

## Appendix C

### National Type Evaluation Technical Committee Weighing Sector

September 6 - 9, 2007 – Sacramento, California  
Meeting Summary

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Glossary of Acronyms			
AWS	Automatic Weighing Systems	NTETC	National Type Evaluation Technical Committee
CC	NTEP Certificate of Conformance	OIML	International Organization of Legal Metrology
CIM	Coupled-in-Motion (Railway Track Scales)	S&T	NCWM Specifications and Tolerances Committee
CLC	Concentrated Load Capacity	SWMA	Southern Weights and Measures Association
EPO	Examination Procedure Outline	W/LRE	Weighing/Load-receiving Element
GIPSA	Grain Inspection Packers and Stockyards Administration	WG	Work Group
NCWM	National Conference on Weights and Measures	WMD	NIST Weights and Measures Division
NIST	National Institute of Standards and Technology	WWMA	Western Weights and Measures Association
NTEP	National Type Evaluation Program		
<p>Unless Otherwise Stated:</p> <ul style="list-style-type: none"> <li>- “Handbook 44” (HB 44) means the 2007 Edition of NIST Handbook 44 “Specifications Tolerances, and Other Technical Requirements for Weighing and Measuring Devices”</li> <li>- “Handbook 130” (HB 130) means the 2007 Edition of NIST Handbook 130 “Uniform Laws and Regulations in the areas of legal metrology and fuel quality.”</li> <li>- “Publication 14” (Pub. 14) means the 2007 Edition of NCWM Publication 14 - Weighing Devices - Technical Policy • Checklists • Test Procedures</li> <li>- “Sector” means the NTETC Weighing Sector.</li> </ul>			
<p>Note: NIST does not imply that these acronyms are used solely to identify these organizations or technical topics.</p>			

## Railway Track Scale Items

### 1. CLC Type Evaluation Tests on Railway Track/Vehicle Scales – Technical Policy (Carryover)

**Source:** 2006 NTETC Weighing Sector Agenda Item 13

**Background:** Please see the 2006 NTETC Weighing Sector Meeting Summary Agenda Item 13 for complete background information on this item.

During the 2006 NTETC Weighing Sector meeting, the NTEP Director, Stephen Patoray, noted that the proposed amendment to Publication 14 technical policies in Section 8.e. applies only to devices submitted for evaluation and could not be applied to previous evaluations without additional testing as it is currently worded. The Sector discussed the impact of the proposal to accept a vehicle scale application on an existing NTEP CC for railway track scales.

The NTEP director suggested, and the Sector agreed, that Publication 14 Section E. Modification of Type could be amended to update existing railway track scale CCs to include vehicle-weighing applications without additional testing if:

1. the section test on the railway track scale was performed with 100 000 lb of certified test weights or weight carts;
2. strain load tests were conducted during the original railway track scale evaluation;
3. the design of the load-receiving element (LRE) is no wider than 12 ft; and

4. the design of the weighing element is “beam and girder” design. (This item would not be applicable to other scale designs such as composite designs where the strength of the deck is dependent on several individual elements being combined in the design of the scale deck.)

Above items (1-3) were added to the 2007 Edition of Publication 14 as notes to technical policy paragraph 8.2.e.

To address Item 4, the Sector also recommended specific language for Publication 14 Section E. Modifications be developed as a carryover item based on the above discussion. Stephen Patoray, Todd Lucas, and Steve Beitzel agreed to review Section E and develop language to be considered by the Sector during its 2007 Annual Meeting.

For the 2007 Sector Meeting, the NIST technical advisor developed language for Publication 14 Section E. Modifications for a new paragraph 10 titled “Adding a vehicle scale feature or option to an active railway track scale CC” for review by the Sector. The Sector was asked to review and comment on the proposed new paragraph to determine if it was sufficiently developed to recommend that it be added to Publication 14.

During the development of this agenda item, Stephen Patoray and Steven Cook noted that several existing railway track and combination vehicle/railway track scales have the dump-through option listed on the CC without additional evaluation. Publication 14 Technical Policy E. Modification of Type paragraph 7 does not include railway track and combination vehicle/railway track scales in the language. Additionally, paragraphs 8 and 9 do not specify what kind of evaluations are to be conducted. The Sector was asked to review the proposed amendments to paragraphs 7, 8, and 9 developed by the technical advisor and:

1. agree with the proposal to include “railway track, or a combination vehicle/railway track scales” to the existing language;
2. recommend that either an initial or complete evaluation be conducted on the scales with composite construction for the “dump-through” option;
3. recommend that either an initial or complete evaluation be conducted on the scales with composite construction for the “rotary dump” feature/option; and
4. provide any additional comments and recommendations proposed by the technical advisor.

**Discussion:** The Sector reviewed the proposed language to amend Publication 14 Technical Policy Section E paragraphs 7, 8, and 9, and the new paragraph 10. The sector provided the technical advisor with additional suggestions to amend the proposed language in paragraph 10 to include a limitation that the LRE be no wider than 12 ft to be consistent with current technical policy in section 8.1.c. “Additional criteria for vehicle scales, railway track scales, combination vehicle/railway track scales, and other platform scales over 30 000 lb and up to and including 200 000 lb,” and corresponding footnote 3 for scales with widths greater than 12 ft, which requires additional testing with procedures “addressed by NTEP management and the NTEP laboratories on a case-by-case basis.”

The Sector also discussed the proposed revisions to Section E Modification of Type paragraphs 7 through 9 and provided input to the four recommendations.

**Conclusion:** The Sector agreed to recommend that Publication 14 Section E Modification of Type paragraphs 7 through 9 be amended and paragraph 10 be added to:

1. provide NTEP laboratories and applicants with guidelines to add a vehicle scale feature or option to an active railway track scale CC;
2. clarify that combination vehicle/railway track scales are included in paragraphs addressing the “dump-through” option;
3. clarify that a full evaluation is required to add a “dump-through” option for scales with other than the “beam and girder” design; and

4. clarify that a full evaluation is required to add a “rotary dump” option for all railway track scales with an active CC.

A copy of the recommended changes to Publication 14 Section E Modification of Type is in Appendix A – Recommendations to Publication 14 – Agenda Item 1.

## **2. In-Motion Railway Track Scale Performance and Permanence - Technical Policy (Carryover)**

**Source:** 2007 NTETC Weighing Sector Agenda Item 15

**Background:** See 2006 Weighing Sector Agenda Item 15 (a) for additional background information on an NTEP appeal to the permanence testing requirements for evaluation of a separable in-motion indicator interfaced to railway track scale with an active CC. The Sector was unable to come to a consensus on whether to agree with the NTEP Committee or propose any changes to the permanence test requirements at its 2006 meeting. The Sector chairman asked for a vote to see if the Sector agrees with the NTEP Committee decision to waive permanence testing for indicators and controllers used in coupled-in-motion (CIM) railway track scale type evaluations.

- 8 Sector members voted *to support* the NTEP Committee decision.
- 9 Sector members voted *not to support* the NTEP Committee decision.
- 1 Sector member *abstained* from voting.

The Sector made no recommendation on this item since Don Onwiler reported that the NTEP Committee would reconsider its decision during their October 2006 meeting.

During the 2006 Fall meeting of the NCWM Board of Directors, the NTEP Committee (a subset of the board members) offered the Sector several options in its response to the 2006 Sector discussion on this item. A copy of the NTEP Committee’s response was provided to 2007 NTEP Participating Laboratory meeting and to the full NTETC Weighing Sector. The NTEP Committee requested the Weighing Sector revisit this subject to review and discuss NCWM Publication 14, Digital Electronic Scales (DES) Section 68, Performance and Permanence Tests for Railway Track Scales Used to Weigh In-Motion, including the opening paragraph that states:

Performance tests are conducted to determine compliance with the tolerances. The tests described here apply primarily to the indicating element. It is assumed that the weighing/load-receiving element used during the test has already been examined and been found to comply with applicable requirements. If the design and performance of the weighing/load-receiving element is to be determined during the same test, the applicable requirements for Railway Scales Used to Weigh Statically must also be referenced.

The NTEP Committee also suggested the Sector come to one of the following conclusions, or develop an alternate proposal:

1. The Sector may agree with the implication of this opening paragraph that a CIM controller may be used in conjunction with any weighing/load-receiving element that is NTEP certified for static weighing. If so, the NTEP Committee recommends Section 68 be modified to eliminate reference to permanence testing.
2. The Sector may determine that NTEP certification of a weighing/load-receiving element as a static scale is not sufficient for its use in commerce in a CIM weighing system. If so, the NTEP Committee recommends a new checklist be developed explicitly for the performance and permanence testing of a CIM weighing/load-receiving element and another checklist be developed explicitly for the performance evaluation of the CIM controller.
3. The Sector may determine that the NTEP certification for CIM weighing should be on an entire system, limiting use of the CIM controller only in connection with the weighing/load-receiving element(s) with which it underwent type approval. If so, the NTEP Committee recommends this clarification be provided.

Existing certificates would be amended providing this limitation of use and additional testing may be required to correctly identify and certify these system requirements.

At the May 2007 NTEP Laboratory meeting, the NTEP “field” labs met separately and reviewed the NTEP Committee’s recommendation to the Weighing Sector. The “field” labs agreed with the NTEP Committee’s first suggestion and provided a recommendation to modify Publication 14 DES, Section 68. The proposal makes Section 68 a checklist for the evaluation of a CIM controller. It recognizes that any weighing/load-receiving element with an NTEP certificate as a static railway track scale may be used in conjunction with the controller. The permanence testing of the weighing/load-receiving element will be verified when the checklist in Section 69 is completed. The “field” labs forwarded their recommendation to the Sector and also recommended that a definition for an “in-motion controller” be developed.

**Discussion:** The first part of the discussion was on the possible directions/options suggested by the NTEP Committee.

Steve Beitzel, System Associates, stated that in-motion devices should be NTEP evaluated and certified as a system. However, he does not agree with suggested option 3 from the NTEP Committee. Under option 3 nearly all installations would need to be evaluated since it requires the system be limited to the metrological elements approved during the evaluation and would not permit the mixing and matching of compatible elements unless they were listed on the certificate for the system. Darrell Flocken, Mettler Toledo, agreed that this option does not give the applicant flexibility to use compatible elements and suggested the Sector consider NTEP Committee options 1 and 2 or develop an alternative 4<sup>th</sup> option. Stephen Patoray, NTEP director, stated that a CC for a system is specific for the components or elements that were evaluated as part of the system. He asked what the purpose of the NTEP evaluation of a complete system is if it is determined that a previously certified static W/LRE is allowed to be substituted with other certified static W/LREs.

The Sector discussed option 2 in great detail. Following are the salient points of the discussion regarding tests/verifications in the controller and W/LRE checklists:

1. An in-motion system can be very long, and the controller has to resolve varying parameters (e.g., speed, direction, etc). The permanence test provides confidence the system (installation) can perform over a period of time.
2. Does the permanence test apply to the in-motion controller, W/LRE, and the entire system?
3. The permanence test should apply to just the controller since it must be able to compensate for both metrological and non-metrological signals from the W/LRE and other inputs from the installation in order for the controller to determine the proper time to establish a weight.
4. Track settling issues:
  - a. Parts of the track may have settled or loosened causing unwanted signals that are received and compensated for by the in-motion controller;
  - b. Could NTEP evaluate 20 to 30 days after installation? Too costly since the railroads would have to pay for an extra “placed-in-service” test in addition to the subsequent test or tests performed by NTEP (GIPSA);
  - c. NTEP should consider verifying the approach foundation is installed according to the manufacturer’s (and/or railroad’s) recommendations;
  - d. Performance problems cannot be resolved by recalibration; problems are typically caused by poor/inappropriate installation;
  - e. Installation problems where the open track interfaces with the track supported by the concrete foundations are also a source of performance problems;
  - f. The in-motion controller checklist would have to include testing to verify it can compensate or filter out unwanted signals. Can unwanted signals be simulated?

