Report of the National Type Evaluation Program (NTEP) Committee

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Reference
Key Number

500 Introduction

The NTEP Committee submits its Report for the 88th National Conference on Weights and Measures (NCWM). This consists of the Interim Report presented in NCWM Publication 16 as amended in the Addendum Sheets issued during the Annual Meeting that was held July 13-17, 2003, in Sparks, Nevada. The Committee considered communications received prior to and during the 88th Annual Meeting that are noted in this report.

Table A, identifies all of the items contained in the report by Reference Key Number, Item Title, and Page Number. The item numbers are those assigned in the Committee's Interim Meeting Report. Voting items are indicated with a "V" or, if the item was part of the consent calendar, by the suffix "VC" after the item numbers. Items marked with an "I" after the reference key number are information items. An item marked with a "W" means that item has been withdrawn. Items marked with a "W" generally will be referred to the regional weights and measures associations or other groups because they either need additional development, analysis, and input, or they do not have sufficient Committee support to bring them before the NCWM. Table B lists the appendices to the report, and Table C provides a summary of the results of the voting on the Committee's items and the report in entirety.

The attached report may contain recommendations to revise or amend NCWM Publication 14, Administrative Procedures, Technical Policy, Checklists, and Test Procedures or other documents. Revisions proposed by Committee members are shown in **bold face print** by ~~crossing out~~ information to be deleted and underlining information to be added. New items proposed for addition to NCWM Publication 14 or other documents are designated as such and shown in **bold face print.**

Table A
Index to Reference Key Items

Table B
Appendices

Table C
Voting Results

Reference Key Number	House of Representatives		House of Delegates		Results
	Yeas	Nays	Yeas	Nays	
500 (Report in Its Entirety) Voice Vote	All Yeas	No Nays	All Yeas	No Nays	Passed

Details of All Items
(In Order by Reference Key Number)

501-1 I International Organization of Legal Metrology (OIML) Certificate Project

Source: Carryover Item 501-1

Background: This item was included on the Committee's agenda to provide an update on NTEP's work to issue OIML R 60**,** "Metrological Regulation for Load Cells" and R 76, "Non-Automatic Weighing Instruments" certificates.

OIML R 76 and R 60 Applications: During the 2003 NCWM Interim and Annual Meetings, Stephen Patoray, NTEP Director, and Louis Straub, NTEP Committee Chairman, reported that NTEP received no new applications for R 76 or R 60 tests. The Committee believes that potential applicants for OIML Certificates are waiting for the results of discussions on the Mutual Acceptance Arrangement and Checklists Document.

OIML Certificate System: At the 2003 Annual Meeting, Dr. Ehrlich reported that the 2003 edition of the "OIML Certificate System for Measuring Instruments" was published in April 2003 and is available for use. Most notably, the revised system contains new provisions such as definitions, requirements, test methods and test report formats regarding families, modules, and families of modules of measuring instruments. Please contact Dr. Ehrlich or visit the OIML website at www.oiml.org to obtain a copy of the new document (designated P1).

See the 2002 Final Report of the National Type Evaluation Program (NTEP) Committee for additional background information.

501-2 I Test Data Exchange Agreements

Source: Carryover Item 501-2

Background/Discussion: This item was included on the Committee's agenda in 1998 to provide an update on NTEP's work to establish bilateral and multilateral agreements. Under such agreements and arrangements, manufacturers would be able to submit their equipment to any of the participating countries for testing to OIML-recommended requirements. The resulting test data would be accepted by other participants, as a basis for issuing each country's own type approval certificate. Following is a report on the three types of test data exchange agreements.

Mutual Acceptance Arrangement (MAA): At the 2003 Annual Meeting, Dr. Charles Ehrlich, NIST International Legal Metrology Group, updated the Committee on the status of the MAA, which has moved from the OIML subcommittee level to the full International Committee of Legal Metrology (CIML). Dr. Ehrlich reported that an International Workshop was held on June 2-3, 2003 in Paris to review and discuss the results of a straw vote on the 1st Draft Document MAA and the associated Checklists Document that had been taken of the members of CIML. Only half of the CIML members voted, but of those voting 80 % had voted "yes." In order to achieve better consensus, the remaining key issues were identified and discussed. These included a clarification of the Scope, who the participants should be, allowance of additional requirements other than those in OIML Recommendations, and anticipated costs. The discussions were highly productive and a better mutual understanding and compromise was achieved. One item that was resolved was the issue of ***peer*** review, including on-site assessments in lieu of laboratory accreditation. It is anticipated that the MAA and Checklists Document will be adopted by the CIML at its annual meeting in November 2003. Please contact Dr. Ehrlich for further details. The MAA and Checklists documents can be downloaded from a specially-created WMD web site (http://ts.nist.gov/ts/htdocs/230/235/ilmg/oiml_maa.htm).

The NTEP Committee continues to closely follow the development of the MAA and encourages interested parties to provide comments to the Secretariat. See the 2002 Final Report of the NTEP Committee for additional background information.

Bilateral Agreements: During the 2003 NCWM Interim Meeting, Stephen Patoray, NTEP Director, reported that there was no additional information on possible bilateral agreements. NTEP is awaiting the outcome of the MAA deliberations before further pursuing bilateral agreements.

NTEP-Canada Mutual Recognition Program: At the 2003 NCWM Annual Meeting, NTEP Director Stephen Patoray and NTEP Chairman Louis Straub announced that Measurement Canada and the NTEP Participating Laboratories are ready to accept NTEP applications for retail motor-fuel dispensers.

See the 2002 Final Report of the NTEP Committee for additional background information.

501-3 I Adoption of Uniform Regulation for National Type Evaluation by States

Source: Carryover Item 501-3

Background/Discussion: For many years, the Scale Manufacturers Association (SMA) has hosted NTEP adoption and implementation meetings for state directors at each regional weights and measures association conference. These meetings enable jurisdictions to share information about adopting and implementing NTEP in their respective jurisdictions, encourage non-NTEP jurisdictions to adopt the regulation, and allow current NTEP jurisdictions to share ideas on how to make enforcement more effective and uniform among the States. The meetings also provide NTEP management with information related to areas in which the operation and implementation of the program can be improved. Several questions have been posed at these meetings about issues associated with NTEP interpretation or practice. Comments from 1997 to 2002 have been summarized, without attribution, and are available for review and download on the SMA web site at http://www.scalemanufacturers.org.

At the 2002 NCWM Annual Meeting, the SMA reported that it was developing two new standards for weighing devices. The first standard was to define a uniform procedure to access the parameter and calibration counters for Category 1 and 2 scale sealing methods and the event loggers in the Category 3 scale sealing method. Specific requirements for the software sealing methods are contained in NIST Handbook 44 paragraph G-S.8. Provision for Adjusting Electronic Adjustable Components. At the 2003 Interim Meeting, Daryl Tonini, SMA, announced that the SMA standard for software sealing had been finalized and was available on the SMA web site for manufacturers interested in voluntarily using a standard method of accessing audit trail information and for weights and measures officials interested in ongoing efforts to standardize audit trail access information. The second SMA standard, updating RFI/EMI field test procedures to reflect current technology, was withdrawn.

