National Type Evaluation Technical Committee (NTETC)
Belt-Conveyor Scale (BCS) Sector Meeting Agenda

February 23, 2012 / St. Louis, Missouri

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 A
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Table B
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

Details of All Items
(In order by Title of Content)

CARRY-OVER ITEMS

1. Belt-Conveyor Scale NTEP Checklist

Prior to the 2009 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 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 suggested changes that were included in this draft were proposed changes involving procedures used when evaluating semi-automatic and automatic zero-setting mechanisms.

This proposed draft has not been sufficiently vetted yet. That draft was offered for use on a trial basis by NTEP labs when evaluating manufacturer's replacement instruments 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.

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. Any input and additional comments that are available will be discussed.

2. Sealable Parameters List for NTEP Evaluation

A list of BCS features and parameters which were identified by the sector as those that should be protected by a form of security seal had been developed during the 2009 NTETC BCS Sector Meeting. The list has been forwarded to NTEP laboratories who have agreed to use this list during NTEP evaluation of BCS to determine if the list is sufficiently comprehensive. Feedback from NTEP evaluators using this amended checklist is requested so that sector members are able to determine if the list is sufficient. Any additional input and comments available from manufacturers and NTEP evaluators on the proposed changes will be discussed.

3. Linearization Feature for BCS

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 in conflict with the prohibition of this type of feature by certain weights and measures regulatory authorities. 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 whether it is (or should be) permitted in 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 requirements within *NIST Handbook 44* to address its use. Test procedures (including those used for type evaluation) are to be analyzed and further developed or amended as needed in order to verify that this feature will comply with the current *NIST Handbook 44*Manufacturers at the 2011 BCS Sector Meeting agreed to participate in a sub-group formed to develop a draft of test procedures that could be submitted to the NTEP Committee as proposed changes within *NCWM Publication 14*. This work group will 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). The work group includes the following members:

- Mr. Bill Ripka, Thermo Fisher Scientific
- Mr. Peter Sirrico, Thayer Scale / Hyer Industries
- Mr. Lars Marmsater, Merrick Industries, Inc.
- Mr. Ian Burrell, Control Systems Technology Pty Ltd.

The work group agreed to continue work on developing test procedures through correspondence and offer a draft for review by the entire sector. An update on any progress that has been made in this effort will be provided to the sector.

4. Conveyor Belt Profiling

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.

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.

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. The work group is comprised of the same members as the work group formed under the previous item and include:

- Mr. Bill Ripka, Thermo Fisher Scientific
- Mr. Peter Sirrico, Thayer Scale / Hyer Industries
- Mr. Lars Marmsater, Merrick Industries, Inc.
- Mr. Ian Burrell, Control Systems Technology Pty Ltd.

A draft of test procedures developed by the work group is expected to be made available for review by the entire membership of the sector. An update on any progress made by the sub-group will be provided to the sector.

NEW ITEMS

5. 2011 NIST Handbook 44 Changes

The 2011 edition of *NIST Handbook 44* BCS code contains an amended paragraph N.3.1.3. It is recommended that *NCWM Publication 14* be changed to reflect this amendment as shown below:

13. Field Test Procedure (page BCS-18)

Field Performance Test of the Belt-Conveyor Scale

N.3.1.3. Check for Consistency of the Conveyor Belt Along Its Entire Length
During a zero-load test with all operational low-flow lockout disabled, the total change indicated in the totalizer during any complete revolution of the belt shall not exceed the absolute value of 0.12 % of the minimum totalized load. 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.

Note: The end value of the zero-load test must meet the ± 0.06 % requirement referenced in the "Test for Zero Stability."
(Added 2002) (Amended 2004 and 2011)

6. Recommended Changes to Existing Language in NCWM Publication 14

1.a. 9. Installation Requirements - Paragraph numbering (page BCS-11)

Recommendation that the paragraph numbers within *NCWM Publication 14* text be changed to correspond with previous renumbering of paragraphs. Suggested amendments as shown below:

Code Reference: UR.2.2.1.