A straw poll of the Sector indicated the majority of the Sector agreed with option 1 of the NTEP Committee, though WMD representatives supported option 3 since it is a more complete evaluation. As a result of the straw poll, the Sector proceeded to discuss the NTEP “field” labs’ proposal on the agenda.

**Conclusion:** The Sector agreed with the proposal from the NTEP “field” labs to eliminate the permanence test requirements in Publication 14 Section 68 and to limit the evaluation to “in-motion” controllers since the W/LRE is required to be evaluated as a static railway track scale in Publication 14 Section 69. Performance and Permanence Tests for Railway Track Scales Used to Weigh Statically. The Sector agreed to change the term “coupled in-motion” systems to “in-motion” systems since the type evaluation requirements apply to both coupled and uncoupled in-motion railway track scale controllers.

The Sector also asked the NIST technical advisor to develop a Publication 14 definition of the term “in-motion controller.” The NIST technical advisor will investigate the possibility on making the definition broad enough to include controllers for other “in-motion” weighing devices such as dynamic monorail scales. The proposed language will be voted on by the Sector in a letter ballot prior to the 2008 NCWM Interim Meeting.

The Sector suggested minor changes to the NTEP “field” labs’ proposed amendment to Section 68 as shown in Appendix A – Recommendations to Publication 14 – Agenda Item 2 and recommended the changes be incorporated into Publication 14.

### 3. Vehicle and Railway Track Scale NTEP Capacity – Technical Policy (New)

**Source:** Don Onwiler, Nebraska

**Background:** This item questions the necessity of basing the NTEP-certified capacity limits of vehicle and railway track scales on strain-load testing.

- In Nebraska’s experience, performance problems are identified in type evaluations during section tests. By the time a strain-load test is conducted, problems related to performance have been identified and corrected. (Note: The shift test is usually conducted first because this test frequently reveals accuracy problems.)
- In section testing on vehicle scales, the evaluator is testing to at least 90 % of CLC. This provides a better test of the upper range capabilities of a scale than strain-load testing which distributes the load to multiple sections of the scale.
- For railway track scales, the minimum strain load is 200 000 lb, regardless of the desired nominal capacity. If a manufacturer requests to amend a CC for a higher capacity, Publication 14 Technical Policy 8.2.a. (for scales with a capacity greater than 200 000 lb) only obligates the evaluator to repeat the tests completed in the original evaluation since there are no differences in the required load used for the strain-load test.
- Handbook 44 provides formulas for maximum nominal capacity of these devices based on CLC and section capacities.

Strain-load tests may still have value in demonstrating the ability of the scale sections to interact with each other and sum together to provide accurate weighments when loads are distributed on the platform.

Nebraska recommends the following:

- Modify the Publication 14 DES Technical Policy for Scales to allow a maximum capacity for vehicle and railway track scales based on the formulas in paragraphs S.6.1. and S.6.4. in Handbook 44, and
- Modify the evaluation checklist for vehicle scales to provide guidance for minimum strain loads other than the traditional nominal capacity provided by the manufacturer or submitter of the device. For example, NTEP could perform a stain-load test to 160 000 lb or 80 % of the calculated maximum nominal capacity of the device under evaluation, whichever is less.

The Sector agenda included additional background from HB 44 Scales Code marking requirements, the 1994 and 2001 S&T Committee Final Reports, and the 2000 NTETC Weighing Sector Final Report discussing the original

justification and history on the development of CLC and section capacity and the ranges covered on the CC for scales with a capacity greater than 200 000 lb.

**Conclusion/Discussion:** The Sector reviewed the background information in the agenda and agreed there is no value in conducting an additional evaluation to increase the section and nominal capacity of a railway track scale CC since there is no difference in the tests to be conducted on the scale with increased capacities. The Sector recommended the NTEP director review the application under question to verify the request to amend the CC is consistent with existing CCs with similar parameters.

The Sector also agreed there is a loophole in the existing policies for RR track scales with a capacity greater than 200 000 lb. The SMA and AREMA Committee 34 volunteered to work on the testing requirements for vehicle and railway track scales with capacities greater than 200 000 lb and provide to the NTEP director and NIST technical advisor an update on developing a proposal for consideration by the Weighing Sector prior to the 2008 NCWM Interim Meeting.

## Carryover Items

### 4. Recommended Changes to Publication 14 Based on Actions at the 2007 NCWM Annual Meeting

The NIST technical advisor, Steve Cook, provided the Sector with specific recommendations for incorporating test procedures and checklist language based upon actions of the 2007 Annual Meeting of the 92<sup>nd</sup> NCWM. The Sector was asked to briefly discuss each item and, if appropriate, provide general input on the technical aspects of the issues.

#### 4.(a) G-S.2. Facilitation of Fraud

**Background:** See the Annual Report of the 2007 NCWM S&T Committee Agenda Item 310-1 for additional background information regarding the discussions to amend HB 44 General Code paragraph G-S.2. During its 2007 Annual Meeting, the NCWM agreed to amend HB 44 1.10. General Code G-S.2. in the 2008 Edition of HB 44 to clarify that the prohibition against facilitating fraud applies to electronic manipulation or alteration of electronically programmed and coded components of weighing and measuring devices.

**Conclusion:** The Sector agreed with the NIST technical advisor that no changes to Publication 14 are required to reflect the amended language in HB 44 paragraph G-S.2.

#### 4.(b) G-S.5.6.1. Indicated and Recorded Representation of Units – Appropriate Abbreviations and Table 1. Recorded Representation of SI Units on Equipment with Limited Character Sets

**Background:** See the Annual Report of the 2007 NCWM S&T Committee Agenda Item 310-2 for additional background information regarding discussions to amend the 2008 Edition of Handbook 44 General Code paragraph G-S.5.6.1. and Table 1. to require abbreviations for SI units as specified in NIST Special Publication 811 “Guide for the Use of International System of Units (SI)” and HB 44 Appendix C – General Tables of Units of Measurement for both indications and recorded representations on new technology. The amendment would also continue to permit exceptions to those guidelines for older equipment with limited character sets.

**Discussion:** The Sector reviewed the changes to HB 44, Publication 14 DES Section 76, and HB 44 Appendix C page C-4 and noted that Publication 14 may be in conflict with HB 44 since Appendix C (page C-4) lists the abbreviation for “grain” (gr) and Publication 14 DES Section 76 List of Acceptable Abbreviations/Symbols lists different abbreviations for the word grain as “GRN,” “grn,” or “GN.”

**Conclusion:** The Sector reviewed HB 44 Appendix C – General Tables of Units of Measurement and agreed the exceptions in Publication 14 Section 76 are appropriate since they are widely used in the marketplace and cannot be confused with other abbreviations in HB 44.

The Sector also agreed to recommend the changes to DES Section 12 and 76 as proposed by the NIST technical advisor as shown in Appendix A – Recommendations to Publication 14 – Agenda Item 4.(b).

#### **4.(c) G-S.8.1. Multiple Weighing or Measuring Elements that Share a Common Provision for Sealing**

**Background:** See the Final Report of the 2007 NCWM S&T Committee Agenda Item 310-3 for additional background information to add paragraph G-S.8.1. to the General Code of the 2008 Edition of Handbook 44. General Code Paragraph G-S.8.1 regarding the identification of adjustments to individual weighing or measuring elements is required when systems have multiple weighing or measuring elements with a single provision for sealing.

**Conclusion:** The Sector agreed to recommend the addition of new language to DES-10 in Pub 14 as proposed by the NIST technical advisor, which is shown in Appendix C (Agenda Item 4.(c)).

#### **4.(d) S.1.1.(c) Zero Indication (Marking Requirements)**

**Source:** 2004 Weighing Sector Agenda Item 4 – S.1.1.(c) Zero Indication (Marking Requirements).

**Background:** See the Annual Report of the 2007 NCWM S&T Committee Agenda Item 320-1 for additional background information regarding the justifications for and against the proposed language to amend Scales Code paragraph S.1.1.(c) Zero Indication (Marking Requirements).

**Discussion/Conclusion:** The Sector reviewed the proposed amendments to Publication 14 to verify that automatic means are provided to inhibit a weighing operation or to return to a continuous digital indication when the scale is in an out-of-balance condition according to the requirement in paragraph S.1.1.(c) Zero Indication. The NIST technical advisor used the requirements and procedures from Measurement Canada’s laboratory and field manuals to develop the proposed changes to Publication 14.

The Sector agreed the proposed amendments to Publication 14 deleted the references to requiring additional markings when a scale is capable of displaying other than a digital zero indication when the scale is in a zero balance condition. The Sector also discussed the proposed terms and definitions and agreed that the definitions for screen saver and sleep modes could be combined since the only difference between the two features was what was or was not displayed. The Sector also agreed to modify the proposed definition for the power save mode to clarify that it requires operator intervention in order to bring the scale back to normal operation.

The Sector noted the proposed amendment to the checklist did not identify all the ways a scales could automatically enter or exit these modes. Therefore, the Sector developed the following table to summarize when a scale can automatically enter the screen saver and power save modes and what was required by either the operator or the scale to exit the screen saver and power save modes to assure automatic means are provided to inhibit a weighing operation or return to a continuous digital indication when the scale is in an out-of-balance condition.

The Sector also recommended that the NIST technical advisor revise the proposed amendment to Publication 14 to address the conditions under which a scale goes into and comes out of one of these modes. The revised proposal will be balloted to the Sector and the final recommendation will be presented to the NTEP Committee prior to their meeting during the January 2008 NCWM Interim Meeting.

Summary of Screen Saver/Sleep and Power Save Mode of Operation				
Mode	Display	Activated by	Exited by	Verified by
Screen Saver/Sleep	i.e., Scrolling or other non metrological information, blank, or annunciator,	Period of time at gross load center of zero	Change in weight, i.e., no longer at gross load zero	<i>Accurate weights are displayed</i> when: - weight is added to the LRE - weight is removed from the LRE, and - the LRE is disturbed by hand
		Period of time with a non changing load on the scale	Deliberate operator action (remove load off scale and rezero if necessary)	<i>No weights are displayed</i> when: - weight is added to the LRE - weight is removed from the LRE, and - the LRE is disturbed by hand
Power save	Off/Blank	Period of time with no activity on the LRE (loaded or unloaded)	Pressing a button, or other deliberate operator action (e.g., turn on the scale, etc.)	<i>Accurate weights are displayed</i> according to Publication 14 Section 53. Values Displayed, Temperature Conditions (Warm-up) Test Procedure 1 or 2

#### 4.(e) Bench/Counter Scale Shift Test and Definitions

**Source:** 2006 NTETC Weighing Sector Item 3 (Carryover Item)

**Background:** See the 2006 Summary of the Weighing Sector Agenda Item 3 and the Annual Report of the 2007 NCWM S&T Committee Agenda Item 320-6 for additional background information regarding proposed language to amend Scales Code shift test definitions and procedures.

At the 2007 NCWM Annual Meeting, the S&T Committee believed there was sufficient support for this item with the correction of the references to Figures 1 and 2 in proposed paragraphs. Consequently, the Committee agreed to present the item for a vote and the item was adopted.

These adopted changes apply to all types of platform scales with fewer than three sections except for livestock, vehicle, and railway track scales, vehicle on-board weighing systems, and other scales listed as exceptions in Scales Code paragraph N.3.8. These changes include:

1. deleting paragraph N.1.3.1. Bench and Counter Scales and renumbering subsequent paragraphs;
2. changing the test load for the shift test from 50 % to a range of 30 % to 35 % of the scale capacity;
3. changing the shift test pattern for bench and counter scales to be the same as the current test pattern for the other scales listed in paragraph N.3.7. (formerly N.3.8.); and
4. providing guidance to the application of standards in a manner that is safe for the weights and measures inspector and will not over-concentrate the test load on the load-receiving element.

The major revision to the shift test procedures were made to shift test paragraph N.3.8 which was been renumbered to N.3.7.

**Discussion/Conclusion:** The Sector reviewed the background information and discussed the revisions to Publication 14 developed by the NIST technical advisor to amend shift test loads from one-half scale capacity to a range of 30 % to 35 % of the scale capacity, including a recommendation to “editorially” amend the references “bench and counter scales” to “platform scales with four or less load supports.”