SMA upgraded the standard titled Recommendation on Electrical Disturbances (SMA RED-0499) from “provisional” to “full” status and developed a new standard titled Vehicle Scale Characterization. The Vehicle Scale Characterization standard provides criteria for characterizing the service life of a vehicle scale based on the concentrated load capacity (CLC) rating of the platform. Potential scale owners and operators can use this knowledge to select the proper vehicle scale for a given application. The final versions of the Vehicle Scale Characterization and the Recommendation on Electrical Disturbances standards are available on the SMA web site.

At the 2003 NCWM Annual Meeting, Daryl Tonini, SMA, updated the NTEP Committee on the status of SMA's drive to assist States to adopt the Uniform Regulation for National Type Evaluation (URNTE) and the Uniform Regulation for the Voluntary Registration of Servicepersons and Service Agencies (VRR). It was reported that the Kentucky URNTE and VRR were adopted and became effective on July 1, 2003. Additionally, Michigan completed work on its weights and measures regulation to adopt the URNTE and VRR. SMA also provided the Committee with a copy of the United States map depicting state adoption of the URNTE and VRR. An updated copy of this map (April 2003) has been included as Appendix A of the Final Report of the NTEP Committee.

At the 2003 NCWM Annual Meeting, Louis Straub announced that the Maryland Department of Agriculture Weights and Measures Section submitted a regulation package to adopt a voluntary registered service agency registration program partially based upon the NCWM VRR standard.

See the 2002 Final Report of the NTEP Committee for additional background information.

501-4 I NTEP Policy: Challenges to a Certificate of Conformance and Verification that Production Meets Type

Source: Carryover Item 501-4

Background: This item has been moved to the NCWM Board of Directors Interim Agenda. See the 2002 Final Report of the National Type Evaluation Program Committee for additional background information.

501-5 I NTEP Participating Laboratories and Evaluations Reports

Source: Carryover Item 501-5

Background: NTEP Director Stephen Patoray provided the Committee with a report of the NTEP laboratory and administrative activities from October 1, 2001 to June 2003. Mr. Patoray reported that the number of NTEP applications to date is in line with projected numbers. A report of NTEP Laboratory Activities was distributed to the NTEP Committee at the 2003 NCWM Annual Meeting and is included in the Final Report of the NTEP Committee in Appendix B.

At the 2003 NCWM Interim Meeting, Mr. Patoray reported that a policy to expedite the process for issuing a CC after a device completes a successful evaluation went into effect on January 1, 2003, for NTEP applicants that desire the expedited CC process. The optional NTEP process is in response to concerns from manufacturers that the delay between the date an evaluation was completed and the date CC numbers were assigned would hold up production and distribution of devices. In summary, the plan requires an applicant and NTEP to agree upon the testing to be performed and the contents of a draft CC *prior* to the start of an evaluation. The final CC and number would be ready for signature and distribution at the conclusion of a successful evaluation. The plan was discussed at the 2002 National Type Evaluation Technical Committee (NTETC) Sectors and BOD meetings.

At the 2003 NCWM Annual Meeting, Mr. Patoray reported on an April 2003 joint meeting of the NTEP Weighing and Measuring Laboratories and the Canadian Participating Laboratories in Sacramento, CA. The laboratories discussed several items including recommendations on mix-and-match components for liquid-measuring devices, updating the mutual recognition applications and checklists, and suggested "device types" to be listed on Certificates of Conformance (CC) for both weighing and measuring devices. Many of these items will be developed as proposals for consideration at the 2003 meetings of the NTETC Weighing and Measuring Sectors.

See the 2002 final report of the NTEP Committee for additional background information.

501-6 I NTETC Sectors Reports

Source: Carryover Item 501-6

Background: The Committee received an update on the activities of the National Type Evaluation Technical Committee (NTETC) Sectors at the 2003 NCWM Interim Meeting. Outlined below is a brief summary of Sector activities since the 2002 NCWM Annual Meeting.

Grain Moisture Meter and NIR Protein Analyzer Sectors: The NTETC Grain Moisture Meter and NIR Protein Analyzer Sectors held a joint meeting in Kansas City, MO on August 21-23, 2002. A summary of these joint meetings was distributed to Sector members in October 2002. A draft of the final summary was provided to the Committee prior to the 2003 NCWM Interim Meeting for review and approval. The Committee reviewed the draft and accepted the recommendations from the Sectors.

The next meeting of the Grain Moisture Meter and NIR Protein Analyzer Sectors is scheduled for August 20-22, 2003, in Kansas City, MO. For questions on the current status of Sector work or to propose items for a future meeting, please contact the Sector Technical Advisors, Diane Lee, NIST WMD, or Jack Barber, J.B. Associates. Ms. Lee can be reached by telephone at 301-975-4405, by fax at 301-926-0647, by e-mail at diane.lee@nist.gov, or in writing at NIST, 100 Bureau Drive - Stop 2600, Gaithersburg, MD 20899-2600. Mr. Barber can be reached by telephone at 217-483-4232, by fax at 217-483-3712, by e-mail at jbarber@cityscape.net, or in writing at J.B. Associates, 10349 Old Indian Trail, Glenarm, IL 62536.

Measuring Sector: The NTETC Measuring Sector met October 11-12, 2002, in Richmond, VA. A draft of the final summary of that meeting was distributed to the Sector in January 2003. A draft of the final summary was also provided to the NTEP Committee prior to the 2003 NCWM Interim Meeting for review and approval. The Committee reviewed the draft and accepted the recommendations of the Sector.

The next meeting of the Measuring Sector is scheduled for October 3-4, 2003, in Charlotte, NC, in conjunction with the Southern Weights and Measures Association's Annual Meeting. For questions on the current status of Sector work or to propose items for a future meeting, please contact the Sector Technical Advisor Richard Suiter, NIST WMD. Mr. Suiter can be reached by telephone at 301-975-4406, by fax at 301-926-0647, by e-mail at rsuiter@nist.gov, or in writing at NIST, 100 Bureau Drive - Stop 2600, Gaithersburg, MD 20899-2600.

Weighing Sector: The NTETC Weighing Sector met September 30 - October 2, 2002, in Annapolis, MD. A draft summary was distributed to Sector members in early December 2002. A final draft of the meeting summary was also provided to the Committee prior to the 2003 NCWM Interim Meeting for review and approval. The Committee did not accept the recommendation of the Sector on agenda item 23 titled Inconsistent Language on a CC. The Sector had suggested a list of consistent information that should be included on a Certificate of Conformance for NCWM Publication 14 Administrative Procedures paragraph P. Certificate of Conformance. The Committee disagreed with the Sector and stated that the Sector recommendation is a technical procedural issue and does not affect the administration of NTEP. The Committee returned this item to the Sector and suggested that it develop language for NCWM Publication 14 Technical Policies at their 2003 meeting. The Committee accepted the remaining recommendations (with minor editorial corrections identified by the Committee) in the final draft of the meeting summary.

