Appendix E
National Type Evaluation Technical Committee (NTETC)
Belt-Conveyor Scale Sector

Meeting Summary
February 26, 2009, St. Louis, Missouri

Contents

Carry-Over Items from 2008:

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

Source: Mr. Bill Ripka, Sector Chairman

Background: At the February 2008 meeting of the Belt Sector, NIST Technical Advisor, Mr. Steven Cook reviewed recent changes to NIST Handbook 44 Section 2.21. (Belt-Conveyor Systems) and recommended that the NCWM Publication 14 (Pub 14) Belt-Conveyor Scale Checklist, which was based on the 2006 edition of NIST Handbook 44, be reviewed and updated. The Sector members reviewed suggested amendments and no further changes were recommended.

Prior to the 2009 Sector meeting, Sector Chairman, Mr. Bill Ripka, provided the draft Pub 14 Belt-Conveyor Scale Checklist technical policies on the substitutions of Master Weight Totalizers and other minor editorial suggestions for review. Among the suggested changes that were included in this draft were proposed changes for procedures involving testing semi-automatic and automatic zero-setting mechanisms.

Discussion/Conclusion: Comments were heard during the February 2009 Sector meeting regarding the draft proposed changes submitted by Mr. Ripka. Manufacturers generally agreed the proposal for evaluation of substitution MWTs is not intended to apply to devices produced by different manufacturers. The Sector also agreed to recommend that this criterion be used to amend existing certificates.

The Sector discussed whether or not a substitute totalizer needs to undergo a permanence test during type-evaluation. Mr. Ian Burrel, Control Systems Technology, stated that a totalizer submitted for evaluation should undergo a permanence test during the laboratory portion of the type-evaluation. Mr. Steven Cook, NIST, questioned whether or not totalizers from different manufacturers could be evaluated on a one-to-one comparison basis during a field test when different totalizers are used with identical associated equipment/systems.

NTEP Administrator, Mr. Jim Truex, polled the manufacturers present as to whether any among them have an instrument which is developed or being developed and will be submitted for NTEP evaluation. If so, would the manufacturers be willing to submit that device and have the above Pub 14 draft used during the evaluation? Mr. Ripka responded that Thermo-Ramsey may have a totalizer which might be available for evaluation by the end of 2009. Mr. Jim Truex stated that NTEP is ready to apply the draft on a trial basis, and that this step is necessary prior to amending Pub 14 by adopting the draft.

Language highlighted in shaded font indicates recommended changes to Pub 14 Belt-Conveyor Scale Checklist as shown below.

** A MWT submitted for approval as a stand-alone device can only be accepted as an addition to an existing Certificate of Conformance (CC) for a complete Belt Conveyor Scale System.

A. Models to be Submitted for Evaluation

A type is a model or models of the same design as defined in the NTEP Policy and Procedures. A complete list and description of all models of a type to be included in the CC shall be submitted with the request for type-evaluation. All options and features to be included on the CC must be submitted for evaluation. If the CC is to include more than one model of the same type, the submitter shall contact the evaluation agency to determine which model or models will be evaluated. A CC will be amended when new models of the same type meeting the specified criteria are applied for by the manufacturer.

The models to be submitted for evaluation shall be those having:

a. Laboratory Test – A master weight totalizer (MWT) or integrator, that as a minimum meets the requirements of the original evaluation, with defined enhancements and additional options indicated. The submitter shall also provide all necessary devices or instruments to represent the load receiving and speed sensing elements.

b. Field Test – The field test shall be performed with a previously "approved for commercial use" weighbridge model by the same manufacturer.

B. Certificate of Conformance (CC) Parameters

A CC will apply to all models that have:

1. Equivalent hardware and software, and

2. Subsets of standard options and features of the equipment evaluated.

Metrological features not recognized by Handbook 44, but capable of being used as the basis for commercial transactions, shall be capable of being disabled and sealed before the device can receive an NTEP CC.

C. Replacement Parts

The policy for addressing the conformance of replacement parts with the parts being replaced is:

1. If a MWT has received an NTEP evaluation and an NTEP, it must be repaired with parts that are consistent with the original design or metrologically equivalent parts.

D. Substitution of the Master Weight Totalizer

For a MWT to be considered an appropriate substitute for the MWT tested during the original type evaluation of a belt-conveyor scale system, the following criteria must be satisfied:

1. The MWT must be tested in the laboratory using appropriate load and speed signal simulators capable of being adjusted within the tolerances indicated in the checklists and tables in this document.