The Sector agreed with the proposed editorial changes throughout the Digital Electronic Scales checklist, changes to Section 31. Multi-Interval Scales and Sections 63 and 64 as shown in Appendix A – Recommendations to Publication 14 – Agenda Item 4(e) and recommends that they be incorporated into Publication 14.

## 5. Publication 14 Force Transducer (Load Cell) Family and Selection Criteria – Report of the Load Cell Work Group (WG)

**Background:** During its 2006 Annual Meeting, the Sector agreed with the suggestion for the NTEP Director to forward the proposal to change the Publication 14 Force Transducer (Load Cell) Family and Selection Criteria to holders of NTEP CCs for review and comment by December 1, 2006.

**Discussion/Conclusion:** The NTEP Director provided the Sector with an update to the status of this item. He reported that he had not received any objections or alternate recommendations on the proposed OIML R 60-based selection criteria (see Appendix C – Attachment to Agenda Item 5 for a copy of the OIML R 60-based load cell selection criteria) and that NTEP will soon receive load cell applications requesting NTEP CCs based on the evaluation of test data from international government laboratories certified to issue test data under the Mutual Acceptance Arrangement (MAA). Additionally, the Publication 14 language on the “selection of load cells” was not identified as an additional national requirement during the “Committee on Participation Review” process since the language in R 60 was developed by the United States; therefore, the load cells submitted for evaluation by the international laboratories will be selected using selection criteria in OIML R 60.

The Sector discussed options for establishing different load cell selection criteria for U.S. and international manufacturers (Publication 14-based criteria for U.S. manufacturers and OIML R 60-based criteria for international manufacturers). However, it was pointed out that this proposal would not be compatible with an existing load cell CC when there is a request to amend the CC. There was also a suggestion for a five-year “phase-in period” after which time existing CCs could no longer be updated using the 2007 Publication 14-based criteria.

Since there were only two load cell manufacturers at the Sector meeting, Darrell Flocken and Stephen Langford stated they would bring this issue before the SMA technical committee during their November 2007 meeting to discuss possible recommendations. Additionally, they will provide the NTEP director and NTEP Committee a report of the discussion and possible recommendation prior to the January 2008 NCWM Interim Meeting.

## 6. Report of the Tare Work Group

**Source:** NTEP Participating Laboratories (Carryover Item):

**Background:** See the 2006 NTETC Weighing Sector Meeting Summary Agenda Item 5, Tare on Multiple Range Scales, for additional background information on the earlier Sector discussions and WG developing items and recommendations.

During its 2006 Annual Meeting, the Sector further recommended the NIST technical advisor submit the Tare Work Group recommendations to the SWMA S&T Committee. These items were considered by the 2006 NCWM S&T Committee. Following is a brief recap of the recommendations and actions by the NCWM. Note there is additional background information available in the 2007 Final Report of the 92<sup>nd</sup> NCWM S&T Committee.

### 6.(a) Add New and Amended Tare Definitions and Tare Requirements

**2006 Sector Recommendation:** Add new and amended definitions to facilitate a uniform understanding of the terms already used in Handbook 44 (e.g., “tare mechanism,” “tare,” “net,” etc.) in Handbook 44 Appendix D – Definitions.

**NCWM Recommendation/Action:** This item became 2007 NCWM S&T Committee Agenda Item 320-9 and was given “informational” status. The S&T Committee agreed that lengthy discussions on all of the tare proposals demonstrate that, although it is necessary to address tare, the matter is too complex to move forward without a more thorough review of all related proposals by the Weighing Sector and jurisdictions. Consequently, the Committee recommended this proposal and other related proposals intended to address tare features remain as Information Items for further review and development. The Committee also agreed that all tare-related items, when ready, should be presented for voting as a block.

**Discussion:** The NIST technical advisor has incorporated the changes to proposed definition of “tare mechanism” as recommended by the S&T Committee and updated the Tare Work Group Handbook 44 “Tare” recommendations based on its August 7, 2007, conference call. The Sector was asked to review the Handbook 44 “tare” recommendations and provide the Tare Work Group and the S&T Committee any comment or suggestions (see Appendix C – Attachment to Agenda Item 6 for a copy of the Tare Work Group recommendations).

**Conclusion:** The Tare WG has completed its work. The Sector agrees the majority of the proposed language is currently verified in Publication 14 with G-S.2. Facilitation of Fraud, S.2.1.6. Combined Zero/Tare(O/T) Key and S.2.3. Tare listed as the HB 44 code references. The WG did not change any existing HB 44 Tare requirements and recommended an amended definition for “Tare mechanism.” The Sector also agreed with the WG that the highlighted items for calculated weights and the identification of preset tare weights go beyond what is currently evaluated by NTEP and recommends these items be split into 320-3B and 320-3C.

#### **6.(b) Amend Scales Code and AWS Code Paragraph S.1.1.1. Digital Indicating Elements**

**2006 Sector Recommendation:** Amend Scales Code and AWS Code paragraph S.1.1.1. Digital Indicating Elements to clarify that a scale can display a “center-of-zero” indication with a load on the platform, provided the indication has been zeroed by a tare mechanism while the scale is in the net mode of operation.

**NCWM Recommendation/Action:** This item became 2007 NCWM S&T Agenda Item 320-2 and was given “informational” status. This proposal was amended after the 2007 NCWM Interim Meeting to include language addressing the “center-of-zero” requirements to coincide with 2007 NCWM S&T Agenda Item 320-1, S.1.1.(c) Zero Indication; requirements for markings of indications for other than digital zero indications. Item 320-1 was withdrawn from the agenda making the changes to S.1.1.1.(a) no longer necessary.

At the 2007 NCWM Annual Meeting, the Committee heard testimony from the CWMA, NEWMA, WMD, and SMA stating that this item has changed from the original intent to verify that zero tracking could be operable in the net mode, to now include the addition of other language which alters the requirement even more. For example, in paragraph S.1.1.1.(a), stating “and” instead of “or” would make both requirements mandatory. Also, if “or” is used instead of “and,” then this proposal lowers the current requirement of  $\frac{1}{2}e$  to  $\frac{1}{4}e$ . The SMA further stated that the wording in the proposed paragraph (a) adds a dual requirement inconsistent with Canadian and OIML requirements. Therefore, the CWMA, NEWMA, and SMA recommended the proposal be moved back to informational for further consideration.

The Committee agreed with comments that the modifications to the originally proposed language in Publication 15 that now appears in Publication 16 significantly changed the original intent of the proposal. Additionally, the changes to the center-of-zero indication requirements are in conflict with OIML recommendations and Canadian requirements.

The Committee recommends the alternate proposal from the WMD in the Committee’s Annual Report become a carryover item for the 2008 Committee agenda since that text is consistent with the intent of the original proposal from the NTETC Weighing Sector.

**Discussion/Conclusion:** The Sector reviewed the above information and agreed to support the WMD language as recommended in the 2007 NCWM S&T Committee Final Report on Agenda Item 320-2.

#### **6.(c) Amend Scales Code Paragraph S.1.2.1. Weight Units**

**2006 Sector Recommendation:** Amend Scales Code paragraph S.1.2.1. Weight Units and AWS Code paragraph S.2.1. Value of Division Units by adding a note that permits calculated net weights from multi-interval and multiple range scales to be in units other than 0, 1, 2, and 5 in order to maintain the accuracy of tare weights when the gross weights are in a weighing range with a larger scale division.

**NCWM Recommendation/Action:** This item became 2007 NCWM S&T Committee Agenda Item 320-3. During the 2007 NCWM Annual Meeting, the Committee heard comments from the CWMA and NEWMA supporting this

item with recommendations to change the word “value” to “division” and incorporating the SWMA recommendation to modify paragraph S.2.3.

NEWMA pointed out that the proposed amendment to S.1.2.1. appears to be permissive and not a requirement and asked if the intent was to prohibit multi-interval and multiple range scales from rounding indicating calculated net weights in scale divisions to only 1, 2, or 5 when appropriate or is rounding the scale divisions of 1, 2, or 5 still allowed? The WMD representative to the NCWM Tare Work Group stated that the intent was for the language to be permissive because there are a significant number of NTEP-certified devices in the marketplace that round tare values before calculating net weights.

The S&T Committee made several modifications to the proposal:

- to clarify the examples in the proposed note to paragraph S.1.2.1., and
- to clarify the SWMA proposed modification to the language in S.2.3. for an exception for multi-interval and multiple range scales only applies to the requirement that the value of tare shall be equal the value of the scale division.

The Committee also agreed that the words “scale value” should be changed to “scale division” and recommended the NIST technical advisor forward the amended proposal to the Tare Work Group and NTETC Weighing Sector for their consideration and comment.

During their August 7, 2007, conference call, the Tare Work Group agreed with the recommendations of the S&T Committee. The group also recognized that the proposed note in S.2.1. is inconsistent with OIML R 76. The Group also noted that the R 76 solution to similar examples is to indicate and record net weight calculations where that would be mathematically incorrect since the net weight display would be rounded to the value of d based on the internal resolution of the gross and tare weights.

**Discussion/Conclusion:** The Sector reviewed the above information and provided the S&T Committee with the following comments:

The Sector supports the item, however it believes there is insufficient information in the example. The example in the note for paragraph S.1.2.1. should provide the values for d or e for each weighing range or segment. Additionally, the second example should come up with a net value that is different than the first example.

The Sector did not have time to provide alternate examples. However, the NIST technical advisor agreed to work with the WWMA S&T Committee during their annual technical conference that immediately followed the meeting of the Weighing Sector.

#### **6.(d) Amend Scales Code Tolerance Paragraph T.N.2.1. General**

**2006 Sector Recommendation:** Amend Scales Code paragraph T.N.2.1. General and AWS Codes paragraph T.2.1. General to clarify that tolerances are also applied to net weight indications from a net indication of zero using any possible tare load.

**NCWM Recommendation/Action:** This item also became 2007 NCWM S&T Committee Agenda Item 320-3. The S&T Committee further modified the proposed formula for subtractive tare in subparagraph 1 that appears in the definition of “tare mechanism” to clarify that the combined net and tare net weight value should not exceed the permissible gross weight capacity.

The S&T Committee agreed that lengthy discussions on all of the tare proposals demonstrate that, although it is necessary to address tare, the matter is too complex to move forward without a more thorough review of all related proposals by the Weighing Sector and jurisdictions. Consequently, the S&T Committee recommended this proposal and other related proposals intended to address tare features remain as Information items for further review and development. The Committee also agreed that all tare related items, when ready, should be presented for voting as a block.

**Discussion/Conclusion:** The Sector reviewed the proposal to amend Scales Code paragraph T.N.2.1. and AWS Code paragraph T.2.1. and agreed that it has no additional comments to forward to the NCWM S&T Committee.

## 7. Minimum Size of Weight and Units Indications

**Source:** 2006 Weighing Sector Item 6 (Carryover Item)

**Background:** See the 2007 NCWM Specifications and Tolerance Committee Annual Report Item 320-4 “S.1.4.6. Height., Definition of Minimum Reading Distance, UR.2.10. Primary Indicating Elements Provided by the User and Definition of Primary Indications,” and the 2006 Weighing Sector Summary Item 6 for additional background information.

This proposal was originally developed to address a growing problem with the readability of weight indications and the values that define transaction information. Field and laboratory officials indicate both are becoming increasingly smaller, as demonstrated in the 2006 Weighing Sector (Item 6) example of a weight display where the actual size of the weight values are 23 mm in height, but the unit of measurement (g) is 4 mm in height.

The status of this item was changed to Developing during the January 2007 NCWM Interim Meeting and was moved to Appendix A as Item 360-2: Developing Items Part 1, Item 1 Scales. During the 2007 NCWM Annual Meeting, the Committee was informed that the NTETC Weighing Sector will continue to develop this item.