9.7.3.	Pulleys, if used, must be properly protected from material build-up.	☐ Yes ☐ No ☐ N/A
9.7.4.	If the tail pulley rides on a carriage, the guides must be protected against material build-up.	☐ Yes ☐ No ☐ N/A
9.7.5.	If the arrangements in ~~**(3)**~~**(9.7.3.)** and ~~**(4)**~~**(9.7.4.)** are used, then the bridle attaching the cable to the carriage must be designed such that the carriage will not become cocked in its guides or tracks.	☐ Yes ☐ No ☐ N/A

1.b. Minimum Test Load (MTL) References

When the value for MTL in *NIST Handbook 44* [2.21], paragraph N.2.3. (a) was changed from 1000 scale divisions to 800 scale divisions in the 2005 edition of *NIST Handbook 44*, not all corresponding values in *NCWM Publication 14* were changed.

To reconcile these *NCWM Publication 14* references with current *NIST Handbook 44* requirements, it is recommended that MTL references in *NCWM Publication 14* Belt-Conveyor Scales Checklist be changed as shown, from 1000 d to 800 d in the following locations:

a. 6. Zero-Setting Mechanism (page BCS-7)

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

The zero-setting mechanism may be either a manual or automatic mechanism. In either case, the range of the zero-setting mechanism is limited to ± 2% of the rated capacity of the scale. If a greater adjustment is needed, the access to the adjustment must be through some security means. An audio or visual signal shall be given when the automatic and semi-automatic zero-setting mechanisms reach the limit of adjustment of the zero-setting mechanism. The zero-setting mechanism must be constructed such that the zero-setting operation is done only after a whole number of belt revolutions (a minimum of 3 revolutions or a time period equivalent to the time required to deliver ~~**1000**~~**800** d of load.) The completion of the zero-setting operation must be indicated. The low-flow lockout must be deactivated for this test.

b. 6. Zero-Setting Mechanism (page BCS-8)

6.3.	The zero-setting operation shall be performed only after at least 3 belt revolutions or a time period equivalent to the time required to deliver ~~**1000**~~**800** d of load.	☐ Yes ☐ No ☐ N/A

c. 7. Sensitivity at Zero Load (page BCS-8)

Test Procedure
Apply a load equal to the weight required to determine compliance with the Belt-Conveyor Scale Code paragraph S.3.2. based upon the equation:

$$\frac{2 * W_c}{C_m}$$

For Example: 2 * 500 lb = 1 lb
~~**1000**~~ **800** d

d. 12. Laboratory Test Procedures (page BCS-14)

Voltage Tests

5. Run an accuracy test at 98% of scale capacity for the time to deliver ~~**1000**~~ **800** d.
6. Change the voltage of the power supply to 100 V.
7. Run a zero test.
8. Run an accuracy test at 98% of scale capacity for the time to deliver ~~**1000**~~ **800** d.
9. Change the voltage of the power supply to 130 V.
10. Run a zero test.
11. Run an accuracy test at 98% of scale capacity for the time to deliver ~~**1000**~~ **800** d.
12. Return the voltage of the power supply to a nominal value.

Percent of Static Scale Capacity	**Nominal Time (minutes)**	**Equivalent Belt Travel[1]**
0	20 minutes, or $MTL_{min}/[(0.35)(BL_{min})$ (belt speed for test)][1] whichever is greater	
35% of SSC_{min}	20 minutes, or $MTL_{min}/[(0.35)(BL_{min})$ (belt speed for test)], whichever is greater	
35% of SSC_{max}	Time to deliver ~~**1000**~~**800** d	
70% of SSC_{max}	Time to deliver ~~**1000**~~**800** d	
98% of SSC_{max}	Time to deliver ~~**1000**~~**800** d	
Leave the scale under load for 1 hour.		
98% of SSC_{max}	Time to deliver ~~**1000**~~**800** d	
70% of SSC_{max}	Time to deliver ~~**1000**~~**800** d	
35% of SSC_{max}	Time to deliver ~~**1000**~~**800** d	
35% of SSC_{min}	20 minutes, or $MTL_{min}/[(0.35)(BL_{min})$ (belt speed for test)], whichever is greater	
0	20 minutes, or $MTL_{min}/([0.35)(BL_{min})$ (belt speed for test)][2] whichever is greater	

e. 15. Data Sheet and Laboratory Test Procedure (page BCS-20)