The next Weighing Sector meeting is scheduled for September 11-13, 2003, in Fresno, CA, and will be held in conjunction with the Western Weights and Measures Association's Annual Meeting. For questions on the current status of Sector work or to propose items for a future meeting, please contact the Sector Technical Advisor Steven Cook, NIST WMD. Mr. Cook can be reached by telephone at 301-975-4003, by fax at 301-926-0647, by e-mail at stevenc@nist.gov, or in writing at NIST, 100 Bureau Drive - Stop 2600, Gaithersburg, MD 20899-2600.

Automatic Weighing Systems Working Group (AWS): The AWS Working Group met on October 2-3, 2002, in Annapolis, MD, following the meeting of the NTETC Weighing Sector and responded to remaining issues related to a proposal to change the status of the tentative AWS Code in NIST Handbook 44. The Work Group dealt with several items related to the current NCWM Publication 14 NTEP Draft Checklist and Test Criteria. The AWS Work Group made several suggestions for amending language in Handbook 44 and submitted their recommendations to the NCWM S&T Committee and the NTEP Committee prior to the 2003 NCWM Interim Meeting. Contact Stephen Patoray, NTEP Director, or NIST WMD Technical Advisor, Steve Cook, to request a copy of the proposed changes. Mr. Patoray can be reached by email at spatoray@mgmtsol.com. Steve Cook can be reached by telephone at 301-975-4003, by fax at 301-926-0647, by email at steven.cook@nist.gov, or in writing at NIST, 100 Bureau Drive-Stop 2600, Gaithersburg, MD 20899-2600.

NTETC Sector Summaries: At the 2002 Annual Meeting, Mr. Straub discussed the whether or not it is necessary to publish the NTETC Sectors summaries as part of the Interim Committee Reports. The summaries currently account for more than one third of the size of the publication. The NCWM Board of Directors and NTEP Committee agreed that the Sector summaries do not need to be published in hard copies of the NCWM Interim Committee Reports for the Annual Meeting. The NTEP Committee will receive copies of the summaries prior to the NCWM Interim Meeting for their review and approval. The NTETC Sector summaries will continue to be included as appendices in the NCWM Annual Reports.

At the 2003 NCWM Interim Meeting, the NCWM Board of Directors and NTEP Committee agreed that electronic copies of the NTETC Sector summaries would be included in electronic versions of NCWM Publication 16 Committee Reports for the Annual meeting. Electronic or hard copies of the NTETC Sector summaries are available upon request from NCWM and NIST. Contact NCWM Inc., or NIST WMD Technical Advisor, Steve Cook, to request electronic or hard copies of the NTEP Sector Summaries. NCWM Inc. can be reached by phone at 240-632-9454 or by email at ncwm@mgmtsol.com. Steve Cook can be reached by telephone at 301-975-4003, by fax at 301-926-0647, by email at steven.cook@nist.gov, or in writing at NIST, 100 Bureau Drive-Stop 2600, Gaithersburg, MD 20899-2600.

501-7 I Grain Moisture Meter (GMM) and Near Infrared (NIR) Instruments Dual Certification – Can a Single Certificate be Issued?

Source: NTETC GMM and NIR Sector

Background: Of the five Grain Moisture Meter (GMM) types with active NTEP Certificates of Conformance (CCs), two are whole-grain Near Infrared (NIR) Instruments with the potential to seek certification as NIR Grain Analyzers. In a previous Sector meeting, the question was raised as to whether a single CC could be issued to cover devices certified as both GMMs and NIR Grain Analyzers. Time constraints caused consideration of this question to be postponed to a future meeting.

In deciding whether a single CC could be issued to cover devices certified as both GMMs and NIR Grain Analyzers, there are two requirements to consider:

1) CCs for GMMs automatically expire July 1. To maintain "active" status, meters must remain in the NTEP ongoing calibration program and the CC's must be reissued annually with valid calibration constants for moisture.

2) NIR Grain Analyzers that display a measured whole grain moisture value are required to comply with the requirements of the GMM Code and be type approved as a grain moisture meter.

When an instrument has been approved under both codes, it would seem that NIR Grain Analyzer CCs are subordinate to GMM CC's, because failure to maintain an "active" GMM CC would automatically invalidate the corresponding NIR Grain Analyzer CC. A single CC, such as a "GMM CC with NIR Grain Analyzer Certification" would have to be reissued annually (and whenever a calibration change is made) so there would be no ambiguity regarding the NTEP status of the instrument and its calibrations. With a single Certificate, weights and measures personnel would have only one CC number to check. Manufacturers would have only one CC to maintain per instrument type. Marking requirements would be simplified. The maintenance fee structure for a CC with a "certification" for compliance with another code could be set to recover any loss in NCWM, Inc. revenue that would result from the elimination of the second certificate.

The Sector agreed to ask the NTEP Committee to consider recommending that NCWM, Inc. authorize issuing a single CC for devices successfully type evaluated using two inter-related codes (e.g., a "Grain Moisture Meter CC with Near Infrared Grain Analyzer Certification" or, simply, "NIR Grain Analyzer with Dual Certification").

The NTEP Committee reviewed the recommendation during the 2003 NCWM Interim Meeting in Jacksonville, FL. and accepted the Sector recommendation to issue a single Certificate of Conformance for a device that has been evaluated using two inter-related codes.