2. All MWT laboratory tests must be performed on the replacement MWT, including temperature testing.

3. During the test, the device must be within the acceptance tolerance.

4. A field test will be performed meeting new initial installation testing criteria.

5. A field permanence test will be performed.

6. A separate CC will not be issued for the new MWT. Instead, the original CC will be amended to include the new MWT as an option.

7. Application limits, such as capacity and speed ranges, established during the original type evaluation will not be amended.

E. Checklist and Test Procedures

1. Indicating and Recording Elements

The integrator of a belt-conveyor scale normally includes the master weight totalizer (MWT and a rate of flow indicator and rate of flow alarms. The MWT must have adequate resolution to be able to establish a valid zero reference value and must have sufficient capacity to totalize loads over a reasonable period of time. The integrator may also have a resettable partial totalizer for indicating the mass of loads conveyed over a limited period of time and may have a supplementary totalizer with a scale interval greater than that of the MWT that will indicate the mass of loads conveyed over a fairly long period of operation. The partial totalizer is normally used for indicating the values for the zero test, simulated load tests, materials tests, and individual measurements of interest to the scale owner.

The MWT shall be equipped with provisions for applying a security seal that must be broken or another approved security means before any change that affects the metrological integrity of the device can be made to the MWT.

1.1	The scale must have a master weight totalizer (MWT).	Yes ☐ No ☐ N/A ☐
1.2	The MWT shall not be resettable without breaking a security means.	Yes ☐ No ☐ N/A ☐
1.3	A power failure test must be conducted on digital electronic MWT's both in the laboratory and in the field permanence test.	Yes ☐ No ☐ N/A ☐

Test Procedure

1.3.1	Accumulate a measured quantity on the MWT and stop the flow of material. Note the reading.	Yes ☐ No ☐ N/A ☐
1.3.2	Disconnect power to the MWT.	Yes ☐ No ☐ N/A ☐
1.3.3	Connect power to the MWT.	Yes ☐ No ☐ N/A ☐
1.3.4	The quantity indication shall return to the previously displayed quantity within 1 division.	Yes ☐ No ☐ N/A ☐

Laboratory Test: The accumulated measured quantity for the MWT is retained in memory during a power failure of 24 hours and is displayed again when power is returned.

Field Test: The accumulated quantity for the MWT is retained in memory during a power failure of 10 seconds up to 24 hours and is displayed again when power is returned.

1.4	The capacity of the MWT shall be at least 10 hours times the maximum rated flow rate indicated on the original CC.	Yes ☐ No ☐ N/A ☐
1.5	The value of the scale division shall be capable of being established for a value less than or equal to 0.1 % of the minimum totalized load.	Yes ☐ No ☐ N/A ☐
1.6	The MWT shall indicate in one or more of the weight units indicated in table T.1 [check the applicable unit(s)]	Yes ☐ No ☐ N/A ☐
	The scale division shall be in increments of 1, 2, or 5 times 10k where k is an integer.	Yes ☐ No ☐ N/A ☐

Table T.1	
Unit	**Abbreviation**
_____ pounds	Lb or LB
_____ U.S. short ton	Ton or T
_____U.S. long ton	LT
_____ Metric ton	T
_____ kilograms	kg

1.7 The indicated weight value must be expressed without the use of a multiplier. Yes ☐ No ☐ N/A ☐

1.8 The MWT may have a no-flow lockout provided the lockout is limited to not more than 3 % of the rated belt loading in terms of weight per unit length. The no-flow lockout must be deactivated during the zero test. Yes ☐ No ☐ N/A ☐

1.8.1 During normal operation, the MWT shall advance only when the belt conveyor is in operation and under load. Yes ☐ No ☐ N/A ☐

1.8.2 If a no-flow lockout is provided, verify that it is limited to not more than 3 % of the rated belt loading. Yes ☐ No ☐ N/A ☐

1.8.3 It must be possible to deactivate the no-flow lockout during the zero test Yes ☐ No ☐ N/A ☐

2. Recording Element

2.1 The MWT shall incorporate or be capable of interfacing with a recording element. Yes ☐ No ☐ N/A ☐

2.1 The value of the scale division for the recording element shall be the same as for the MWT. Yes ☐ No ☐ N/A ☐

2.3 The recording element shall record the initial indication and the final indication of the MWT, the quantity delivered, the unit of measurement, (i.e., kilograms, tones, pounds, tons,), the date and time (see Table T.2). 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 ☐

All weight values shall be recorded as digital values.