At its 2007 NTEP Participating Laboratory meeting, the weighing device labs discussed this item and reviewed the equivalent recommendations in OIML R 76. It was noted that the minimum height requirement for the weight display applied to scales used in direct sale applications with a capacity of 100 kg or less. Additionally, it was noted that R 76 was written to apply to weighing devices that indicated primarily in SI units and that U.S. scales are frequently configured with both SI and inch-pound units. The labs agreed with the suggestion that the proposed language for the minimum height of the weight display be limited to scales used in direct sales with a capacity of 100 kg or less. The minimum height of the “units” indication only would be applicable to devices with external lb/kg switching capability since there would be no chance of facilitating fraud using the lb/kg switching capability.

The NIST technical advisor contacted a manufacturer about the labs’ recommendation to revise proposed S.1.4.6. The manufacturer believed most products could comply; however, he could not speak for other manufacturers. He also stated that this did not address questions about the minimum size of an annunciator that points to a unit legend silkscreen on the scale next to the annunciator.

WMD believes there has been too little discussion on the clarity of the displays and annunciators and perhaps the proposal should include language similar to the following Handbook 130 Packaging and Labeling Regulation paragraphs:

- 8.1.2. Style of Type or Lettering states that the “declaration or declarations of quantity shall be in such a style of type or lettering as to be boldly, clearly, and conspicuously presented with respect to other type, lettering, or graphic material on the package, except that . . .,” and
- 8.1.3. Color Contrast states that the “declaration of quantity shall be in a color that contrasts conspicuously with its background . . .”

**Discussion/Conclusion:** The NIST technical advisor amended the proposal to address the concerns and suggestions from the manufacturers, NTEP labs, and WMD. The NIST technical advisor did not develop any changes to the proposed definition of “Primary Indications” or to the proposed User Requirements and associated definition for “Minimum Reading Distance.”

Manufacturers stated they prefer the proposed paragraph be written so the requirements apply to new NTEP applications instead of all devices manufactured after the effective date. They state that the cost to modify the design of the scale displays is not justified considering they have not received comments from their customers stating consumers are complaining that the size of the displays are too small. Additionally, the majority of the

Sector believed the current definition for “primary indications” in HB 44 is sufficient and that it be deleted from the proposal.

The Sector agreed to submit the following revised language to the regional weights and measures associations and the NCWM S&T Committee. The Sector also recommends deleting the proposed amendment to the definition of primary indications. Additionally, the Sector did not discuss or make any recommendations on the proposed user requirements and definition for “minimum reading distance.”

#### **S.1.4. Indicators.**

**S.1.4.6. Direct Sale Primary Indications – Size and Character. Scales designed for direct sale applications with a capacity of 100 kg (200 lb) or less shall comply with the following:**

- (a) **All indications shall be indicated clearly and simultaneously.**
- (b) **All indications and associated descriptive markings (e.g., lb, kg, gross, tare, net, etc.) shall be presented in such a style of type or lettering as to be boldly, clearly, and conspicuously presented with respect to other type, lettering, or graphics and shall be at least 2 mm (<sup>3</sup>/<sub>32</sub> in) high.**
- (c) **All indications and associated descriptive markings shall be in a color or shade that contrasts conspicuously with its background.**
- (d) **All primary numeric indications displayed to the customer shall be at least 9.5 mm (0.4 in) high.**
- (e) **All units and descriptors shall be at least 2 mm (<sup>3</sup>/<sub>32</sub> in) high.**  
**[Nonretroactive as of January 1, 200X]**  
**(Added 200X)**

#### **New Items**

### **8. Level Indicating Means – Out-of-Level Test**

**Source:** Paul Lewis, Rice Lake Weighing Systems

**Background:** Rice Lake Weighing Systems reported there appears to be some confusion within the weighing industry regarding the interpretation of the level requirements in Handbook 44 and Publication 14. Several individuals believe the reference to 5 % refers to 5 % of 90 degrees. This would make the angle for the requirements 4.5 degrees. Therefore, some manufacturers are stating that their devices are “certified” for use out-of-level up to 4.5 degrees.

Handbook 44 Scales Code paragraph S.2.4. Level-Indicating Means. states:

Except for portable wheel-load weighers and portable axle-load scales, a portable scale shall be equipped with level indicating means if its weighing performance is changed by an amount greater than the appropriate acceptance tolerance when it is moved from a level position and rebalanced in a position that is out of level in any upright direction by 5 % (approximately three degrees). The level-indicating means shall be readable without removing any scale parts requiring a tool.

Rice Lake reports that the reference to 5 % infers this is based on a grade or slope on a 180 degree plane. However, HB 44 does not clearly state it.

The NTEP director added that 5 % out of level means a rise of 5 % of a 100 % run or, in other words, the increase in height is 5 units for every 100 units of run. That means a 45 degree angle would be a 100 % slope. Using this you can calculate the angle by taking the arctangent of <sup>5</sup>/<sub>100</sub> or 0.05 which is 2.86 degrees or, rounded off, 3 degrees.

Rice Lake submitted a proposal to amend Publication 14 Digital Electronic Scales Sections 56. Level-Indicating Means – Portable Scales, 63.4. Out-of-Level Test (If Applicable), and 71 Performance and Permanence Tests for Type Evaluation of Electronic Vehicle-On-Board Weighing Systems by adding a new note to clarify the requirement.

Sector members pointed out that the reference paragraph in HB 44 states that the scale's weighing performance cannot shift by an amount greater than the appropriate acceptance tolerance when it is "placed out-of-level by 5 % (approximately three degrees)." The exact conversion of 5 % to degrees is 2.86 degrees. As a result, it is possible that a portable scale without a level indicating means may comply with paragraph S.2.4. when placed out-of-level by 5 % and fail when placed out-of-level by 3°. Additionally, some Sector members believe this is more an interpretation issue that can be better addressed in EPOs, newsletters, etc., and that Publication 14 section 63.4. "Out-of-Level Test" uses the phrase "3° (or 5 percent)" instead of the language in HB 44 paragraph S.2.4. "5 % (approximately three degrees)."

The Sector agreed to recommend the language in Publication 14 be amended to be consistent with HB 44 and that a note be added to clarify that "5 percent refers to a 5 percent slope/grade."

## 9. Wireless Communication Information on the Certificate of Conformance (CC)

**Source:** Stephen Langford, Cardinal Scale Manufacturing Co./Detecto Scales Co.

**Background:** The Sector was asked to review the 2006 Summary of the Weighing Sector Agenda Item 9 for additional background information regarding the development and subsequent recommendation of the type evaluation procedures for wireless communication for metrological information.

Stephen Langford, Cardinal Scale Manufacturing Co./Detecto Scales Co. stated that in many instances the wireless component consists of a separate module connected to the serial port on the indicating device. This module is usually a purchased item although in some instances could be contained within the indicating device enclosure. Listing a specific make or model of the wireless module on the indicating device's NTEP Certificate of Conformance effectively limits the manufacturer to the use of that specific wireless module which was used in the original evaluation. This presents a problem when, the manufacturer is no longer able to purchase that particular device, a more cost-effective substitute is found, or a change is made in the module. In these instances, the manufacturer has no alternative but to have their device re-evaluated in order to maintain the wireless feature on the NTEP certificate.

Cardinal/Detecto also recommended that the wireless feature should be listed simply as a "wireless interface" rather than listing a specific model of wireless interface module. This would allow other types of wireless modules to be substituted without having to submit the device for further examination.

Cardinal/Detecto also stated that NTEP is concerned with the manner in which the indicating or transmitting device and the peripheral or receiving device respond to the loss or degradation of the wireless signal. NTEP is not concerned with the manner in which the data is transmitted or the frequency or type of modulation or encryption method. NTEP's primary concern, however, is that an incorrect weight value is not displayed, recorded, or otherwise interpreted as a valid weight. This is a function of the indicating device and/or the receiving device and not that of the wireless module. Therefore, the characteristics of the wireless module itself are not metrologically significant and, hence, do not need to be listed on the NTEP certificate.

**Discussion:** The Sector reviewed the background information and discussed the recommendation to amend the information on the NTEP CC to discontinue listing the specific model of the wireless interface and list the "wireless interface" as a feature or option on the NTEP CC.

The Sector also discussed the value of listing the specific model of the wireless communication device(s) on the scale CC since the majority of the devices are added onto the device as opposed to being an integral part of the scale. An example of an integral wireless communication scale is a crane scale where the load-receiving element is

remotely located from the user operator and indicating element. Alternatively, a crane scale can have wireless communication through a non-integral wireless device provided by the OEM or a third party supplier.

Manufacturers stated that it would be difficult for the holder of a CC to keep the CC up-to-date due to the frequent turnover of suppliers and models of wireless communication devices. A participating laboratory stated that using a wireless device is equivalent to a cable that connects separable elements. Other manufacturers stated that the non-integral devices not submitted for NTEP verification, including third party add-on devices, should be permitted provided the “wireless communication” of digital information was verified during type evaluation with a representative wireless communication device. The manufacturers also stated that this policy should not apply to wireless devices that transmit analog information from a W/LRE and the indicating element.

**Conclusion:** Based on the above discussion, the Sector stated that it is not necessary to indicate the specific model of a wireless device on a CC. Additionally, it was noted that Publication 14 does not require the model designation of the wireless device be listed on the CC. The Sector recommended the term “wireless interface” be listed as a “Standard Feature or Option” on the CC rather than listing the specific model of the wireless device. The Sector also recommended that the manufacturer and model of the wireless device be included in the “Test Conditions” portion of the CC to be consistent with the technical policy in Publication 14 Section B. Certificate of Conformance Parameters which states that only the features and options evaluated will be included on the CC.

During the development of the Sector summary, the NIST technical advisor reviewed Publication 14 to determine if changes were needed in case the Sector recommendation was in conflict with existing technical policies and checklist procedures. Although it appears there are no conflicts, the technical advisor recommended the following changes highlighted in underlined and shaded text to section 11.19 to facilitate consistent application of the Sector recommendation. The technical advisor believes that no changes to Publication 14 Section B. Certificate of Conformance Parameters and the procedures in sections 11.19.1 through 11.19.6 are required.

11.19. As used in this section, a wireless communications device may include weighing elements, load-receiving elements, indicating elements, recording elements (output), etc., with integral or separate add-on communication devices capable of transmitting and/or receiving metrological information between elements.

In order for the wireless communication capability to be listed on the CC, the following procedures shall be used to evaluate indicating elements that communicate digital weight and other information from separable load-receiving elements (LRE) or other peripheral equipment (i.e., PC or remote control) by means of a radio transmitter/receiver or other wireless communication devices. At least two (2) complete devices (e.g., crane scales), or a combination of separable indicating, LRE, and recording elements shall be evaluated to ensure:

11.19.1. . . .

## 10. Hopper Scale Design Parameters – Technical Policy

**Source:** NTEP Participating Laboratories

**Background:** Currently due to changes in some state requirements, hopper scales used in concrete batch plants need to be NTEP certified. This presents a concern as to what defines the “type” of hopper scales since there are a multitude of hopper scale variants in order to fit different installations and applications. Also, as the labs discussed, “What characterizes the parameters that will be covered on a single NTEP CC?”

With concrete batch plants in particular, there can be several different shapes, capacities, numbers of supports, method of load application (tension/compression), and permanent/portable designs, etc., all at one installation site.

No specific information is contained in Publication 14 regarding the tests required for these different parameters.

This item was discussed at the May 2007 NTEP Lab meeting. The labs were not in agreement as to the parameters that would define the device type. The labs were also not in agreement as to whether or not these different parameters should be contained on a single NTEP CC or each different parameter should be on a separate NTEP CC. The only parameter listed in Publication 14 is rectangular or circular hopper. There is no mention of number of supports, supports above or below (tension or compression), or several other parameters in Publication 14. During the meeting, the labs discussed this issue and could not reach consensus. The labs did develop a list of possible parameters to consider.

The following is a list of design (type) and installation parameters regarding Hopper Scales developed by the NTEP labs during their May 2007 Annual Meeting:

1. Hopper shape (rectangular, round or oval)
2. Load cell type (suspension vs. compression)
3. Portable vs. permanent installation
4. Mechanical
5. Electronic
6. Electro-mechanical
7. Number of supports
8. Material input and output mechanism
9. Accuracy class, no. of divisions, (based on information provided by the applicant)
10. Peripherals
11. Tolerance values (Class III, Class III L, Grain, Construction Material, ABWS, etc.)