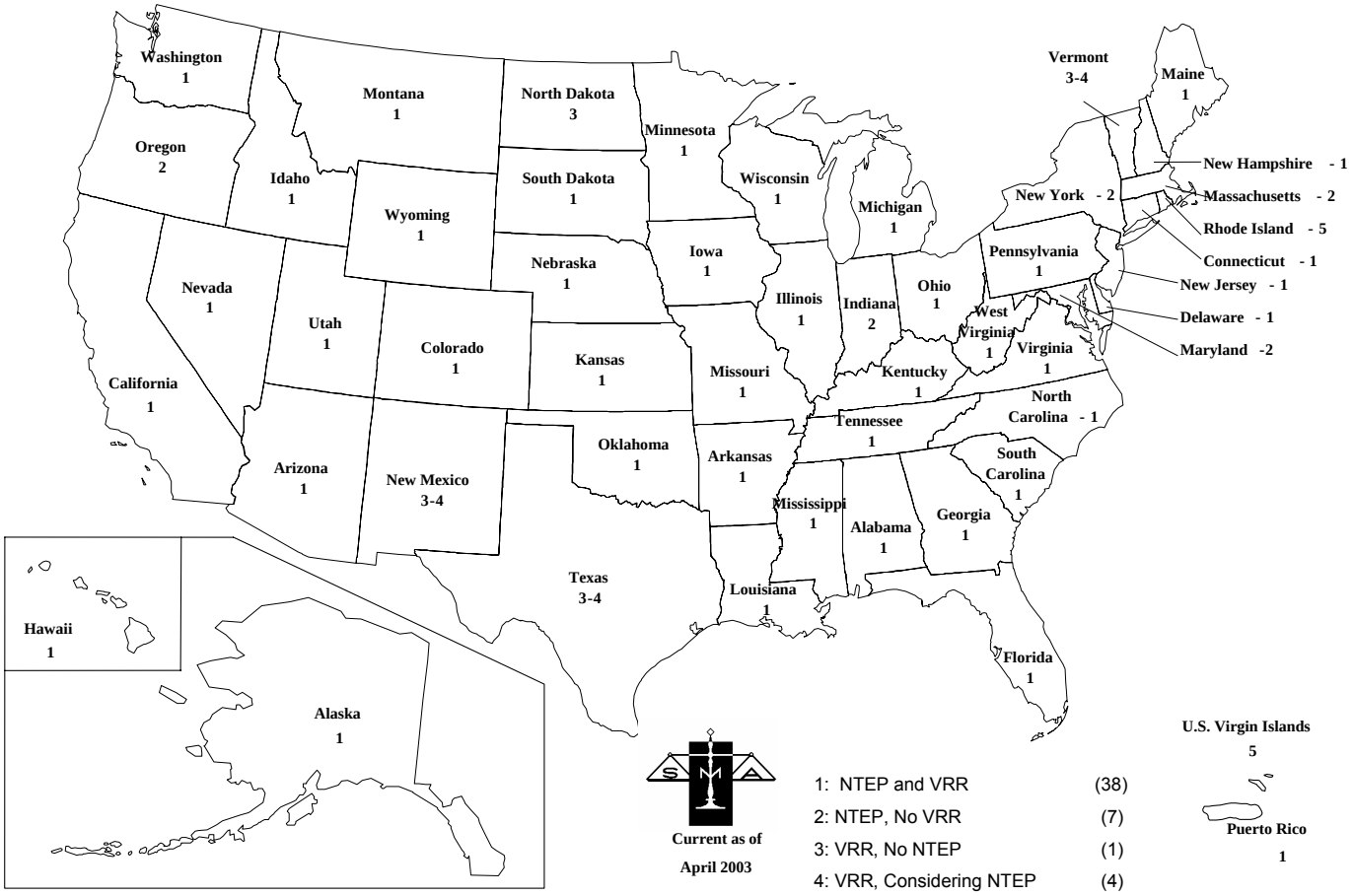
L. Straub, Maryland, Chairman

R. Andersen, New York, NCWM Chairman
D. Ehrhart, Arizona, NCWM Chairman-Elect
D. Onwiler, Nebraska
M. Gray, Florida
NTEP Technical Advisor: S. Patoray, NTEP Director
NIST Technical Advisor: S. Cook, NIST WMD

National Type Evaluation Program Committee

Appendix A

NTEP Status by State



NTEP: Uniform Regulation for National Type Evaluation

VRR: Uniform Regulation for Voluntary Registration of Service Persons and Service Agents

Appendix B

NTEP Participating Laboratories and Evaluations Report

NTEP Application Statistics - June 2003			
	2001-2002	**2002-2003**	**Total**
	10/1/01 6/19/02	**10/1/02- 6/19/03**	**10/1/00- 6/19/03**
Applications Processed	230	188	687(41)
Applications Completed	182	67	466
New Certificates Issued	193	164	636
Certificates Distributed to State Directors	187	160	618
Certificates Posted To Web Site	1103	158	3148
Active NTEP Certificates	-	-	1549

	Average	**Median**
Time For NCWM To Assign An Evaluation	12 days	8 days
Time For NCWM To Review A Draft Certificate	8 days	6 days
Time For Complete Evaluation (Completed NCWM Assignments)	145 days	101 days

Appendix C

National Type Evaluation Technical Committee (NTETC)
Grain Moisture Meter (GMM) Sector

August 21-22, 2002 - Kansas City, MO

Meeting Summary

Agenda Items

★ 1. NIST/Office of Weights and Measures Reorganization
2. Report on Proposed Revisions to OIML IR 59 "Moisture Meters for Cereal Grains and Oilseeds"
3. Proposed Changes and Additions to Publication 14
   a. Identification Marking Requirements
   b. Miscellaneous Editorial Changes
4. Update on Field Evaluation of Proposed Test Weight per Bushel Tolerances
   a. Review of Phase I and Phase II data
   b. Proposal to move the Developing Issue for Test Weight per Bushel forward as a Voting Item
5. Review Latest Draft of Evaluation Procedure Outline (EPO) and Test Procedures for the Field Evaluation of NTEP GMM Devices (air-oven method)
★ 6. A Message from the NCWM Board of Directors
7. Update on NTEP Type Evaluation and OCP (Phase II) Testing
★ 8. A Quality Control Procedure for Grain Analysis at a Country Elevator
★ 9. Time and Place for Next Meeting

Note: Because of common interest, items marked with a star (★) will be considered in joint session of the NIR Grain Analyzer and the Grain Moisture Meter Sectors.

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1. NIST/Office of Weights and Measures Reorganization

Discussion: As part of a broader reorganization within NIST Technology Services (TS), the Office of Weights and Measures (OWM) has been raised from the program level with the Office of Measurement Services (now the Measurement Services Division) to the Division level within the TS organization structure. Henry Oppermann has been named Chief of the new Weights and Measures Division. In addition to national weights and measures matters, OWM will be responsible for NIST's Metric Program and for international matters relating to legal metrology, including U.S. participation in the OIML. This will provide a closer tie between national and international interests in standards matters.

2. Report on Proposed Revisions to OIML IR 59 "Moisture Meters for Cereal Grains and Oilseeds"

Background: At the OIML TC17/SC1 meeting in Berlin, Germany on June 22, 2001, the U.S. delegation, put forth a series of proposals relating to the revision of OIML Recommendation IR 59 "Moisture Meters for Cereal Grains and Oilseeds." The U.S. proposals are summarized below:

Document Purpose. - The purpose of the revision of IR 59 is to define technical and metrological requirements for type approval and verification of measuring instruments using physical principles to determine the moisture content of cereal grains and oil seeds. These type-approved instruments are intended to be used for moisture measurements in commercial transactions.

Document Application. - This document is to be developed for implementation in the OIML Certificate System, therefore necessitating an internationally agreed test procedure and test report format.

Document Direction. - The document should be developed for fully automatic direct indicating moisture meters. This means instruments for which all necessary measurements are internal and are self-calculating. Directions for

dealing with instruments of comparable accuracies but a lesser degree of automation would be contained in an annex. This would define a direction for future instruments without precluding existing instruments.

Maximum Permissible Errors (MPES). - The testing of the instruments should be carried out with naturally occurring grain samples and the evaluation of instrument errors will be conducted statistically. Grain samples have a large degree of natural variability due to region and climate. A statistical evaluation accounts for this natural variability and is consistent with the U.S. NTEP program.

Moisture Reference Method. - The state-of-the-art in grain moisture reference methods has not reached international consensus and application on the best method. The U.S. uses a documented GIPSA air oven reference method and several other methods exist and are utilized internationally. All of these methods suffer to some extent in their absolute accuracy. The U.S. believes that it would be best to separate the international type approval of instruments from the definition of the reference method and proposes that the reference method should be established by the national legal metrology authority in that country and that manufacturers submitting for type approval in that country should take into account the national reference in the calibration of the type approved instrument.