Information required on the ticket:

Table T.2	
Date	05 06 2008
Time	15:30
Master Start Total	44113.5 T
Master Stop Total	44300.5 T
Quantity	187.0 T

2.4 If a reset to zero mechanism is incorporated, there must be an interlock to prevent the zeroing of the device between the printing of the initial and final values of the totalized weight. Yes ☐ No ☐ N/A ☐

2.5 The printing of weight values shall be inhibited when the flow rate is greater than either: Yes ☐ No ☐ N/A ☐

~ 3 % of the maximum flow rate, or

~ The flow rate at which the MWT is engaged unless the weight value is identified as a subtotal, in process weight, or the equivalent.

2.6	The recorded weight value must be expressed without the use of a multiplier.	Yes ☐ No ☐ N/A ☐
2.7	The printer must automatically sequence through a print cycle so that each printed document includes two weight values to represent the initial and final values.	Yes ☐ No ☐ N/A ☐

3. Rate of Flow Indicator and Recorder

A rate of flow indicator and recorder are required. The MWT shall incorporate or be capable of interfacing with a rate of flow indicator and recorder. They may express the rate in weight units per hour or as a percent of capacity. The indicator and recorder may be either analog or digital.

3.1	The system must have both a rate of flow indicator and rate of flow recorder. The rate of flow recorder is: _____ analog _____ digital	Yes ☐ No ☐ N/A ☐
3.2	If a digital flow rate recorder is provided, the readings must be taken at time intervals not exceeding 10 seconds.	Yes ☐ No ☐ N/A ☐
3.3	The rate of flow indicator must indicate from zero to at least 100 % of capacity.	Yes ☐ No ☐ N/A ☐
3.4	The rate of flow recorder shall record from zero to at least 100 % of capacity.	Yes ☐ No ☐ N/A ☐

4. Rate of Flow Alarms

The system shall be equipped with a permanent means to provide an audio or visual alarm (signal) when the rate of flow is equal to or less than 20 % and equal to or greater than 100 % of the rated capacity of the scale. The alarm shall be located such that it will be noticed by the operator during normal operation.

The rate of flow alarm is:

_____ both audio and visual _____ audio _____ visual

4.1	The alarm (signal) is located so it will be noticed during normal scale operation.	Yes ☐ No ☐ N/A ☐
4.2	Record the values at which the alarm is triggered: Low alarm:_______________ High alarm:_______________	Yes ☐ No ☐ N/A ☐
4.2.1	The alarm triggered when the rate of flow is equal to or less than 20 % and equal to or greater than 100 % of the rated capacity of the scale.	Yes ☐ No ☐ N/A ☐
4.3	Access to the parameters for setting the alarm limits shall be through a	Yes ☐ No ☐ N/A ☐

security means.

5. Zero-Setting Mechanism

The zero-setting mechanism may be either a manual or automatic mechanism. If the zero-load reference is recorded at the beginning and end of a delivery, the range of the zero-setting mechanism shall not be greater than ± 5 % of the rated capacity of the scale. Where the zero-load reference is not recorded at the beginning and end of a delivery, the range of the zero-setting mechanism shall be 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. 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 three minutes). The completion of the zero-setting operation must be indicated. The low-flow lockout must be deactivated for this test.

5.1 To verify the ± 5 % range of the zero setting mechanism and the zero load reference recording capability: Yes ☐ No ☐ N/A ☐

5.1.1 Verify that the zero-setting range is limited to ± 5 %. Yes ☐ No ☐ N/A ☐

5.1.2 Adjust the load simulating device to represent 8 % of the scale capacity. Yes ☐ No ☐ N/A ☐

5.1.3 Zero the scale. Yes ☐ No ☐ N/A ☐

5.1.4 Adjust the load simulating device representative of a 1 % of scale capacity decrease; the automatic-zero-setting mechanism shall reset the zero of the scale and the recording element shall indicate the change in zero.. Yes ☐ No ☐ N/A ☐

Adjust for another 1 % of scale capacity decrease.

Again, the MWT shall reset the zero and the recording element shall indicate the change.

Continue to decrease the load simulating device in 1 % increments until the automatic-zero-setting mechanism no longer resets the zero.

Record the total amount of adjustment.

Return the load simulating device to the initial zero value. Increase the load simulating device in 1 % increments, verifying zero corrections and recordings until the MWT will no longer automatically reset the zero.

Record the value where automatic zero correction is restricted.

The total range of the automatic-zero-setting mechanism shall not exceed 10 % of the scale capacity.