**Discussion:** The NIST technical advisor reported on the NTEP laboratories' discussion just prior to the Sector meeting and noted the following items that need to be reviewed or addressed:

- Publication 14 only discusses some of the parameters for circular or rectangular designed hopper scales.
- The list of design parameters started by the labs should be reviewed and discussed.
- Publication 14 must cover the HB 44 differences between Class III, III L, and construction material hopper scales.
- How should the multiple variations of hopper scales in an installation used for a single evaluation be treated?
- How many certificates need to be issued if there are different types of scales in one installation?
- What tests need to be done?
- What can be covered in a single evaluation and CC?
- “Modification of type” technical policies are needed since there are scale retrofits that convert mechanical scales to full electronic scales and hoppers to hopper scales.
- How are current active CCs going to be treated when an application is received to revise the CC?
- CCs for only lever systems without the tank/hopper.

The Sector was asked to review and discuss these items (and others that may not be listed) and to provide some technical guidance to the NTEP director and the NTEP labs. The labs were asked to determine whether or not each parameter is a metrologically significant parameter and then develop recommendations to amend Publication 14, Section B.6. “Certificate of Conformance Parameters for Weighing Systems Using a Tank or Hopper Load-Receiving Element.” accordingly.

The discussion was focused strictly on hopper scales since the parameters listed above are not common to other weighing devices.

Don Onwiler indicated that an increasing number of NTEP applications for hopper scales are being received, particularly for hopper scales used in concrete batch plants. Designs of these scales vary greatly by geometric shape, number and type of load cells, methods of support, etc. Mr. Onwiler added that the term “hopper scale” is insufficient to describe the “type.” Publication 14 Administrative Policy states the definition of “type” as one that “positively identifies the design” and may vary in models and parameters. Publication 14 does not provide sufficient tests to address the various designs and fails to provide guidance on what needs to be tested. Additionally, questions arose regarding what information needs to be included on a CC. Mr. Onwiler is concerned that some CCs already issued have far too many things included based on the number devices submitted for evaluation. Many Sector members had strong opinions regarding different characteristics, e.g., number of supports, different shapes, etc.

Publication 14 includes a definition of the word “type.” Don Onwiler interprets the definition to mean that each design is a type; for example, a rectangular hopper and a round hopper are different designs and therefore are also different types. The number of load cells and the kind of load cells used also affect design. Mr. Onwiler’s objective was to define design so we know how much to include on a single CC since the CC must be limited to a single design.

Stephen Patoray agreed these different parameters mentioned by Mr. Onwiler need to be tested, yet Publication 14 does not indicate this. If these examples are determined to be a different design or type, then a separate CC is needed for each. However, a single installation being evaluated can have several hopper scales that differ in many of the above parameters. NTEP needs guidance. Also, how many CCs are issued in this kind of example?

No one disagreed about the test to be performed. However, there is no guidance on what is to be listed on the CC, what describes a family, and which sample in the family is selected for evaluation.

**Conclusion:** Since there was no specific recommendation submitted on this agenda item, the Sector could not come to a consensus on the questions raised on this item and suggested that a hopper scale work group be established to (1) define what is a type, and (2) determine selection of device(s) to be submitted for evaluation, modifications that can be made to the type, and whether or not multiple types can be listed on a CC. Stephen Patoray and Don Onwiler volunteered to develop a specific proposal to be considered by the Sector during the 2008 NTETC Weighing Sector Annual Meeting.

## 11. Method of Sealing – Set-up and Verification of Calibration/Configuration Access

**Source:** NTEP Director

**Background:** At the 2003 NTEP Participating Laboratory meeting, the participating labs reported examples where a device could be sealed with a physical security seal while the device had been configured with access to external means to change calibration and configuration parameters. The labs have been using HB 44 General Code paragraph G-S.2. Facilitation of Fraud to require the applicants to correct this problem.

The discussion in 2003 was to address a specific deficiency that was found in several devices at that time. At least one device manufacturer attempted to address this deficiency with changes to the device function. This device was evaluated and based on the input from the NTEP lab, the NTEP Committee chair and the NTEP director; it was determined that this device met the requirements. Currently several NTEP labs do not believe that this “fix” is acceptable.

It was requested that the Sector review the item from the NTETC Weighing Sector Annual Meeting September 11 - 13, 2003, in Fresno, California, Final Summary, Item 18. Physical Security Seals on Scales with External Calibration Capability.

There is still disagreement among the NTEP labs on this topic. There may be a problem with Pub 14 since the current procedures and type evaluation requirements are not fully supported by HB 44 since the changes were made to Pub 14 in the anticipation of changes to HB 44 and the changes to HB 44 were never submitted.

**Discussion:** There is disagreement among the NTEP labs on this topic. If you review the 2003 item from the Sector, changes were made to Pub 14 in the anticipation of changes to HB 44. The changes to HB 44 did not happen. There may be a problem with Pub 14 since the current procedures and type evaluation requirements are not fully supported by HB 44.

Stephen Patoray described the issue and indicated there were numerous scales that NTEP had already evaluated with this feature (i.e., an internal jumper that if left installed after calibration would allow someone to go into a set-up mode whenever they desired). The devices in question had a “calibration” switch that enables external keyboard calibration and configuration adjustments. The operator’s manual clearly stated that the switch must be returned to its initial position to disable the external adjustment capability for “legal-for-trade” applications. The “fix” that was accepted required the person going into the set-up mode to answer the question “Is this a legal-for-trade device?” If answered “yes,” you had to flip a switch to get out. The only foolproof way was to make two different scales – one scale for legal-for-trade applications and one for non-legal-for-trade applications. Building two different scales was determined to be cost prohibitive.

Some members of the 2007 Weighing Sector stated that the 2003 Weighing Sector changes to the 2004 Edition of Publication 14 sufficiently addressed this problem provided device owners and service agents configured the device according to setup and calibrations procedures published in the instruction manuals provided by the manufacturer. Allowing this feature permits an inspector to seal the device not knowing if it is in the setup mode because he may not have a copy of the CC that has instructions on how to verify the “legal-for-trade” status of the scale.

The Sector considered amendments to the General Code User Requirements to include language that:

1. A device shall “be installed and a security means enabled in accordance with the manufacturer's instructions” in paragraph G-UR.2.1. Installation.
2. A device shall be located, or such facilities for normal access thereto shall be provided to permit inspecting and applying security seals according to the manufacturer's instructions to the device in paragraph G-UR.2.3. Accessibility for Inspection, Testing, and Sealing Purposes.
3. A security seal shall be appropriately affixed according to the manufacturer's instructions to any adjustment mechanism designed to be sealed in paragraph G-UR.4.5. Security Seal.

The Sector decided that changes to the User Requirements would not be suitable since users and officials may not always have access to the manufacturer’s instructions. The Sector, therefore, developed the following proposed amendment to General Code paragraph G-S.8. Provisions for Sealing Electronic Adjustable Components:

***G-S.8. Provision for Sealing Electronic Adjustable Components.*** - *A device shall be designed with provision(s) for applying a security seal that must be broken, or for using other approved means of providing security (e.g., data change audit trail available at the time of inspection), before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism.*  
*[Nonretroactive as of January 1, 1990]*

A device may be fitted with an automatic or a semi-automatic calibration mechanism. This mechanism shall be incorporated inside the device. After sealing, neither the mechanism nor the calibration process shall facilitate fraud.

(Added 1985) (Amended 1989 and 1993)

**Conclusion:** The Sector agreed to submit the proposed language to amend G-S.8. Provisions for Sealing Electronic Adjustable Components to the NCWM S&T Committee.

## **Next Sector Meeting**

**Discussion/Conclusion:** Measurement Canada (Ottawa) is the next laboratory location in the normal rotation of NTEP participating laboratories.

The Sector was asked to discuss these and other locations and make a recommendation for the date and location of the 2008 Annual Meeting of the NTETC Weighing Sector.

It was reported by some of the Sector members that several industry and weights and measures associations meetings and conferences are being held in September 2008, including the WWMA (Alaska), the CWMA (Oklahoma), and the American Railway Engineering and Maintenance-of-Way Association (Utah). A suggestion was made to have the Sector meet in conjunction with one of these associations since it would eliminate an extra trip for many Sector members attending one or more of these meeting. However, the Sector agreed to recommend that the next meeting of the NTETC Weighing Sector be held in Ottawa, Canada, and that consideration be given to schedule a date that does not conflict with the above-mentioned association meetings and conferences.

## Appendix A – Recommendations for Amendments to Publication 14<sup>1</sup>

### Agenda Item 1: CLC Type Evaluation Tests on Railway/Vehicle Scales – Technical Policy

#### E. Modification of Type (Digital Electronic Scales Checklist 12-13)

7. Adding a dump-through option/modification, without modifying the lever system or load cell placement, to vehicles, railway track, or combination vehicle/railway track scales where the vehicle load support primarily comes from the beams and girders on a scale with a combination steel and concrete weighbridge or all steel weighbridge construction, does not require evaluation for an existing CC to apply, however, the modification option must be listed on the CC.
8. Adding a dump-through option/modification, to vehicle, railway track, or combination vehicle/railway track scales with other than beam and girder design does requires an a full evaluation to be listed on a new or existing CC.
9. Adding a rotary dump feature/option/modification to a railway track scale requires an a full evaluation to be listed on a new or existing CC.
10. Adding a vehicle scale feature or option to an active railway track scale CC does not require additional evaluation provided that:
  - b. The shift test data (located over the sections and mid span between sections) be used to demonstrate compliance with the CLC requirements for the vehicle portion of the scale.
  - c. The  $e_{min}$  for the vehicle scale is the smallest  $e_{min}$  value that was evaluated on the railway track scale certificate.
  - d. The CLC for the vehicle scale portion of the device must not exceed the maximum test weight used for the section test of the railway track scale. The CLC listed on the CC shall be no greater than what would be permitted in Section B. 8. d.
  - e. The design of the LRE is no wider than 12 ft (See footnote 3 in Section B. 8.1. c.).

The railway track scale is a beam and girder design.

### Agenda Item 2: In-Motion Railway Track Scale Performance and Permanence – Technical Policy (Carryover)

#### 68. Performance Tests for Railway Track Scale **Controllers** Used to Weigh In-Motion

Performance tests are conducted to determine compliance with the tolerances. The tests described here apply primarily to the indicating element, the in-motion system controller (which may include the indicating element), and recording element(s).

The in-motion system controller performance tests are to be conducted with a railway track scale load-receiving element used in an “in-motion” railway track scale application without the use of simulation devices (e.g., load cells, sensors, and other digital inputs intended to simulate actual use).

It is assumed that the weighing/load-receiving element used during the test has already been examined and been found to comply with applicable requirements in Section 69. If the design and performance of the weighing/load-

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<sup>1</sup> Recommended changes to Publication 14 are indicated in shaded, strike-out, and underlined text.

receiving element is to be determined during the same test, the applicable requirements ~~for in Section 69. Performance and Permanence Tests for Railway Scales Used to Weigh Statically~~ must also be referenced.

The following checklist provides specific items to be checked on an in-motion railway track scale ~~system controller~~.