The U.S. proposals were well received, in particular by France, the previous Secretariat, and Germany. Dr. Gunter Scholtz of Physikalisch-Technische Bundesanstalt (PTB), who chaired the meeting, asked the USA to prepare an OIML draft based on the U.S. NTEP program for review by an IWG composed of France, Germany, Poland, China and the USA. The U.S. agreed to this.

Discussion: The Sector reviewed a partial draft of Revised IR59 (dated August 2002) prepared by Dr. Ambler Thompson of NIST. Sector members offered the following comments and suggestions:

1. No moisture ranges have been specified for any of the type approval tests. Although some of the tolerances presently suggested are broader than those in Publication 14, it was pointed out that the type approval tolerances in Publication 14 are based on testing specific grains over a specified 6 % moisture range (12 %-18 % for corn; 10 %-16 % for all wheats, soybeans, sorghum, oats, barley and rice; and 6 %-12 % for sunflower). Sample condition, moisture range, and individual grain characteristics all influence the performance of a grain moisture meter and have to be considered in establishing realistic tolerances. Testing at higher moisture levels may cause problems due to sample instability. Sample instability is especially troublesome on tests involving temperature cycling of the samples and on long-term stability tests where samples must be stored for an extended period of time. If Handbook 44 tolerances are specified in place of the existing OIML Maximum Permissible Errors (MPES), type approval testing should be limited to the grain types and moisture ranges specified in Publication 14.

2. There appear to be fundamental differences between the U.S. and proposed OIML approach to moisture meter type approval. In the U.S. initial type evaluation focuses on the instrument itself. Basic instrument tests, which include all of the influence factors listed in Section 5.6.1 of IR59, except grain temperature sensitivity, are conducted using only hard red winter wheat. Calibrations for corn, HRW wheat and soybeans are initially approved based upon type evaluation testing over a 6 % moisture range and manufacturer supplied data over the remainder of the calibration range. Calibrations for other grains are approved based upon data collected as part of the ongoing national calibration program. Continued type approval requires participation in the ongoing national calibration program. Over the moisture range for each of the grains for which a meter is approved, none of the average differences between predicted and reference values for the respective 2 % moisture intervals can exceed one-half the Handbook 44 acceptance tolerance plus a 95 % confidence interval. Revised IR 59 proposes to subject all grains to all influence factors over unspecified moisture ranges.

3. No field evaluation method has been specified. Appropriate values for MPES will depend on the field test method used (meter-to-meter vs. air-oven, number of replicates, sample selection, etc.). The field test method on which the MPES are based should be referenced.

4. Section 3. Terminology. - Definitions of terms appearing in the “Terminology” section should be replaced with corresponding definitions from Handbook 44.

5. Section 3.2. Moisture and Volatile Matter Content. - The need for a definition of "moisture and volatile matter content" was questioned. It was recommended that this term be dropped from the definitions, and that the possible loss of mass due to volatile matter content (other than water) be addressed in a footnote if necessary.

6. Section 3.4. Conversion Tables. - The definition shown is the Handbook 44 definition for "Correction Tables." Fully automated grain moisture meters do not require the use of either Correction Tables or Conversion Tables. If the purpose of defining Conversion Tables is to cover terminology that will be used in an annex to IR 59, then a definition of Correction Tables should also be included.

7. Section 3.5. Zero Value and Test Value. - This paragraph states that moisture meters may give a (zero) indication. The Sector noted that there is no allowance for a zero indication in Section 5.56.(a) of Handbook 44. Paragraph S.1.1.(d) states:

   > A digital indicating element shall not display, and a recording element shall not record, any moisture content values before the end of the measurement cycle.

   Paragraph S.1.1.(f) further states:

   > A meter shall not display or record any moisture content values when the moisture content of the grain sample is beyond the operating range of the device, unless the moisture representation includes a clear error indication (and recorded error message with the recorded representation).

   To comply with these requirements, several manufacturers have chosen to blank the moisture display when the test cell is empty (and do not display a "zero"). A moisture value is not displayed until the end of the measurement cycle. Even though the present wording of 3.5 is permissive ("may" display a zero), it would be preferable to include additional wording to indicate that direct reading instruments "may but are not required to display a (zero) indication."

8. Section 3.6. Test Value. - The wording of this section needs to be revised to make it clear that test values are produced by a meter's built-in self-test features to verify the correct functioning of those elements having a critical effect on the measurement. Grain samples are not required for these self-tests.

9. Section 5.3.2. MPES During Type Approval Testing, Including All Influence Quantity Testing, and on Initial Verification. - The equations add 0.2 % to the MPES for all tests, but Paragraph 5.6.1. shows $\Delta M = 0.35$ % for both instrument temperature sensitivity and grain temperature sensitivity tests and $\Delta M = 0.20$ % for the other influence factor tests.

10. Sections 5.5.4 and 5.5.5. - The reference to "MPES in 5.5.1" should be changed to read, "MPES in 5.3.1".

11. Section 5.6.1. - The reference to "relevant conditions specified in 5.3" for influence factor testing appears to be in error. Paragraph 5.6.2 states, "A description of performance tests for influence factors is given in Annex B." Should 5.6.1 reference "relevant conditions specified in Annex B" or will a table of relevant conditions be added elsewhere?

12. Section 6.2 does not mention near-infrared absorbance as one of the possible quantities that may be related to moisture.

Conclusion: Dr. Thompson asked Sector participants and manufacturers to submit additional comments, especially those related to test procedures and MPES, within the next two months so he can obtain a consensus from interested U.S. parties and complete another draft by December. Dr. Thompson can be reached at the following address:

Dr. Ambler Thompson
NIST/TSAP
NIST North (820) Room 248
100 Bureau Drive, Stop 2150
Gaithersburg, MD 20899
e-mail: ambler@nist.gov

3. Proposed Changes and Additions to Publication 14

3.a. Identification Marking Requirements

Discussion: The 86th National Conference on Weights and Measures (NCWM) in 2001 adopted changes to the General Code section of Handbook 44 that require corresponding changes to the Grain Moisture Meter Check List in Publication 14. The changes include:

- A specification of acceptable abbreviations for the word "Model"
- A requirement that devices be permanently marked with the applicable Certificate of Conformance (CC) number or a corresponding CC addendum number.

[For a detailed discussion of the above changes see the report 86th NCWM. NIST *Special Publication 976*.]

Because grain moisture meter (GMM) CCs are reissued annually with incremented addendum numbers, the Sector considered whether devices should be marked with only the original "parent" CC number and not with the addendum number; for example, "CC Number 03-123" and NOT "CC Number 03-123A4." State Weights and Measures representatives indicated that there would be no confusion if CC marking included the addendum number. Inspectors would know to refer to the current version of the CC regardless of the addendum number marked on the device. It was suggested that including the addendum number might be of assistance in helping field inspectors determine whether nonretroactive requirements applied to a particular device.

Also, paragraph S.1.5. of Handbook 44, Section 5.56.(a) was changed by action of the 81st NCWM in 1996 to remove the requirement to mark the operating temperature range on the device. The original draft of the 2002 issue of the grain moisture meter checklist in Publication 14 does not reflect this change.