5.1.4 The zero should move a maximum of ± 5 % either in its automatic-zero setting mode or as manually adjusted. Yes ☐ No ☐ N/A ☐

5.2 To verify the ± 2 % range of the zero setting mechanism: Yes ☐ No ☐ N/A ☐

5.2.1 Verify that the zero-setting range is limited to ± 2 %. Yes ☐ No ☐ N/A ☐

5.2.2	Adjust the load simulating device to represent 5 % of the scale capacity.	Yes ☐ No ☐ N/A ☐
5.2.3	Zero the scale.	
5.2.4	Adjust the load simulating device representative of a 1 % of scale capacity decrease; the automatic-zero-setting mechanism shall reset the zero of the scale. Adjust for another 1 % of scale capacity decrease. Again, the MWT shall reset the zero. Continue to decrease the load simulating device in 1 % increments until the automatic-zero-setting mechanism no longer resets the zero. Record the total amount of adjustment. Return the load simulating device to the value initial zero value. Increase the load simulating device in 1 % increments, verifying zero corrections, until the MWT will no longer automatically reset the zero. Record the value where automatic zero correction is restricted. The total range of the automatic-zero-setting mechanism shall not exceed 4 % of the scale capacity.	Yes ☐ No ☐ N/A ☐
5.2.5	The zero should move a maximum of ± 2 % either in its automatic-zero setting mode or as manually adjusted.	Yes ☐ No ☐ N/A ☐
5.3	The zero-setting operation shall be performed only after a whole number of belt revolutions and at least 3 minutes of operation.	Yes ☐ No ☐ N/A ☐
5.4	The completion of the automatic zero-setting operation must be indicated.	Yes ☐ No ☐ N/A ☐
5.5	The range of the zero-setting mechanism must be limited to ± 2 % or ± 5 % of the capacity of the scale without breaking a security means.	Yes ☐ No ☐ N/A ☐
5.6	An audio or visual signal shall be given when the automatic and semi-automatic Zero-setting mechanisms reach the limit of adjustment.	Yes ☐ No ☐ N/A ☐

6. Sensitivity at Zero Load

The purpose of this requirement is to assure that the MWT has sufficient resolution and sensitivity to establish a good zero reference value. The manufacturer may specify an alternate test procedure to demonstrate the required sensitivity. The no-flow lockout must be deactivated for this test.

6.1 Adjust the load simulating device to represent the weight required to determine compliance based on the equation: Yes ☐ No ☐ N/A ☐

$$\frac{2 * W_c}{C_m} \underline{\hspace{6cm}}$$

For example: $\frac{2*500}{1000} = 1 \text{ lb}$

Where: C_m = counts in dynamic weighing scale divisions required for the minimum totalized load

W_c = weight required to reach the static scale capacity of the weighbridge.

Static scale capacity = (maximum weight/foot)(length of weighbridge)

6.2 Operate the scale for a time equal to the time required to deliver the minimum totalized load.

6.2.1 Record the time period: ___________ minutes.

6.3 The totalizer shall advance at least one but not more than three divisions. Yes ☐ No ☐ N/A ☐

6.3.1 Record the quantity registered: _________ divisions.

6.4 The MWT has the sensitivity specified at zero. Yes ☐ No ☐ N/A ☐

7. Marking Requirements

7.1 The marking of the MWT shall meet the requirements established during the initial CC evaluation. Yes ☐ No ☐ N/A ☐

8. Provisions for Metrological Sealing of Adjustable Components or Audit Trail

Due to the ease of adjusting the accuracy of electronic MWTs, all MWT's must provide for a security seal that must be broken or provide an audit trail, before any adjustment that detrimentally affects the performance of the electronic device can be made. Only metrological parameters that can affect the measurement features that have a significant potential for fraud and features or parameters whose range extends beyond that appropriate for the device compliance with HB 44 or the suitability of equipment, shall be sealed.

For additional information on the proper design and operation of the different forms of audit trail, see the Appendix for Audit Trail

8.1 The device has the capability for a physical seal. Yes ☐ No ☐ N/A ☐

8.2 The device meets the requirements for Audit Trail. Yes ☐ No ☐ N/A ☐

9. RFI/EMI Environment

The equipment shall be suitable for the environment in which it is intended to be used, including resistance to electromagnetic and radio-frequency interference generated by electromechanical equipment, portable hand-held radio transmitters and citizen's band transmitting equipment (if normally used at the site of installation).