- 68.1. ~~Insure~~-Assure that the ~~in-motion controller~~ scale will not indicate or record a weight when the train speed exceeds the manufacturer's ~~declared~~ allowable limit. Yes  No  N/A
- 68.2. - 68.7. ~~(no change)~~ Yes  No  N/A
- 68.8. On ~~installations systems~~ where cars are not to be coupled during ~~in-motion~~ weighing, (i.e., ~~uncoupled-in-motion~~ weighing systems) the ~~in-motion controller~~ instrument must selectively prevent the weight of coupled cars from being recorded. Yes  No  N/A
- 68.9. When the ~~primary indication or recorded representation digitizer~~ indicates zeros for the weight of a railcar, a message must be printed indicating the nature of the fault. Yes  No  N/A  ~~(editorial)~~

### Handbook Compliance

~~Appropriate~~ ~~laboratory tests of the indicating element must be completed prior to the field performance and permanence testing to assure compliance with the applicable requirements of Handbook 44.~~

~~If the WIM Controller to be tested incorporates an indicating element with NTEP approval and the indicating element to be tested processes only digital information ("indicators"), then the laboratory test for Influence Factors may be waived.~~

### Test Standards ~~(no change)~~

#### Performance Test ~~(no change)~~

#### Permanence Test

~~The permanence test shall be conducted after a minimum of 20 days after successful completion of the initial performance test. It is recommended that the performance tests described above be repeated. However, if the original test car is not available, the static test may be conducted with a composite test car. The results of this test must be within the in motion tolerances specified in Handbook 44. If the device does not meet these tolerance limits, the entire test must be repeated, including successful initial performance testing and a subsequent test after a minimum of 20 days.~~

*Determine the Type of Test:* ~~(no change)~~

**Rail Scale Testing** ~~(no change)~~

**Inspect the Scale** ~~(no change)~~

**The Static Test** ~~(no change)~~

**The ~~In-~~Motion Test**

**Recording Results, Coupled-In-Motion Test Individual Car:** ~~(no change)~~

**Agenda Item 4.(b):** G-S.5.6.1. Indicated and Recorded Representation of Units – Appropriate Abbreviations and Table 1. Recorded Representation of SI Units on Equipment with Limited Character Sets

### 12. Values Defined

**Code References:** G-S.5.2.4., G-S.5.3.1., G-S.5.6., and G-S.5.6.1.

Graduations, indications, and recorded values that are intended to have specific values shall be adequately identified by a sufficient number of figures, words, and symbols. These defining terms shall be uniformly placed relative to

the graduations, indications, and recorded values and as close as practical to them without interfering with their readability. When SI units are used, the symbols shall comply with those given in Table 1 of the General Code (Section 1.10 of Handbook 44). Other symbols shall comply with the abbreviations given in Appendix C (General Tables of Units of Measurement) in Handbook 44 or NIST Special Publication SP 811 “Guide for the Use of International System of Units (SI).” Other symbols shall comply with the abbreviations given in Appendix C (General Tables of Units of Measurement) in Handbook 44. Exceptions are the abbreviations for “carat” (c or ct), U.S. short ton (ton or TN), and U.S. “long ton” (LT), and the “grain” in Publication 14 DES Section 76.

**76. List of Acceptable Abbreviations/Symbols**

Device Application	Term	Acceptable	Not Acceptable
Values Defined:	SI Units	Table 1 of the General Code NIST Special Publication 811 – “Guide for the Use of International System of Units (SI).”	
	Notes on SI Units: <ul style="list-style-type: none"> <li>lower case “kg” on display panels &amp; keys</li> <li>lower case “kg” shall should be used for printing when possible; upper case “KG” is acceptable only if lower case “kg” cannot be printed</li> </ul>		upper case “KG”
	Other symbols	HB 44 Appendix C – General Tables of Units of Measurement General Table of Weights and Measures, HB 44*	

**Agenda Item 4.(c):** G-S.8.1. Multiple Weighing or Measuring Elements that Share a Common Provision for Sealing

**10. Provision For Metrological Sealing of Adjustable Components or Audit Trail**

**Code References:** G-S.8.1. and S.1.11.

**10.11** A change to a sealable metrological parameter (calibration or configuration) of any element shall be individually identified. (Note: Compliance with this section is required on devices submitted for evaluation and manufactured on or after January 1, 2010). **Yes  No  N/A**

*Examples of acceptable identification of a change to a metrological parameter of an element include but are not limited to: (Check which solution is used on the device.)*

- A broken, missing, or replaced physical seal on an individual element.
- A change in a calibration factor or configuration setting for each element.
- Display of the date of or the number of days since the last calibration event for each element.
- A counter indicating the number of calibration and/or configuration events per element.
- Other. (Describe the solution to identify the method of sealing for each individual element.)

**Agenda Item 4.(e): Bench/Counter Scale Shift Test and Definitions**

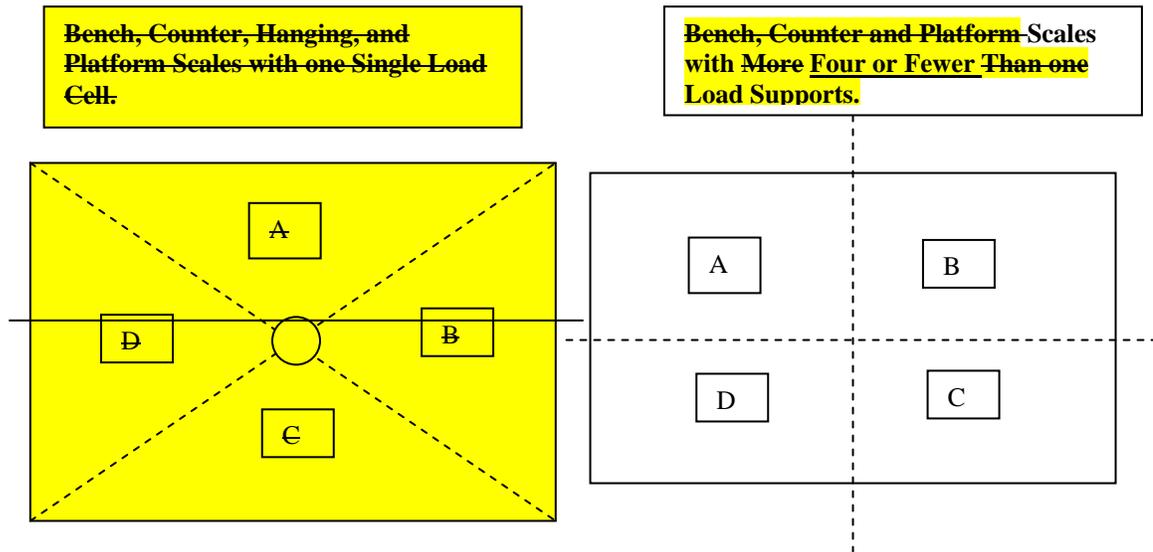
**31. Multi-Interval Scales**

A multi-interval scale is an instrument having one weighing range that is divided into partial weighing ranges (segments). Each weighing range (segment) is defined by its division size, its minimum capacity, and its maximum capacity. The selection of the appropriate weighing range (segment) is determined automatically according to the load applied, both on increasing and decreasing loads. The shift test shall be conducted at 30 % to 35 % of one-half the capacity of the scale. Corner tests, if appropriate, shall be run at one-quarter of the scale capacity. The number of scale divisions, n, for each weighing range (segment) is determined by dividing the maximum capacity of the weighing range (segment) by e of the same weighing range (segment). In the case of multi-interval scales, e must be equal to d (see NIST Handbook 44 Scales section S.5.3.).

**63. Performance and Permanence Tests for Platform Scales With Four or Fewer Load Supports Counter (Bench) Scales (Including Computing Platform Scales with Computing Capability)** page DES-90.

63.3. Shift Test

Test with test loads equal to 30 % to 35 % of one-half capacity as specified in N.1.3.47, and at test positions as illustrated below.



63.7. Field Permanence Tests

Review performance of the width of zero, zone of uncertainty, sensitivity, and discrimination near zero and at or near capacity.

Make certain that movement of the load cell cable does not affect the “live” load.

A minimum of four sets of increasing-load, decreasing-load, and shift tests are to be conducted at the evaluation installation at the start of the field permanence test. The scales are to be tested to capacity using certified test weights. The results of all increasing-load, decreasing-load, and shift tests conducted during the initial tests must be within acceptance tolerances. If scale repeatability is very good (e.g., <0.5d) the fourth test may be waived.

- 
- On the first increasing-load test, when 30 % to 35 % of one-half capacity is reached, perform a shift test with the 30 % to 35 % one-half capacity load located in each quadrant. (Be careful to avoid back-weighing.)

- 
- On the third increasing-load test, perform a **shift test at 30 % to 35 % one-half capacity** with **the** load located in each quadrant.

64. Performance and Permanence Tests For **Platform Scales With No More Than Four Load Supports (Field Permanence Tests)-Floor Scales** page DES-93.

64.1. Initial Type Evaluation Performance Test

Initial Review

•

A minimum of four sets of increasing-load, decreasing-load, and shift tests are to be conducted at the evaluation installation as the start of the field permanence test. The scales are to be tested to capacity using certified test weights. The results of all increasing-load, decreasing-load, and shift tests conducted during the initial permanence tests must be within acceptance tolerances. If scale repeatability is very good (e.g., <0.5 d), the fourth test may be waived.

- ...
- On the first increasing-load test, when **30 % to 35 % one-half** capacity is reached, perform a **shift test with the 30 % to 35 % one-half capacity** load located in each quadrant. (Be careful to avoid back-weighing.)
- On the second increasing-load test, perform a corner test at ¼ capacity.
- On the third increasing-load test, perform a **shift test at 30 % to 35 % one-half** with test load located in each quadrant.

**Agenda Item 8: Level Indicating Means – Out-of-Level Test**

**56. Level-Indicating Means – Portable Scales**

Code Reference: S.2.4.

Portable wheel-load weighers and portable axle-load scales intended for law enforcement must weigh accurately when placed out-of-level by 5 percent\* (approximately 3 degrees).

A portable scale which is intended to be moved must either be equipped with a readily observable level-indicating means (typically a bubble level) or the scale must still weigh accurately when placed out-of-level by 5 percent (approximately 3 degrees). Weighing accurately means the results must be within acceptance tolerance.

**\*Note: 5 percent refers to 5 percent slope/grade**

63.4. Out-of-Level Tests (If Applicable)

If the scale is not equipped with a level-indicating means, it must be tested in an out-of-level condition to determine compliance with paragraph S.4. Leveling-Indicating Means.

- 63.4.1. Place one side of the scale **5 percent\* (approximately 3 degrees)3 degrees (or 5 percent)** out-of-level with respect to the width axis of the scale. Zero the scale. Conduct a shift test<sup>1</sup> and increasing and decreasing load tests.
- 63.4.2. Place the opposite side or the scale out-of-level, zero, and repeat tests.
- 63.4.3. Place the front of the scale **5 percent\* (approximately 3 degrees)3 degrees (or 5 percent)** out-of-level with respect to the length axis of the scale. Zero the scale and conduct the shift, increasing, and decreasing load tests.

- 63.4.4. Place back of scale out-of-level, zero the scale, and repeat tests. All test results must be within acceptance tolerances. If the scale fails any of these tests, a level-indicating means is needed.

**\*Note:** 5 percent refers to 5 percent slope/grade.

## 71. Performance and Permanence Tests for Type Evaluation of Electronic Vehicle On-Board Weighing Systems

### Out-of-Level Tests

A vehicle on-board weighing system shall operate within tolerance when the weighing system is out-of-level up to 5 percent (approximately 3 degrees). Note that 5 percent refers to 5 percent slope/grade. However, beyond the 3 degrees or 5 percent, if the accuracy is affected by out-of-level conditions normal to the use of the device, the system shall be equipped with an out-of-level sensor that inhibits the weighing operation when the system is out-of-level to the extent that the accuracy limits are exceeded.

## Appendix B – Meeting Attendees



# 2007 Weighing Sector Meeting Attendees Marriott Rancho Cordova – Sacramento, California September 6 - 8, 2007

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## 2007 Weighing Sector Meeting Attendees Marriott Rancho Cordova – Sacramento, California September 6 - 8, 2007

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## Appendix C – Attachments

### Attachment for Agenda Item 5

#### D. Force Transducers (load cells) to be Submitted for Evaluation

Force transducers (load cells) of essentially the same design may be considered to form a family that can be listed on an NTEP CC. If force transducers (load cells) within a family are made from different materials, such as aluminum, alloy steel, or stainless steel, then all material types must be submitted for evaluation. If the force transducers (load cells) within a family are available in either a 4-wire or 6-wire version, then at least one 4-wire version and one 6-wire version must be evaluated. This policy applies to all applications for new or amended NTEP Certificates of Conformance received after January 31, 2007. This policy is non-retroactive for NTEP Certificates of Conformance issued prior to February 1, 2007.