Conclusion and Recommendation: The Sector decided that it would not be necessary to include a note recommending restricting CC marking of GMM's to the "parent" CC number. The Sector agreed to recommend amending and modifying Publication 14, GMM Checklist, Section 1. General**,** to combine related marking requirements and to address the above issues. In addition, the Sector recommended removing the requirements for marking the operating temperature range on the device and moving the paragraph related to Code Reference G-S.1.1., to a more appropriate location following the list of marking requirements. Recommended changes are shown below.

1. General

Code Reference: G-S.1. Identification

Virtually all measuring equipment (except separate parts necessary to the measurement process but not having any metrological effect) must be clearly and permanently marked with the manufacturer's name or trademark, model designation, and serial number. Additionally, devices that have (or will have) an NTEP Certificate of Conformance (CC) Number, must be marked with the CC number or a corresponding CC addendum number. "Permanent" markings addresses two aspects: (1) the printed information will withstand wear and cleaning, and (2) if the markings are on a plate or badge, then the marking badge must be "permanently" attached to the device. A permanently attached badge means that the identification information required by G-S.1. is not easily removed, and if removed, then it must be obvious that the badge or plate containing this information has been removed. All markings must be clear and easily readable. The following test procedure shall be used to determine the permanence of the identification markings.

Permanence of Lettering: The lettering for the markings are subjected to the following tests to simulate accelerated wear. The markings are then compared with a typical set of labels exhibiting various degrees of wear, graded from minimal effect (1) to excessive unacceptable wear (7).

Attempts are made to remove the marked information, whether on a badge (plate) or on the device itself, using the following means.

1. Rub over one letter of the marking at least 20 times using an ink eraser in the same manner and force as one would normally exert while erasing an inscription written with a ball point pen.

2. Clean the marking or badge with the following cleaners presumed to be "readily available."

   a. Disinfecting cleaning liquid and a damp cloth.
   b. "Soft" household cleaning powder and a damp cloth.
   c. Window cleaning fluids and a damp cloth.

Permanence of Attachment Badge is an attempt to remove the badge by pulling it off or prying off a metal badge that is attached using only adhesive; removal must be "difficult" at all temperatures. If the badge can be removed, it must show obvious evidence that the badge was removed. Acceptable indications are destruction of the badge by tearing, permanent and extensive wrinkling, or repeated exposure of the word "VOID" upon removal of the badge.

As a practical matter, remote moisture displays are not required to have serial numbers because they typically only repeat the moisture information received from the measuring element. Similarly, external printers are not required to have serial numbers because they do not alter the information received from the measuring element.

If the required information is located on the back of a device, the same information must also appear on the side, front, or top. The bottom of a device is not an acceptable surface for these markings.

The identification marking must be permanent and attached with pop rivets, adhesive, or other permanent means. Removable bolts or screws are not permitted. A foil badge may be used provided that it is durable, difficult to remove, and exhibits obvious evidence of an attempt to remove the marking or badge.

The system must be clearly and permanently marked on an exterior surface, visible after installation with the following information:

1.1	The name, initials or trademark of the manufacturer. A remote display is required to have the manufacturer's name or trademark and model designation. (Code Reference GS.1.(a))	Yes ☐ No ☐ NA ☐
1.2	A model designation that positively identifies the pattern or design of the device. The Model designation shall be prefaced by the word “Model”, “Type”, or “Pattern.” These terms may be followed by the term “Number” or an abbreviation of that word. The abbreviation for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., No or No.). The abbreviation for the word “Model” shall be “Mod” or “Mod.” [Effective January 1, 2003]. (Code Reference G-S.1.(b)&(c))	Yes ☐ No ☐ NA ☐
1.3	A nonrepetitive serial number prefaced by words “Serial Number” or an abbreviation of that term. Abbreviations for the word “Serial” shall, as a minimum, begin with the letter “S,” and abbreviations for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., S/N, SN, Ser.No, and S No.). (Code Reference G-S.1.(d),(e), & (f)).	Yes ☐ No ☐ NA ☐

1.4	The NTEP Certificate of Conformance (CC) Number or a corresponding CC addendum number for devices that have (or will have) a CC. The number shall be prefaced by the terms "NTEP CC," "CC," or "Approval." These terms may be followed by the term "Number" or an abbreviation of the word "Number". The abbreviation shall, as a minimum, begin with the letter "N" (e.g., No or No.). (Code Reference G-S.1.(g). Effective January 1, 2003). The device must have an area, either on the identification plate or on the device itself, suitable for the application of the CC number. If the area for the CC number is not part of an identification plate, note its intended location and how it will be applied. Location of CC Number if not located with the identification information: _____	Yes ☐ No ☐ NA ☐
1.5	If the information required by G-S.1. is placed on a badge or plate, the badge or plate must be permanently attached to the device. (See criteria above for permanence of Attachment of Badge.)	Yes ☐ No ☐ NA ☐
1.6	Identifying information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device.	Yes ☐ No ☐ NA ☐
1.7	All markings must be clear and easily readable.	Yes ☐ No ☐ NA ☐
1.8	The lettering for all markings must be permanent. Record the grade for the permanence of markings. _____.	Yes ☐ No ☐ NA ☐
1.9	If the markings for other than device identification required by G-S.1. are placed on a badge or decal, then the badge or decal must be durable (difficult to remove at all temperatures).	Yes ☐ No ☐ NA ☐

Code Reference: G-S.1.1. Remanufactured Devices and Remanufactured Main Elements.

Refer to the Section Policy on Remanufactured and Repaired Devices in the NCWM Publication 14 Administrative Policy.

1.10	If the manufacturer specifies a temperature range, the range shall be at least 20 °C (36 °F).	Yes ☐ No ☐ NA ☐

3.b. Miscellaneous Editorial Changes

Discussion: The Sector reviewed the original draft of the 2002 issue of the grain moisture meter checklist in Publication 14. Several typographical errors were noted.

Recommendation: The Sector recommended changes to correct typographical errors. The Sector also recommended changing formulas to use a "bar" over variables that are intended to indicate an "average" or "mean". Recommended changes are shown below.

Accuracy. The two tests for accuracy are bias (meter versus oven) and the Standard Deviation of the Differences (SDD) between the meter and the air oven for each of the 2 % moisture intervals. Each instrument will be individually tested.

$$Bias = \frac{\sum_{i=1}^{n} (\bar{x}_i - r_i)}{n}$$

where,

$\bar{x}_i$ = average predicted moisture content for sample i (3 replicates)

r_i = reference moisture content for sample i

n = number of samples per 2 % moisture interval ($n = 10$)

$$SDD = \sqrt{\frac{\sum_{i=1}^{n} (y_i - \bar{y})^2}{n-1}}$$

where,

y_i = $\bar{x}_i - r_i$ (see above)

$\bar{y}$ = average of the y_i

n = number of samples per 2 % moisture interval ($n = 10$)

Tolerances for both of these tests will be one-half the Handbook 44 acceptance tolerance for the appropriate 2 % interval. Use the maximum acceptance tolerance for intervals where the tolerance changes with the moisture content, (i.e., in the 16 %-18 % interval for corn use 0.5 x 0.05 x 18 = 0.45 for the tolerance). Specific tolerances are:

Grain Type	Moisture Content	Tolerance
Corn	12-14 %	0.40
	14-16 %	0.40
	16-18 %	0.45
HRW wheat and Soybeans	10-12 %	0.35
	12-14 %	0.35
	14-16 %	0.35

The manufacturer may adjust the calibration bias to compensate for differences from the type evaluation laboratory in reference methods or sample sets.