9.1 The instrument meets standard NTEP RFI/EMI influence requirements. Yes ☐ No ☐ N/A ☐

10. Laboratory Test Procedures

A. Technical Policy

The MWT is to be placed in the environmental chamber to determine performance with respect to influence factors. It is not necessary to re-rest a previously type approved weighbridges, speed sensors or ancillary devices. It is not necessary, nor recommended, that signal simulators for load and speed be located in the chamber. The simulated test loads to be used for the MWT evaluation shall be equal to the signal levels from the actual tests loads used during the initial type evaluation.

B. Initial Tests

1. Determine and record the load simulating device setting for zero and full scale ranges.
2. Calibrate the MWT at 20 ºC.
3. Conduct the sensitivity test at zero load.
4. Verify that the range of the automatic zero setting mechanism(s) do not exceed ±2 % and ±5 % of capacity.
5. Test the alarms for flow rates below 20 % and above 100 % of rated capacity.

Once the laboratory test is started, after completion of the voltage tests, neither the zero nor the span are to be adjusted. The data should be normalized for the many tests.

The laboratory tests consist of a combination of simulated dynamic tests. These tests require adjusting a load simulating device and a speed simulating device to pre-calculated values and conducting a simulation of belt travel distances, integrating the weight on the MWT.

C. Soak Requirements

The laboratory test is to be run at 20 ºC, the upper temperature limit and the lower temperature limit. The surface temperature of the MWT is to be measured. In consultation with the manufacturer, place the temperature sensor on the portion of the MWT that is expected to be the last part to reach thermal equilibrium. After the surface temperature has reached the test temperature, allow the equipment to soak for at least an additional two hours, but not more than six hours, before starting the test. For convenience of the test, however, an overnight period may be used for the soak period before running the next temperature test.

1. Stabilize the temperature at 20 ºC.
2. Enable the speed simulating device for a constant signal level.
3. Deactivate the automatic zero setting mechanism and no-flow lock-out.
4. Zero the MWT.

The MWT shall have sufficient resolution (that is a sufficiently small dynamic scale division) to permit this test to be completed in the greater of 20 minutes, or for a time equivalent to the test time required for the test run at 35 % of the minimum static capacity.

The beginning and ending MWT indications shall not change more than ± 1 scale division.

D. Voltage Tests

Verify the line power source, AC or DC, is set to the manufacturers recommended nominal value (i.e., 120 VAC or 24 VDC)

1. Run an accuracy test at 98 % of scale capacity for the time to deliver 800d.
2. Reduce the line power supply to 85 % of nominal (i.e., 100 VAC or 20.4 VDC).
3. Run a zero test.
4. Run an accuracy test at 98 % of scale capacity for the time to deliver 800d.
5. Increase the line power supply to 110 % of nominal (i.e., 130 VAC or 26.4 VDC).
6. Run a zero test.
7. Run an accuracy test at 98 % of scale capacity for the time to deliver 800d.

8. Return the line power supply to the nominal value.

E. Temperature Tests

1. Run a zero test.
2. Do not reset zero or adjust the span at any time after the start of this test.
3. Adjust the load simulating device to achieve the desired load representations.
4. Test the MWT simulating dynamic operation of the belt conveyor scale system at the following "flow rates" (all percent values represent percent loads of static scale capacity (SSC)):

0 (zero test), 35 % (SSC_{min}), 35 %, 70 %, 98 %,

Leave the MWT under simulated load for 1 hour, then:

98 %, 70 %, 35 %, 35 % (SSC_{min}), and 0 (zero test)

Table T.3

Percent of Static Scale Capacity	Nominal Time (Minutes)	Equivalent Belt Travel
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 800d	
70 % of SSC_{max}	Time to deliver 800d	
98 % of SSC_{max}	Time to deliver 800d	
Leave MWT under simulated load for 1 hour		
98 % of SSC_{max}	Time to deliver 800d	
70 % of SSC_{max}	Time to deliver 800d	
35 % of SSC_{max}	Time to deliver 800d	
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	__________

The tolerance to be applied for the laboratory test is set at 0.45 times the tolerance for the complete installation times 0.3 (30 %). The formula is shown in Table T.4 to illustrate the process. The reference value for a particular accuracy test is the simulated load times the simulated belt travel distance. The values to be used for the laboratory test are shown in the following example:

F. 98 % load – Zero load test = difference

Proportion the effect of the zero-load test to the time of the tests for each simulated load. The values for the differences represent the simulated material measured by the MWT and are compared to the reference value for accuracy.

1. Change the temperature to -10 ºC (14 ºF) at a rate no faster than 1 ºC/min following the "soak requirements."
2. Repeat the simulated dynamic tests.