Device Parameters		Abbreviations	Maximum	Minimum	Dim.
Load per unit length (from manufacturer) corresponds to the largest capacity and the lowest capacity rating.		BL			lb/ft
Length of the weighbridge (inches.)					in
Belt speed (from manufacturer.)		SP			ft/min
Determine scale capacity in units per hour SC=SPxBLx60/2000		SC			ton/hr
Record the static scale capacity in units of weight. SSC = (maximum weight per foot) (length of weighbridge)		SSC			lb
Allowable zero error for temperature change of 10 °C (18 °F) AZE = (0.0007) (SC_{min}) (time)/60 where "time" is the time of the zero test in minutes.		AZE			ton
Size of scale division required for zero.		SD			ton
Determine the minimum and maximum totalized loads.		MTL			ton
Test Conditions		**Abbreviations**	**Maximum**	**Minimum**	**Dim.**
Determine the time in minutes to acquire MTL with the test load to be applied in laboratory testing.	Test load, pound/foot.				lb/ft
	Test load, total.				lb
	Time (minutes) to deliver MTL (at least 10 minutes.)	time			min
Determine number of belt travel sensor revolutions required for the above time. Manufacturer to provide revolutions per foot or pulses per foot as appropriate to determine 3 belt revolutions and a delivery of ~~1000~~**800** d (from manufacturer.)		BTR			Revolutions
Allowable weighing error (units of weight) for dynamic tests which will be divisions on master weight totalizer (MWT.) AWE = 0.45(0.005)(TL)		AWE			ton

Percent of Static Scale Capacity	Time (minutes)	Totalized Load TL (ton)	Tolerance AWE = 0.45 (.005) (TL)
0	20 minutes, or MTL_{min}/[(0.35) (BL_{min}) (belt speed for test)], whichever is greater		
35% of SSC_{min}	20 minutes, or MTL_{min}/[(0.35) (BL_{min}) (belt speed for test)], whichever is greater		
35% of SSC_{max}	*Time to deliver ~~1000~~**800** d		
70% of SSC_{max}	*Time to deliver ~~1000~~**800** d		
98% of SSC_{max}	*Time to deliver ~~1000~~**800** d		
Leave the scale under load for 1 hour.			
98% of SSC_{max}	*Time to deliver ~~1000~~**800** d		
70% of SSC_{max}	*Time to deliver ~~1000~~**800** d		
35% of SSC_{max}	*Time to deliver ~~1000~~**800** d		
35% of SSC_{min}	20 minutes, or MTL_{min}/[(0.35) (BL_{min}) (belt speed for test)], whichever is greater		
0	20 minutes, or MTL_{min}/[(0.35) (BL_{min}) (belt speed for test)], whichever is greater		

7. Field Test Procedures for Reference Scales

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

1.a. Hopper Scales – 13. Field Test Procedure (page BCS-17)

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.

A recommendation is made that the sector consider that the required minimum test weights of 10% of scale capacity as stated in *NCWM Publication 14* does not correspond with the minimum test weight required in *NIST Handbook 44* [2.20], Table 4 of 12.5%. Should these values be reconciled?

1.b. Railway Track Scales – 13. Field Test Procedure (page BCS-17)

Railway Track Scales
Because of the difficulties of obtaining adequate test weights or test cars to test railway track scales, the American Association of Railroads Committee simply recommends that the scales be tested the best way that can be arranged. The scale must be accurate to 0.1% and adjusted if necessary.