Repeatability. The Standard Deviation (SD) of the three replicates will be calculated for each sample in a 2 % moisture interval and pooled across samples. Each instrument will be tested individually. The equation used to calculate SD is:

$$SD = \sqrt{\frac{\sum_{i=1}^{n} \sum_{j=1}^{3} (P_{ij} - \bar{P}_i)^2}{2n}}$$

where,

P_{ij} = predicted moisture for sample i and replicate j

$\overline{P}_i$ = average of the three predicted moisture values for sample i

n = number of samples per 2 % moisture interval ($n = 10$)

Tolerances for repeatability are 0.25 x the maximum Handbook 44 acceptance tolerance for the 2 % moisture interval. Specific tolerances are:

Grain Type	Moisture Range	Tolerance
Corn	12-14 %	0.200
	14-16 %	0.200
	16-18 %	0.225
HRW wheat and Soybeans	10-12 %	0.175
	12-14 %	0.175
	14-16 %	0.175

Reproducibility. The results for each of the three replicates will be averaged for each instrument using samples over the 6 % moisture range and the Standard Deviation of the Differences (SDD) between instruments will be calculated using the following equation:

$$SDD = \sqrt{\frac{\sum_{i=1}^{n}(d_i - \overline{d})^2}{n-1}}$$

where,

d_i = $\overline{P}_{1i} - \overline{P}_{2i}$

$\overline{P}_{1i}$ = average of three replicates for sample i on instrument 1

$\overline{P}_{2i}$ = average of three replicates for sample i on instrument 2

$\overline{d}$ = average of the d_i

n = number of samples in all three 2 % moisture ranges ($n = 30$)

Tolerances for reproducibility are 0.3 x the maximum Handbook 44 acceptance tolerance for the 6 % moisture range. Specific tolerances are:

Grain Type	Moisture Range	Tolerance
Corn	12-18 %	0.27
HRW wheat	10-16 %	0.21
Soybeans	10-16 %	0.21

V. Criteria for NTEP Moisture Calibration Review

The following criteria are to be applied along with criteria listed in Part IV above to determine "approved" and "pending approval" moisture ranges.

Special Cases Dealing with Inadequately Represented Moisture Intervals:

VI. Standardization of Instruments

Continuing participation in the ongoing data collection and calibration review program (Phase II) is mandatory for all grain moisture meters. Annually, prior to Phase II data collection, device manufacturers are required to make a side-by-side comparison[1] between their reference standard instruments and instruments of like type in the NTEP Participating Laboratory. The specific details of the comparison tests will vary with the technology involved, but manufacturers will be required to provide details of their test procedures to the NTEP Participating Laboratory and will be required to show that the mean moisture difference between Manufacturer's Laboratory Standard Meters and the corresponding NTEP Laboratory Meters (path A in figure below) does not exceed ±0.2 x the Handbook 44 acceptance tolerance. Manufacturers must demonstrate that their methods for standardizing units in production result in "as shipped" units which agree with the corresponding NTEP Laboratory units (path D in figure below) within ±0.3 x the Handbook 44 acceptance tolerance. Manufacturers must also demonstrate that once units are standardized, moisture results between units of like type will not exceed these tolerances when a grain calibration change is made.

[1] an exchange of samples may be used in lieu of side-by-side testing if mutually agreeable to the NTEP Laboratory and the Manufacturer.

4. Update on Field Evaluation of Proposed Test Weight per Bushel Tolerances

4.a. Review of Phase I and Phase II Data

Background: At the Sector's September 1999 meeting, maintenance tolerances of 0.8 pounds per bushel for corn and oats; 0.5 pounds per bushel for all classes of wheat; and 0.7 for soybeans, barley, rice, sunflower, and sorghum were proposed for further study. States agreeing to participate in a field evaluation of the proposed tolerances and test methods included:

Arkansas	Nebraska	Maryland
Illinois	North Carolina	Missouri

The Field Evaluation of Tolerances project was conducted in two phases:

Phase 1. Standardization of Quart Kettle Test Weight Apparatus. - In late September 2000, the USDA/Grain Inspection Packers and Stockyards Administration (GIPSA) sent one portion of a hard red winter wheat HRW standardizing sample to each of the participating State Laboratories. Participating laboratories verified that the quart kettle used in their standard test weight per bushel (TW) apparatus met the requirements spelled out in GIPSA's volume test. They also verified that the apparatus was set up according to GIPSA standards before testing the HRW standardizing samples.

To obtain base-line performance data on the standard quart kettle test method for corn and soybeans, GIPSA sent corn and soybeans samples to the participating laboratories prior to the Sector's August 2002 meeting. Tests were run on each State's standard quart kettle TW apparatus and on any NTEP model Grain Moisture Meter with TW capability that the State had in its laboratory.

Phase 2. Field Tests of Test Weight per Bushel Capability. - Participating laboratories obtained their own samples for this test. Each participating laboratory was to make an initial determination of the test weight per bushel of each sample portion with the standard quart kettle apparatus before sending it to the field. Tests were to be run on TW capable NTEP grain moisture meters and on the kettle test weight apparatus used at each commercial location selected for field-testing. Kettle tests at each location were to be made by the operator who normally made test weight per bushel determinations for commercial transactions. No instruction was to be given to the operator on how to perform the test. The participating laboratory was to make a final determination of test weight per bushel when the sample was returned to the lab. Data was to be collected on no more than twenty instruments per grain sample.

Discussion: Diane Lee, OWM, reported on the current status of this project. Phase I data for corn and soybeans had been received from all six participating states. (Wheat samples were sent to the states in late September 2000. With the exception of one State, the test weight apparatuses were within GIPSA's tolerance. GIPSA has since worked with

the State to correct the test weight apparatus that was out of tolerance.) The results for corn and soybeans are summarized below:

Quart Kettle Method Test Weight per Bushel Test Results for Participating State Grain Moisture Labs with GIPSA Measurements as Reference

	Corn		Soybeans	
	Bias (pounds per bushel) (avg. of 3 replicates)	Individual Lab Precision (pounds per bushel) (3 replicates)	Bias (pounds per bushel) (avg. of 3 replicates)	Individual Lab Precision (pounds per bushel) (3 replicates)
State 1	0.23	0.06	0.13	0.06
State 2	-0.60	0.00	-0.50	0.00
State 3	0.07	0.06	0.00	0.00
State 4	0.27	0.06	0.27	0.06
State 5	-0.07	0.06	-0.13	0.06
State 6	0.30	0.00	0.07	0.06
Avg Bias	0.03	---	-0.03	---
Intralab SDD	---	0.34	---	0.27

With the exception of State 2 that reported results significantly lower than the reference for both corn and soybeans, the results indicate that in a laboratory setting the quart kettle method can achieve accuracies (based on the average of 3 readings) that are approximately one-half to one-third the proposed maintenance tolerances of ∀0.8 pounds per bushel for corn and ∀0.7 pounds per bushel for soybeans.