3. Change the temperature to 40 ºC (104 ºF) at a rate no faster than 1 ºC/min following the "soak requirements."
4. Repeat the simulated dynamic tests.
5. Change the temperature to 20 ºC (68 ºF) at a rate no faster than 1 ºC/min following the "soak requirements."
6. Repeat the simulated dynamic tests.

G. Data Analysis

1. The data are evaluated on the Simulated Dynamic MWT Test Work Sheet, Item 14 and 15, for pass or fail.

11. Field Test

A field test is required prior to final type approval. The field test can be performed as a retrofit on a previously approved for commercial use belt-conveyor scale system or in a new application. The Field Test Procedures as defined in paragraph 13 of the initial belt-conveyor scale Type Evaluation section of Publication 14 and as defined in HB 44 are to be followed. The results of all tests must be within acceptance tolerances.

12. Permanence Test

A permanence test is conducted to determine the accuracy of the device in use over a period of time. The permanence test shall be conducted after a minimum of 20 days after successful completion of the initial performance test, and after a minimum volume of material has been transported across the belt-conveyor scale. This minimum volume of material shall be no less than the maximum scale capacity times 8 hours times 20 days. (i.e. A system with a maximum scale capacity of 1000 TPH requires a minimum volume of 160000 tons [1000 * 8 * 20] to have been transported prior to the permanence test.). The results of all tests must be within acceptance tolerances.

The permanence test shall include:

1. initial stable zero tests
2. at least two test loads at normal use capacity
3. simulated load tests
4. verification of audit trail recorded events

13. Data Sheet and Laboratory Test Procedure

Temperature Testing: Belt-Conveyor Scale Systems Code paragraphs T.3.1., T.3.1.1., T.3.1.2. The accuracy of the MWT is to be adjusted at 70 % of the static scale capacity (SSC). A weight display of 0.01 % (1 part in 10,000) is required for the laboratory tests. The allowable error is adjusted to 30 % of the allowable error for the entire system type approval. If tests are run for a time greater than that needed for the minimum test load (MTL), substitute the totalized load (TL) for the MTL in the tolerance calculation in Test Conditions, step 3 (Table T.4).

Table T.4

Device Parameters	Abbrev.	Maximum	Minimum	Dim
1. Load per unit length from existing CC; corresponds to the largest capacity and the lowest capacity rating	BL			lb/ft
2. Length of the weighbridge (inches) from existing CC				In
3. Belt Speed from existing CC	SP			ft/min
4. Determine scale capacity in units per hour SC=SP*BL*60/2000 (must correspond to existing CC)	SC			ton/hr
5. Record the static scale capacity in units of weight SSC=(maximum weight per foot)(length of weighbridge)	SSC			lb
6. Allowable zero error for temperature change of 10 ºC (18 ºF) AZE=(.003)(0.0007)(SC_{min})(time)/60 where "time" is the time of the zero test in minutes	AZE			ton
7. Size of scale division required for zero	SD			ton
8. Determine the minimum and maximum totalized loads	MTL			ton
Test Conditions	**Abbrev.**			
1. Determine the time in minutes to acquire MTL with the test load to be simulated in the laboratory.	Test load, pound/foot			lb/ft
	Test load, total			lb
	Time (minutes) to deliver MTL (at least 10 minutes)	Time		min
2. 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 800d.		BTR		revolutions
3. Allowable weighing error (units of weight) for simulated dynamic tests which will be divisions on master weight totalizer. AWE = (0.003)(0.45)(0.005)(TL)	AWE			ton

Table T.5
Initial Tests
1. Set up the unit at 20 ºC (68 ºF), zero the MWT, and adjust the span following the manufacturer's procedure.
2. Conduct the sensitivity test at zero load.
3. Verify that the range of the automatic zero setting mechanism(s) do not exceed ±2 % and ±5 % of capacity.
4. Test the alarms for flow rates below 20 % and over 100 % of scale capacity.