Under the Mutual Acceptance Arrangement (MAA) for the International Organization of Legal Metrology (OIML), it is possible to obtain either an NTEP CC or an OIML R 60 Certificate or both with a single evaluation. NCWM is a utilizing participant under the MAA and as such will accept test data from issuing participants within the MAA. Evaluations performed by NTEP laboratories can only result in an NTEP CC. These certificates can cover a family of force transducers (load cells) based on the evaluation of representative samples from the family. In order to determine which specific models of force transducers (load cells) are to be used for evaluation, the following selection criterion shall be used:

1. Evaluation of New Force Transducers (load cells) for NTEP Certificates Only

#### Required Information

The following information is required from the manufacturer for review and selection of sample force transducers (load cells):

- a. Properly completed request for evaluation
- b. A drawing of each capacity force transducer (load cell) within the family to substantiate that they are of the same basic design
- c. A determination of quality or accuracy class
- d. Maximum number of scale divisions requested (n-max)
- e. Minimum verification scale division requested (V-min)
- f. Force transducer (load cell) capacities
- g. The type(s) of material from which the force transducers (load cells) are made
- h. As applicable, outline dimensions and general description illustration of any special equipment (loading fixtures, interconnection boxes, etc.) intended to accompany the force transducers (load cells) submitted
- i. A complete set of test data on the force transducers (load cells) submitted for evaluation. (Test data is only required for those force transducers (load cells) submitted for type evaluation; test data for each capacity model in the family is not required.)
- j. The technology employed by the force transducer (load cell); e.g. strain gage (analog or digital), hydraulic, vibrating wire, piezoelectric, or other. Applicants for analog strain gage force transducers

(load cells) must indicate on the application whether 4-wire or 6-wire (or both) design force transducers (load cells) are included in the family.

Note: The manufacturer may market force transducers (load cells) with a smaller number of scale divisions (n-max) and/or with a larger V-min value than those listed on the approval certificate; however, the force transducer (load cell) or accompanying documentation must be marked with the appropriate n-max and V-min for which the force transducer (load cell) may be used.

#### Selection Criteria

- A. Selection of force transducers (load cells) from the family shall be based on the following considerations:
1. The selection of force transducers (load cells) shall be such that the number of force transducers (load cells) to be evaluated is minimized.
  2. Where force transducers (load cells) of the same capacity belong to different groups within the family, approval of the force transducer (load cell) with the best metrological characteristics (greatest  $n_{max}$ , smallest  $v_{min}$ ) implies approval of the force transducers (load cells) with the lesser metrological characteristics. When a choice exists, the force transducers (load cells) with the best metrological characteristics shall be selected for the evaluation.
  3. Force transducers (load cells) with a capacity in between the capacities evaluated, as well as those with a capacity greater than the largest capacity model tested, but not over five times the largest capacity evaluated, are deemed to be certified.
  4. For any family of force transducers (load cells), the model with a capacity nearest the center of the range of capacities and with the best metrological characteristics shall be selected for evaluation. When the ratio of the largest capacity force transducer (load cell) within the group or family to the smallest capacity force transducer in the same group or family is 10:1 or less, a cell with a capacity nearest the center of the range shall be selected. The capacity of the selected cell shall not have a ratio greater than 5:1 in regard to the capacity of the force transducers (load cells) at the each extreme of the capacity range. If this is not possible, a second force transducer (load cell) must be selected for evaluation (see Item 5 below). If the selected mid-range capacity cell cannot be evaluated due to laboratory limitations, the NTEP representative should be contacted to select the specific model for evaluation.
  5. When the ratio of the largest capacity force transducer (load cell) within the group to the smallest capacity force transducer (load cell) within the same group or family significantly exceeds 10:1, then another force transducer (load cell) shall be selected for evaluation. The selected force transducer (load cell) shall have a capacity between 5 and 10 times that of the first force transducer (load cell) that was selected for evaluation. When no capacity meets this criteria, the selected force transducer (load cell) shall be that having the smallest capacity that exceeds 10 times that of the nearest smaller capacity force transducer (load cell) that has been selected for evaluation. Should the capacity of the selected cell exceed the capacity of the greatest capacity model in the family or group by a ratio greater than 10:1, an additional model must be selected for evaluation.
  6. If both 4-wire and 6-wire designs of force transducers (load cells) are included in the family, then at least one of the selected models for evaluation shall be of the 4-wire design and at least one of the remaining models shall be of the 6-wire design.
  7. If the family of force transducers (load cells) includes two or more types of material used for construction of the device, then at least one of the selected models for evaluation shall be of each type of material used for construction.
  8. If the family of force transducers (load cells) includes two or more means of environmental sealing (potting, welded cups, etc.), then at least one model using each sealing means shall be selected for evaluation.

9. If the family of force transducers (load cells) includes two or more output levels (2 or 3 mV/V), then at least one model with each output level shall be selected for evaluation.

B. Examples of force transducer (load cell) model selection for evaluation:

- a. Force Transducer (load cell) Family A characteristics:
  1. Both stainless steel and alloy steel models
  2. 2 mV/V and 3 mV/V outputs
  3. Bending beams in smaller capacities and shear beams in larger capacities
  4. 4-wire and 6-wire designs
  5.  $n_{\max}$  is 5000 on all models
  6. Potting or welded metal cup sealing variations
  7. All  $v_{\min}$  values equal to 0.015 % of cell capacity
  8. All capacities in pounds:  
500, 1000, 2000, 2500, 4000, 5000, 7500, 10 000, 15 000, 20 000

The following cell models would be selected for evaluation:

- One - 500 lb stainless steel, potted, 3 mV/V, 4-wire bending beam cell
- One - 2500 lb alloy steel, potted, 2 mV/V, 4-wire shear beam cell
- One - 15 000 lb stainless steel, welded, 3 mV/V, 6-wire shear beam cell

Note that Item 2 in Part A above is not applicable in this situation since the metrological characteristics ( $n_{\max}$  and  $v_{\min}$  for all of the models are equivalent.

Note that Item 3 in Part A above is met since the 20 000 lb model is less than five times the capacity of the greatest capacity model selected for evaluation (15 000 lb).

Note that Item 4 in Part A above is met since the 2500 lb capacity model of force transducer (load cell) is the closest to the center and is able to meet the requirements in both Item 4 and 5 and therefore was selected for evaluation.

Note that Item 5 in Part A above is met since the ratio between the capacities of the models selected for evaluation does not exceed five.

Note that Item 6 in Part A above is met by having at least one of the models selected of a 4-wire design and at least one of the models selected of a 6-wire design.

Note that Item 7 in Part A above is met by having at least one of the models constructed from each type of materials used.

Note that Item 8 in Part A above is met by having at least one of the selected models with each environmental sealing method employed within the family.

Note that Item 9 in Part A above is met by having at least one of the selected models with a 3 mV/V output and at least one with a 2 mV/V output.

- b. Force Transducer (load cell) Family B characteristics:
1. Compression cells constructed from either alloy steel or stainless steel
  2. All cells are Class III L
  3. Cells from 10 000 lb to 75 000 lb have an  $n_{\max}$  of 7500 and cells from 50 000 lb to 200 000 lb have an  $n_{\max}$  of 10 000
  4. All cells are 2 mV/V
  5. All cells have the same environmental sealing
  6. All cells have  $v_{\min}$  values equal to 0.018 % of their capacity
  7. All cells are of 6-wire design
  8. Cell capacities are:  
10 000; 25 000; 50 000; 75 000; 100 000; 200 000

The following models would be submitted for evaluation:

- One - 50 000 lb with an  $n_{\max}$  of 10 000 in stainless steel
- One - 10 000 lb in alloy steel

Note that Item 2 in Part A above is met with the selection of the 50 000 lb model with an  $n_{\max}$  of 10 000 since it has the best metrological characteristics.

Note that Item 3 in Part A above is met with the selection of the 10 000 lb model. Selection of the 200 000 lb model could have taken place but the 10 000 lb model was chosen because of the ease of testing.

Note that Item 4 in Part A above is met with the selection of the 10 000 lb model since it is within the 5:1 capacity ratio of the 50 000 lb model initially selected.

Note that Item 5 in Part A above is met with the selection of the 10 000 lb model since the ratio of its capacity to that of the 50 000 lb model does not exceed 5:1.

Note that Item 6 in Part A above does not apply since all models are of 6-wire design.

Note that Item 7 in Part A above is met with the selection of the 10 000 lb model in stainless steel and the 50 000 lb model in alloy steel thus covering both types of material used for construction of the force transducers (load cells) in the family.

Note that Item 8 in Part A above does not apply since all models use the same means of environmental sealing.

Note that Item 9 in Part A above does not apply since all models use the same output level of 2 mV/V.

2. *Evaluation of New Force Transducers (load cells) for OIML R 60 Certificate or OIML R 60 Certificate and NTEP Certificate of Conformance under the DoMC*

#### Required Information

The information needed for an OIML R 60 evaluation is listed in OIML Recommendation 60. If the manufacturer is seeking an NTEP Certificate of Conformance for the force transducer (load cell) family or individual model, the information shown in Section 1 above shall also be provided along with a properly completed application for NTEP evaluation. All NTEP requirements are to be met in this type of evaluation. The manufacturer must make certain

the issuing participant selected for the evaluation of the force transducer(s) (load cell(s)) is aware that the submittal is for both NTEP and OIML R 60. A completed application and copies of all submitted data must be sent to NTEP. Once the evaluation has been successfully completed, the issuing authority will provide an OIML Evaluation Report that may then be used to secure an OIML R 60 Certificate. This report is also sent to NTEP. NTEP will evaluate the OIML Evaluation Report and issue an NTEP Certificate of Conformance based on this evaluation. Note that issuance of an NTEP Certificate of Conformance may require the conduct of other tests not performed by the issuing participant. If this happens, the costs of these tests are the responsibility of the applicant.

Note: Should the force transducers (load cells) submitted fail to comply with all OIML R 60 requirements and the manufacturer then seeks to secure an NTEP Certificate of Conformance based on the OIML Evaluation Report, additional testing may be required in order to fully determine compliance of the device(s) with NTEP requirements. The costs for any additional testing deemed necessary for completion of the NTEP review will be the responsibility of the applicant.

#### Selection Criteria

Selection of the force transducers (load cells) for evaluation shall be based on the OIML R 60 selection criteria as described in OIML Recommendation 60.

#### 3. Amendment of an Existing NTEP Certificate of Conformance to Add Capacities and/or Change Metrological Characteristics in Conjunction with an OIML R 60 Evaluation Under the DoMC

##### Required Information

The information needed for an OIML R 60 evaluation is listed in OIML Recommendation 60. If the manufacturer is seeking to amend an existing NTEP Certificate of Conformance for the force transducer (load cell) family or individual model, the information shown in Section 1 above shall also be provided along with a properly completed application for NTEP evaluation. All NTEP requirements are to be met in this type of evaluation.

Successfully completed, this type of evaluation will result in a test report and test certificate that may be used to secure an amended OIML R 60 Certificate. The test report will be reviewed by NTEP and, if the appropriate criteria are met, a NEW NTEP Certificate of Conformance will be issued. Note that the original NTEP Certificate of Conformance will remain active and will not be amended. The new NTEP Certificate of Conformance resulting from this evaluation will list the new capacities added and/or the change in metrological characteristics. Note that the appropriate NTEP Certificate of Conformance number must be marked on the device in compliance with G-S.1. Marking Requirements of NIST Handbook 44.

Note: Should the force transducers (load cells) submitted fail to comply with all OIML R 60 requirements and the manufacturer then seeks to only amend the existing NTEP Certificate of Conformance based on the test report, additional testing may be required in order to fully determine compliance of the device(s) with NTEP requirements. The costs for any additional testing deemed necessary for completion of the NTEP review will be the responsibility of the applicant.

#### Selection Criteria

The proper models for evaluation will depend upon the nature of the change or addition to be made. Because of this, NTEP personnel shall be contacted and shall determine which model or models of force transducer (load cell) are to be submitted.

