value provided for the minimum test load in N.2.3

Recommendation: Design specification S.1.3.1. (value of the scale division) is not currently addressed in Publication 14. The technical advisor recommends that Publication 14 page BCS-4 be amended as follows:

1.8. (S.1.2. and S.1.3.1.) 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) on the minimum totalized load**. Yes ☐ No ☐ N/A ☐

1.8.1. What is the scale division?

Unit	Abbreviation
pounds	lb or LB
U.S. short ton	ton or T
U.S. long ton	LT
Metric ton	t
kilograms	kg

1.8.2. **Attempt to enter a value that is 0.l% (1/1000) of the totalized load.**

3. HB-44 N.2., N.2.1. (321-5) (Number of Tests during Initial Verification)

HB44 paragraph N.2.1. has been amended to provide clarification of how many test runs are required during an official test. Portions of the wording changes in N.2.1. relate to testing a belt-conveyor scale at a single flowrate (using a minimum of four test runs). These changes are applicable to specific installations that operate exclusively (within parameters) at one flowrate and would therefore not impact procedures used during type evaluation testing.

Other changes to N.2.1. will impact testing procedures regardless of the specifics of an installation and should therefore result in changes to Publication 14.

Recommendation: To reflect changes in the 2010 edition of NIST Handbook 44, the technical advisor recommends that Publication 14 page BCS-15 be amended as follows:

13. Field Test Procedure

Field Performance Test of the Belt-Conveyor Scale

N.2.1. Initial Verification. – A belt-conveyor scale system shall be verified with a minimum of two test runs at each of the following flow rates:

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

4. HB-44, T.1.1 (321-6)

During the 2009 USNWG on BCS meeting, the belt-conveyor scale manufacturers commented that the MWT is typically disabled during the zero-load test and recommends that the reference in T.1.1. to MWT be deleted since there are other indicating devices (e.g., before and after zero reference numbers) that will display the change in zero.

Included in the amendments to T.1.1. is the new language that provides recognition that the official with statutory authority is permitted to establish the interval for zero-load testing during normal operation when the range of zero adjustments during an official verification test exceeds 0.18% of the totalized load at full scale capacity for the duration of the zero-load test.

Recommendation: Because these Handbook 44 requirements are not referenced explicitly in Pub 14 and the amendment to T.1.1. does not apply to type approval test procedures, no action is recommended.

5. HB-44, Sections N.3.1.2., N.3.1.3., and S.3.3.1

In 2008 the USNWG on Belt Conveyor Scale Systems recommended that paragraphs N.3.1.2. and N.3.1.3 be combined. This combination would result in one paragraph identified as **N.3.1.2. Test of Zero Stability**. The USNWG also recommended that paragraph S.3.1.1. be added so that specification requirements within the code coincide with the recommended amendments to paragraph N.3.1.2.

During the February 2009 meeting of the Belt-Conveyor Scale Work Group the WG agreed the language regarding "obscuring any change in zero by the automatic zero setting mechanism" in the proposed paragraphs S.3.1.1 and N.3.1.2 is confusing and not necessary.

The S&T Committee agreed with the comments and recommendations from the WG and amended the proposal to read as follows:

~~**N.3.1.2. Initial Stable Zero. – The conveyor system shall be run to warm up the belt and the belt scale shall be zero adjusted as required. A series of zero-load tests shall be carried out until three consecutive zero-load tests each indicate an error which does not exceed ± 0.06 % of the totalized load at full scale capacity for the duration of the test. No adjustments can be made during the three consecutive zero-load test readings.**~~

~~**(Added 2002) (Amended 2004)**~~

N.3.1.2~~3~~. Test of Zero Stability. – The conveyor system shall be run to warm up the belt and the belt scale shall be zero adjusted as required. A series of zero-load tests shall be carried out **immediately before conducting the simulated-load or materials test** until three consecutive zero-load tests each indicate an error which does not exceed ± 0.06 % of the totalized load at full scale capacity for the duration of the test. No adjustments can be made during the three consecutive zero-load test readings.

(Added 2002) (Amended 2004 **and 2009**)

S.3.1.1. Automatic Zero-Setting Mechanism. The automatic zero-setting mechanism shall indicate or record any change in the zero reference.
[Nonretroactive as of January 1, 2010]
(Added 2009)

Recommendation: The NIST technical advisor recommends that references in Publication 14 pages BCS-16 be amended to reflect the merging of these paragraphs as follows:

13 Field Test Procedure

~~**N.3.1.2. Initial Stable Zero.** – The conveyor system shall be run to warm up the belt and the belt scale shall be zero adjusted as required. A series of zero-load tests shall be carried out until three consecutive zero-load tests each indicate an error which does not exceed ± 0.06 % of the totalized load at full scale capacity for the duration of the test. No adjustments can be made during the three consecutive zero-load test readings.~~
~~(Added 2002) (Amended 2004)~~

N.3.1.32. Test of Zero Stability. - The conveyor system shall be operated to warm up the belt and the belt scale shall be zero adjusted as required. A series of zero-load tests shall be carried out immediately before **conducting** the simulated **load** or materials test until the three consecutive zero-load tests each indicate an error which does not exceed ± 0.06 % of the totalized load at full scale capacity for the duration of test. No adjustments can be made during the three consecutive zero-load test readings.
(Added 2002) (Amended 2004 **and 2009**)

N.3.1.43. Check For Consistency of the Conveyor Belt Along Its Entire Length. - After a zero-load test with flow rate filtering disabled, the totalizer shall not change ~~**more**~~ **by an amount greater** than plus or minus (± 3 d) 3.0 scale divisions from its initial indication during one complete belt revolution.
(Added 2002) (Amended 2004)

The technical advisor also recommends adding the following language to Publication 14 page BCS-7:

6. Zero-Setting Mechanism

Code Reference: S.3.1. and S.3.1.1.

6.3.1 Verify that any changes in the zero reference are indicated and/or recorded Yes ☐ No ☐ N/A ☐

B. Proposed Update to NCWM Publication 14 Belt-Scale Checklist

This checklist was offered for use on a trial basis by NTEP labs that would be evaluating manufacturer's replacement instruments that are scheduled to undergo NTEP evaluation. During the February 2009 meeting the manufacturer, Thermo-Ramsey stated that they would possibly have an instrument that could be submitted in the near future to undergo the NTEP process where this checklist could be used on a trial basis. The results/comments would be returned to NTEP Administrator and Sector WG for review and further development.

C. Develop a List of Sealable Parameters for BCS Systems

This list was to be forwarded to NTEP laboratories for use on a trial basis after which comments and suggested amendments would be forwarded to NTETC Belt Sector WG for further development.