Table T.6
Laboratory Tests
1. Stabilize the temperature at 20 ºC.
2. Enable the speed simulator to represent 100 % speed.
3. Deactivate the automatic zero setting mechanism and zero the MWT.
4. Run a zero test.
Voltage tests
5. Run an accuracy test at 98 % of scale capacity for the time to deliver 800d.
6. Reduce the live voltage to 85 % of nominal.
7. Run a zero test.
8. Run an accuracy test at 98 % of scale capacity for the time to deliver 800d.
9. Increase the line voltage to 110 % of nominal.
10. Run a zero test.
11. Run an accuracy test at 98 % of scale capacity for the time to deliver 800d.
12. Return the live supply to nominal.
Temperature Tests
13. Run a zero test. Do not reset zero or adjust the span at any time after the start of this test.
14. Adjust the load simulating device to represent normal loading of the scale (70 % of scale capacity).
15. At 20 ºC, test the MWT dynamically with simulation of the load and speed. Test the MWT at the following "flow rates" (all percent values represent percent loads of static scale capacity): 0 (zero test); 35 %(SSC_{min}); 35 %; 70 %; 98 %. Then, leave the MWT at full load for 1 hour and test at the following flowrates: 98 %; 70 %; 35 %; 35 %(SSC_{min}); and 0 (zero test).

Table T.7			
Percent of Static Scale Capacity	**Time (Minutes)**	**Totalaized Load TL (ton)**	**Tolerance AWE= (0.003)(0.45)(0.005)(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 800d		
70 % of SSC_{max}	Time to deliver 800d		
98 % of SSC_{max}	Time to deliver 800d		
Leave MWT under simulated load for 1 hour			
98 % of SSC_{max}	Time to deliver 800d		
70 % of SSC_{max}	Time to deliver 800d		
35 % of SSC_{max}	Time to deliver 800d		
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		

Table T.8
Laboratory Tests *continued*
16. Change the temperature to -10 ºC (14 ºF) at a rate no faster than 1 ºC/min. Follow soak requirements.
17. Repeat the simulated dynamic tests performed in step 15 (Table T.6)
18. Change the temperature to 40 ºC (104 ºF) at a rate no faster than 1 ºC/min. Follow soak requirements.
19. Repeat the simulated dynamic tests performed in step 15 (Table T.6)
20. Change the temperature to 20 ºC (68 ºF) at a rate no faster than 1 ºC/min. Follow soak requirements
21. Repeat the simulated dynamic tests performed in step 15 (Table T.6)
Data Analysis
1. The data are evaluated on the following Simulated Dynamic MWT Test Work Sheets for pass or fail
2. Approval is for addition of MWT to existing Certificate of Conformance without changes to minimum and maximum ranges.

14. Dynamic MWT Test Work Sheet and Laboratory Test Procedure No. 1

The calibration point is the 70 % load for the initial room temperature (20 ºC) test. Because the weight indication when in the test mode may not be at zero and may not be adjusted to indicate n weight values (e.g., the quantity indication may be voltage output or "counts." the table provides for calculations to convert indications into weight units). The scale indication shall not be zeroed during the test process. Corrections for the change in zero tests are to be done by calculation.

Places to record information needed for the test and the formulae needed to compute table entries are given below.

Static Scale Capacity, SSC = (maximum weight per foot)(length of weighbridge) = ________ lb.

Test load for 70 % SSC = _______________ lb.

Weight/foot = (static scale load)/(length of weighbridge) = Static scale capacity)/(length of weighbridge)

Start and end readings are in divisions and must be converted to weight values.

Conversion factor for divisions to weight = (change in static weight indication from zero to 70 % SSC load) / (70 % SSC load in pounds)

Change in zero = (Total change of zero during zero test) {(time of test for applied load)/(time of zero test)}

Indication corrected for change of zero = (Indicated change) – (Change of zero)

Scale indication in lb = (Indication corrected for change of zero) / (Conversion factor)

Actual weight = {(Applied load)/(length of weighbridge)}(speed)(time)

Note: Speed and time must use the same units of time (e.g., feet per minute and minutes)

Error = Scale indication – actual weight

Tolerance is from the Belt-Conveyor Scale Data Sheet and Laboratory Test Procedure, step 3.

15. Dynamic MWT Test Work Sheet and Laboratory Test Procedure No. 2

Scale indication at zero load (static scale indication) = _______________ divisions

(Not required if MWT can display static weight)

Scale indication at 70 % SSC (static scale indication) = _______________ divisions (Not required if MWT can display static weight)

Conversion factor = (change in static weight indication from zero to 70 % SSC load) / (70 % AAC load in pounds) = divisions/lb

Temperature__________ ºC

Type of Tests_______________ Signature____________________

Table T.9

Test Load (lb)	Applied load (lb)	Time of test in minutes	Reading in counts		Indicated Change = End – Start	Change in Zero	Indication corrected for change in zero	Scale Indication (lb)	Actual Weight	Error (lb)	Toleran ce (lb)
			End	Start							
Zero test	0										
35 % SSC_{min}											
35 % SSC_{max}											
70 % SSC_{max}											
98 % SSC_{max}											
Leave scale under simulated load for 1 hour											
98 % SSC_{max}											
70 % SSC_{max}											
35 % SSC_{max}											
35 % SSC_{min}											
Zero test	0										