#### 4. Amendment of an Existing NTEP Certificate of Conformance ONLY

##### Required Information

The required information will depend upon the nature of the change being made. If additional models of force transducers (load cells) are being added to a family, then the same information and selection criteria as listed in

Section 1 above apply. If the change is to add another version of the force transducer (load cell) listed on the current NTEP Certificate of Conformance the nature of the change or addition must be fully disclosed in the application.

#### Selection Criteria

The necessity of an evaluation to implement the requested change will depend upon the nature of the change. In general, addition of new models of force transducers (load cells) with capacities outside the 5:1 ratio of those previously evaluated will require additional evaluation. Addition of a 4-wire design with no change in capacity will require an evaluation while the addition of a 6-wire design with no change in capacity will not. The addition of models constructed from a different material will require the evaluation of at least one model constructed of the new material. NTEP personnel will inform you of what models, if any, require evaluation after review of the application.

#### Attachment for Agenda Item 6

**The Tare Work Group recommended adding the following definitions to the Definitions (as amended by the S&T Committee) already in 2007 S&T Agenda Item 320-9**

**Calculated weight (gross or tare\*) value.** Calculated sum or difference of more than one measured weight value and/or calculated net value. (\* TARE WG Comment – This new HB definition is from the revised version of R 76 and is beyond what is currently required by NTEP.)

**Tare-balancing mechanism.** A tare mechanism with an indication that tare has been taken and without an indication of the tare value (weight) when the instrument is loaded. A negative net weight is assumed to be the tare value when the weighing instrument is unloaded.

**Tare-weighing mechanism.** A tare-balancing mechanism that stores the tare value and is capable of displaying (continuously or upon command) or printing the value whether or not the instrument is loaded.

**Preset Tare.** A numerical value, representing a weight that is entered into a weighing device (e.g., keyboard, recalling from stored data, or entered through an interface) and is intended to be applied to weighings without determining individual tares.

**Preset Tare Mechanism.** A part of a weighing system for subtracting a preset tare value from a gross or net weight value and indicating the result of the calculation as a net weight. The weighing range for net loads is reduced accordingly.

Types of preset tare mechanisms include:

- **Keyboard Tare.** The operation of keys on a keyboard; e.g., with a typical 10-key keyboard with values 0 through 9, by the pushing of a key numbered 5, the number 5 is entered as a tare value.
- **Digital Tare.** By the repeated operation of a particular key, tare values are entered in amounts equal to the value of a scale division. For example, on a 25 lb x 0.01 lb scale, each time a specifically marked key is depressed; a tare is entered equal to 0.01 lb. If that key were depressed five times, the tare value would be equal to 0.05 lb.
- **Programmable Tare.** Preset (predetermined) tare values that are stored in memory for multiple transactions. They may be part of the product information on PLU (product look-up), preset product, or tare keys.
- **Stored Tare.** Preset (predetermined) tare values that are stored in memory for multiple transactions and are used predominately in vehicle scale applications.
- **Percentage Tare.** A preset tare value, expressed as a percentage (i.e., 5.6 %), that represents the percentage of tare material compared to the gross or net weight of the commodity. A percentage tare is one form of proportional tare.

- **Proportional Tare.** A preset tare value, automatically calculated by the scale, proportional to the gross weight indicated by the scale. A proportional tare can be a percentage tare or a fixed tare value proportional to a range of gross weights (i.e., a 10 g tare for gross weights between 0 and 2 kg, a 20 g tare for gross weights between 2 and 4 kg, etc.). A proportional tare is, therefore, not limited to being a percentage tare.

The Tare Work Group recommends the following changes to Scales Code.

## S.2. Design of Balance, Tare, Level, Damping, and Arresting Mechanisms.

### S.2.3. Tare-Value of Tare Indication and Recorded Representations:

~~On any scale (except a monorail scale equipped with digital indications), the value of the tare division shall be equal to the value of the scale division.\*~~—The tare mechanism shall operate only in a backward direction (that is, in a direction of underregistration) with respect to the zero-load balance condition of the scale. A device designed to automatically clear any tare value shall also be designed to prevent the automatic clearing of tare until a complete transaction has been indicated.\*

(Amended 1985)

[Note: On a computing scale, this requires the input of a unit price, the display of the unit price, and a computed positive total price at a readable equilibrium. Other devices require a complete weighing operation, including tare, net, and gross weight determination]\*

[\*Nonretroactive as of January 1, 1983]

S.2.3.1 Scale Interval. – The interval of a tare weighing mechanism shall be equal to the scale interval of the weighing device for any given load.

(a) On any scale (except a monorail scale equipped with digital indications **and multi-interval scales or multiple range scales when the value of tare is determined in a lower range**), the value of the tare division shall be equal to the value of the scale division.\*

[\*Nonretroactive as of January 1, 1983]

(b) ~~S.2.3.1. Monorail Scales Equipped with Digital Indications.~~ – On a static monorail weighing system equipped with digital indications, means shall be provided for setting any tare value of less than 5 % of the scale capacity to within 0.02 % of scale capacity. On a dynamic monorail weighing system, means shall be provided to automatically maintain this condition.

(Amended 1999)

(Renumbered 200X)

S.2.3.2. Accuracy. – A tare weighing or balancing mechanism shall permit setting the indication to zero with an accuracy equal to or better than:

± 0.25 d for electronic weighing devices and any weighing device with an analog indication,

± 0.5 d for mechanical weighing devices with a digital indication (e.g., weighbeams with only notched poises and no sliding poises).

On a multi-interval scale, d shall be replaced by d1 (division value of the first weighing segment).

S.2.3.3. Operating Range. – The tare mechanism shall be such that it cannot be used at or below its zero effect or above its maximum indicated effect.

On a single or multiple range scale, the maximum tare capacity can not exceed that maximum capacity of the highest weighing range.

**On a multi-interval scale, the maximum tare capacity can not exceed that maximum capacity of the first weighing segment.**

**S.2.3.4. Visibility of Operation. – Operation of the tare mechanism shall be visibly indicated on the instrument. In the case of instruments with digital indication, this shall be done by marking the indicated net value with the word “NET” or the symbol “N.”**

**Note: NET may be displayed as “NET,” “Net,” or “net.”**

**Note: If a scale is equipped with an indicator that allows the gross value to be displayed temporarily while a tare mechanism is in operation, the “NET” symbol shall disappear while the gross value is displayed.**

**S.2.3.5. Subtractive Tare Mechanism. – After any tare operation and while tare is in effect, an indicating or recording element shall not display nor record any values when the gross load (not counting the initial dead load that has been canceled by an initial zero-setting mechanism) is in excess of 105 % of scale capacity after tare has been taken.**

*(Tare WG Recommendation: Insert into paragraph S.1.7. (a) Capacity Indication “Flashing weight values are not acceptable as and overload indication.”*

**S.2.3.6. Semi-automatic or Automatic Tare\* Balancing or Weighing Mechanisms. – These mechanisms shall be operable or accessible only by a tool outside of and separate from this mechanism or it shall be enclosed in a cabinet, or it shall be operable only when the indication is stable within:**

**(a)  $\pm 3$  scale divisions for scales of more than 2000 kg (5000 lb) capacity in service prior to January 1, 1981, and for all axle load, railway track, and vehicle scales; or**

**(b)  $\pm 1$  scale division for all other scales.**

**\* Automatic Tare Mechanisms are not permitted for direct sales to the public.**

**S.2.3.7. Combined Zero-setting and Tare-balancing Mechanisms (0/T Key). – (TWG recommends deleting S.2.1.6. Combined Zero-setting and Tare-balancing Mechanisms (0/T Key) in order to keep all tare requirements together). Scales not intended to be used in direct sales to the public may be equipped with a combined zero and tare function key, provided that the device is clearly marked as to how the key functions. If the semi-automatic zero-setting mechanism and the semi-automatic tare-balancing mechanism are operated by the same key, the following apply at any load:**

- 1) After zero/tare setting the effect of accuracy of the zero setting shall be not more than  $\pm 0.25$  d.**
- 2) A “center-of-zero” condition shall either automatically be maintained to  $\pm 0.25$  scale division or less, or have an auxiliary or supplemental “center-of-zero” indicator that defines a zero-balance condition to  $\pm 0.25$  of a scale division or less.**
- 3) A zero-tracking mechanism, if equipped, shall operate only when:**
  - the indication is at zero, or at a negative net value equivalent to gross zero, and**
  - the weight indication is stable.**
- 4) The scale must also be clearly marked on or adjacent to the weight display with the statement “Not for Direct Sales.”**

**S.2.3.8. Consecutive Tare Operations. – Repeated operation of a tare mechanism (including preset tare) is permitted. If more than one tare mechanism is operative at the same time, tare weight values shall be clearly designated when indicated or printed.**

#### **S.2.3.9. Indication and Printing of Weighing Results.**

- a) **Gross weight values may be printed without any designation or by complete word or symbol. For a designation by a symbol, only “G” is permitted.**
- b) **If only net weight values are printed without corresponding gross or tare values, they may be printed without any designation or by a complete word or symbol. The complete word or symbol “N” shall be used to designate a net weight. This applies also where semi-automatic zero-setting and semi-automatic tare balancing are initiated by the same key.**
- c) **Gross, net, or tare values determined by a multiple range instrument or by a multi-interval instrument need not be marked by a special designation referring to the (partial) weighing range.**
- d) **If net weight values are printed together with the corresponding gross and/or tare values, the net and tare values shall be identified at least by the corresponding symbols “N” and “T” or by complete words.**
- e) **If net weight values and tare values determined by different tare mechanisms are printed separately, they shall be suitably identified.**
- f) **When gross, net, and tare values are printed together, one of these values may be calculated from two actual determinations of mass. In the case of a multi-interval device the calculated weight gross or tare value may be printed with a smaller scale interval.**
- g) **The printout of a calculated gross or tare weight value shall be clearly identified. This should be done by the symbol “C” in addition to the symbols mentioned above, if applicable, or by complete words.**

*TARE WG Comment: The requirements in f) and g) are from the revised version of R 76 and is beyond what is currently required by HB 44 and NTEP.*

#### **S.2.4. Preset Tare Mechanism.**

**S.2.4.1. Modes of Operation. – A preset tare mechanism may be operated together with one or more tare devices provided that:**

- **the preset tare mechanism complies with paragraph S.2.3.8. Consecutive Tare Operations., and**
- **a preset tare operation cannot be modified or cancelled as long as any tare mechanism operated after the preset tare operation is still in use.**
- **a preset tare associated with a price look-up (PLU) shall be automatically cancelled at the same time a PLU is cancelled.**

**Preset tare may operate automatically only if the preset tare value is clearly identified with the load to be measured (e.g., part of the product look-up information).**

**S.2.4.2 Indication of Operation. – Operation of the preset tare device shall be visibly indicated on the instrument. In the case of instruments with digital indication, this shall be done by marking the indicated net value with the sign “NET,” “Net,” or “net.” If an instrument is equipped with a device that allows the gross value to be displayed temporarily while a tare device is in operation, the “NET” symbol shall disappear while the gross value is displayed. It shall be possible to temporarily indicate the preset tare value.**

**Paragraph S.2.3.9. Indication and Printing of Weighing Results. applies accordingly provided that the calculated net value is printed and at least the preset tare value is printed, with the exception of:**

1. **a class II, or a class III instrument with a maximum capacity not greater than 100 kg used in direct sales to the public, or**
  2. **including price computing scales, or**
  3. **nonautomatic weigh/price labeling scales.**
- **preset tare values are designated by the symbol “PT”; however, it is permitted to replace the symbol “PT” with complete words.** *(TARE WG Comment – This requirement is from the revised version of R 76 and is beyond what is currently required by HB 44 and NTEP. The Tare WG added the class and capacity exception since they felt that the need for providing the additional type of tare information is greater for larger capacity scales and for vehicle scale applications where preset tares are not allowed by some jurisdictions.)*

**Note: Paragraph 2.4.2. also applies to weighing devices with a combined semi-automatic zero-setting device and a semi-automatic tare-balancing device operated by the same key.**