Split-draft static-weighing is acceptable. ~~**Uncoupled in-motion weighing is permitted if it is done as a single draft.**~~ As written, this procedure does not prohibit weighing rail cars, uncoupled in-motion, to obtain reference weights for use during a material test when the railway scale's accuracy has only been verified through static testing.

Given the statement above and considering the substantial time and effort involved in testing an uncoupled in-motion railway scale, it is reasonable to question whether or not the scale will be properly tested as an in-motion scale (when used as such) or if it will only have its accuracy verified through a statically performed test. If the railway track scale is not tested as an in-motion scale, is it prudent to assume that the scale will be capable of producing reference weights of 0.1% accuracy when the scale is used as an in-motion scale?

The sector will be asked to provide input regarding a recommendation that uncoupled in-motion railway scales used to establish reference weights for material tests be required to be tested in the mode (in-motion or statically) that will be used to determine the reference weights?

8. Time and Date Information Required on Recorded Indications

The agenda for the USNWG on BCS 2012 Meeting includes discussion regarding paragraph S.1.4. in the *NIST Handbook 44* BCS code which requires that recorded indications include the date and time in addition to the initial and final totalizer reading and the unit of measurement.

The statement of date and time however is non-specific in that there is no association made for the date and time record with the stage that the totalization process is in.

This issue has also been included in the agenda for the NTETC Belt-Conveyor Sector Meeting due to the reference to this *NIST Handbook 44* requirement in *NCWM Publication 14*. The example of a recorded indication provided in *NCWM Publication 14* (shown below) indicates a single, unspecified date and time. It may be reasonable to assume that because the total quantity is also provided on the recorded indication, that the date and time shown are associated with the final MWT reading.

2. Recording Element (page BCS-5)

Code Reference S.1.4. and G-S.5.2.2.:

2.3.	The value of the scale division of the recording element shall be the same as that of the indicating element. The belt-conveyor scale system shall record the initial indication and the final indication on the MWT, the quantity delivered, the unit of measurement, (e.g., kilograms, tonnes, pounds, tons, etc.), the date, and time. This information shall be recorded for each delivery. The indicated and recorded weight values must agree to the nearest scale division.	☐ Yes ☐ No ☐ N/A
2.4.	All weight values shall be recorded as digital values.	☐ Yes ☐ No ☐ N/A
2.5.	Information required on the ticket.	☐ Yes ☐ No ☐ N/A

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

The sector is asked to consider whether or not it is useful to include a time and date for the recorded indications of both the initial MWT reading and the final MWT reading. Additionally, is there justification for providing enough information on the recorded indications to establish a span of time for the delivery of the total amount of material?

If it is determined that an amendment is needed to the *NIST Handbook 44* requirement, it is recommended that the sector draft the appropriate necessary changes to *NCWM Publication 14*.

9. Short Conveyor Belt (Weigh-Belts) Systems

One of the items found on the 2012 USNWG BCS Meeting Agenda include the reintroduction of language in *NIST Handbook 44* under UR.2. regarding shorter belt systems that are designed and furnished by the manufacturer. This proposal would place language back into *NIST Handbook 44* that had been stricken in 2001.

Although this language is not in the current edition of *NIST Handbook 44*, reference to *NIST Handbook 44* in the current *NCWM Publication 14* still includes this deleted wording. The sector needs to consider how to reconcile *NCWM Publication 14* with references to requirements in *NIST Handbook 44*. Suggested amendments to correct this are shown below:

9. Installation Requirements (page BCS-11)
Code Reference: UR.2.2.1.

9.7. ~~**Unless the scale is installed in a short conveyor designed and furnished by the scale manufacturer or built to the scale manufacturer's specifications, the conveyor shall comply with the following minimum requirements:**~~ **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:** ☐ Yes ☐ No ☐ N/A

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. ☐ Yes ☐ No ☐ N/A

9.7.1.1. Indicate the Type: ☐ Vertical ☐ Horizontal