16. Zero Change with Respect to Temperature

Table T.10							
	Low Temperature		**High Temperature**		**20 ºC**		**Performance limit for temperature effect on zero test, AZE, per 10 ºC**
Previous Temperature T_P	**20 ºC**						
Current Temperature T_C					**20 ºC**		
Change in Temperature ($T_C - T_P$)							
	Divisions	**lb**	**Divisions**	**lb**	**Divisions**	**lb**	
Zero load indication at T_P							
Zero load indication at T_C							
Change in zero							
Change in zero per 5 ºC (9 ºF)							

Date: ___________________

Indicator Model Number:________________ Indicator Serial Number:________________

______________________________________ ________________________________

Signature **Title**

2. Develop a List of Sealable Parameters for BCS Systems

Background: During the Sector's February 2008 meeting, members were asked to develop a list of programmable parameters within belt-conveyor scale systems which should have access restricted by means of some form of security seal. In developing this list, members were asked to consider all instruments which would have any metrological effect to the system. Mr. Paul Chase agreed to poll those manufacturers which currently hold NTEP certificates in order to develop a list of parameters that would be inclusive of the different design types. The resulting list was intended to be incorporated in NCWM Publication 14 and used in the type evaluation process.

A copy of the "Requirements for Metrological Audit Trails" from NCWM Publication 14 was provided to Sector members prior to the meeting for a review and discussion and recommendations.

Discussion: During the February 2009 Sector meeting, Mr. Chase indicated that he did not receive replies from all the manufacturers polled. Some members stated during the 2009 meeting that not all manufacturers give similar parameters within their particular devices, the same name, or terminology as do other manufactures do. Also, pointed out during discussion were situations where several (if not all) programmable parameters could have access limited through the use of one security seal, and what consequence this type of situation has on the development of a list that is useful to an NTEP evaluator. Mr. Ian Burrell stated that an adjustable parameter (such as span adjustment) may, in some systems, involve more than one component or module, and thereby, require the use of more than just one seal to limit access to a single parameter.

Mr. Jim Truex, NTEP Administrator, stated that NTEP evaluators require some foundation to base the test procedures on when various devices go through the type approval process. There was discussion among the members about various specific features (e.g., coarse zero adjustment; high/low flow alarm settings; etc.) that may be found on a device and whether or not to require a security seal to limit access.

Conclusion: The following table was initially developed showing what parameters should be protected by limiting access to them through a security seal or other security means. The Sector agreed that this table is simply a generic basis for the evaluator to use as a starting point, and the need to seal additional features would be assessed on a case-by-case basis for each manufacturer during the application for type evaluation.

Mr. Truex stated that NTEP evaluators will employ this table on a trial basis and note and comment on any changes that are deemed necessary.

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).*	

Attendees			
Steve Cook	NIST	(301) 975-4003	steven.cook@nist.gov
Richard Harshman	NIST	(301) 975-8107	richard.harshman@nist.gov
John Barton	NIST	(301) 975-4002	john.barton@nist.gov
Jim Truex	NCWM	(740) 919-4350	jim.truex@ncwm.net
Paul Chase	Chase Technology	(218) 545-2356	mjc@emily.net
Al Page	Montana Dept. of Agric.	(406) 841-2058	awp88bb@gmail.com
Bill Ripka	Thermo Ramsey	(612) 783-2664	billripka@thermofisher.com
Art Amsler	Arcadia Controls	(412) 841-2700	artarcadia@aol.com
Phil Carpentier	P.T.C. Consulting	(651) 235-4726	ptcarpentier@att.net
James A. Hale	Southern Company	(606) 226-3581	jahale@southernco.com
Peter Sirrico	Thayer Scale	(781) 826-8101	psirrico@thayerscale.com
Todd Deitrich	Kaskaskia Valley Scale Co.	(618) 295-3331	todd@kvsco.com
Ian Burrell	Control Systems Technology	+ 61 619 292 604	iburrell@controlsystems.com.au
Ken Jones	Calif. Dept. of Food and Agric.	(916) 229-3052	kjones@cdfa.ca.gov
Bryan Gibson	Alabama Weights & Measures	(334) 240-7133	bryangibson@agi.alabama.gov
Johnie Nix	Alabama Weights & Measures	(334) 240-7133	nix.johnie@agi.alabama.gov

THIS PAGE INTENTIONALLY LEFT BLANK