In state moisture labs and in the ongoing calibration maintenance program at GIPSA, the bias on NTEP meters using TW calibrations that had been standardized met the proposed tolerance requirements for corn and soybeans with one exception. The exception, with an error at least seven times greater than meters of the same type, was judged to be an isolated case, most likely indicating the need for service, as results for nine other meters of like type were well within the proposed tolerance limits. Consistent biases on the majority of meter models with TW calibrations that had not been standardized suggest that with proper standardization, these models would also meet the proposed tolerance requirements. The laboratory TW results (from both NTEP and State labs) for GMM's are summarized below.

Test Weight per Bushel Test Results
for
Grain Moisture Meters in Participating State Grain Moisture Labs and at the NTEP Laboratory
with
GIPSA Quart Kettle Measurements as Reference

Model	number of meters tested	Corn		Soybeans	
		Average Bias (pounds per bushel)	SDD (pounds per bushel) Based on 3 replicates per meter	Average Bias (pounds per bushel)	SDD (pounds per bushel) Based on 3 replicates per meter
Model 1	2	-0.35	0.21	0.08	0.12
Model 2	9*	-0.29	0.17	-0.04	0.16
Model 3	3	-1.14	0.21	-0.66	0.07
Model 4	2	-1.12	0.40	-0.37	0.38
Model 5	2	-1.48	0.35	-1.35	0.07
* net of 1 outlier					

Dr. Richard Pierce, GIPSA, remarked that the repeatability of the meters was impressive, especially in light of the fact that the SD between two inspectors at GIPSA is typically 0.25 pounds per bushel for official inspections. This translates to 0.5 pounds per bushel at a 95 % confidence level.

One Sector member remarked that the samples used for Phase I tests were fairly dry (corn: approximately 13.3 % and soybeans: approximately 10 %). The use of low moisture samples, plus the fact that the samples were also clean and free of foreign material and broken kernels may have contributed to the excellent results obtained in Phase I tests. Official TW determinations by GIPSA, for most large grains, are obtained prior to removal of dockage and foreign material.

It was also pointed out that TW measurements on high moisture samples are not reliable. In normal years, TW will increase as a grain samples loses moisture. The grain kernel tends to shrink somewhat as it dries. In fact, the volume reduction is normally greater, percentage wise, than the reduction in mass due to drying. As a result, TW (weight per unit volume) increases. The surface condition of high moisture corn may also contribute to additional variance in the packing density as the sample is loaded into the test kettle or test cell of a GMM.

Phase II field data were received from Illinois, Missouri, Nebraska and Arkansas. The results are summarized below. The Sector noted that TW errors were essentially the same for both GMM's with TW capability and for the various kinds of stand-alone TW apparatus currently in use in the field. The results for corn and soybeans were especially encouraging considering that most of the field GMM's had not been adjusted for optimum performance on TW.

Phase II biases reported by Arkansas were significantly greater (and all negative with respect to their reference) than those reported for wheat and soybeans by other states on both GMM devices and on kettle test weight apparatus. The Arkansas weights and measures representative said that he would review the data to see if a cause for this difference could be determined.

Field Evaluation – Bushel Test Weight Hard Red Winter Wheat & Soft Red Winter Wheat State Quart Kettle Apparatus as Reference				
State	**Grain Moisture Meters**		**TW Apparatus**	
	SDD (pounds per bushel) Based on 3 replicates per meter	Average Bias (pounds per bushel) with respect to reference sample	SDD (pounds per bushel) Based on 3 replicates per device	Average Bias (pounds per bushel) with respect to reference sample
All participating states	0.47	-0.47	0.31	-0.23
Illinois	0.43	-0.52	0.50	0.02
Missouri	0.26	-0.55	0.32	-0.31
Nebraska	0.29	-0.02	0.23	-0.19
Arkansas (net of 1 outlier)	0.45	-0.92	0.23	-0.36

Field Evaluation – Bushel Test Weight Soybeans State Quart Kettle Apparatus as Reference				
State	**Grain Moisture Meters**		**TW Apparatus**	
	SDD (pounds per bushel) Based on 3 replicates per meter	Average Bias (pounds per bushel) with respect to reference sample	SDD (pounds per bushel) Based on 3 replicates per device	Average Bias (pounds per bushel) with respect to reference sample
All participating states	0.79	-0.05	0.64	0.06
Illinois	0.40	-0.09	0.41	0.25
Nebraska	0.32	0.66	0.20	0.36
Arkansas (net of 1 outlier)	0.41	-1.10	0.56	-1.04

Field Evaluation – Bushel Test Weight Corn State Quart Kettle Apparatus as Reference				
State	**Grain Moisture Meters**		**TW Apparatus**	
	SDD (pounds per bushel) Based on 3 replicates per meter	Average Bias (pounds per bushel) with respect to reference sample	SDD (pounds per bushel) Based on 3 replicates per device	Average Bias (pounds per bushel) with respect to reference sample
All participating states	0.55	0.05	0.61	-0.27
Illinois	0.60	0.33	0.46	0.37
Nebraska	0.38	-0.18	0.37	-0.59

4.b. Proposal to move the Developing Issue for Test Weight per Bushel forward as a Voting Item

Discussion: [For additional background, see also S&T Committee 2002 Interim Report, Developing Issues – Grain Moisture Meters, Item 1, Recognize Indications and Recorded Representations of Test Weight per Bushel, in NCWM Publication 16 dated April 2002.]

Knowledge of test weight per bushel (TW) is important not only in determining the price a producer receives for grain delivered to a grain elevator; it is also important to the grain elevator when grain stocks in storage are audited for quantity. Grain industry members reported that the proposed tolerances for TW are acceptable to the industry.

Stressing that the grain industry urgently needed the capability to simultaneously (and easily) make TW determinations, they urged the Sector to recommend moving forward on this issue. Some members were hesitant about moving forward at this time, citing concern about the unresolved issue of large negative bias in the Arkansas Phase II data. It was pointed out that even if the Sector recommended moving ahead at this time, the earliest date that changes in the code would become effective was January 1, 2004.

The Sector considered whether the recommended changes should be retroactive or nonretroactive. Discussion centered on the requirement that meters measuring TW must provide some means to ensure that measurements of TW are not allowed to be displayed or printed when insufficient sample volume has been supplied. Although the proposed code does not specify how this will be accomplished, it is generally assumed that the means will include a level sensor of some sort installed in either the sample hopper or the test cell.

Those favoring making the proposed code retroactive reminded the Sector that although moisture measurements are not significantly affected when samples are not of sufficient size to completely fill the measuring cell of a GMM, the TW measurement is greatly affected when the cell is not filled. Measurement of TW requires determination of two parameters: volume and mass. The vast majority of GMM's with TW capability presently in the field do not have means to assure that the measuring cell is completely full. If the cell is not filled completely, TW indications will be lower than they should be to the disadvantage of the producer selling grain. Some of those favoring making the code nonretroactive felt that GMM's with a window, through which the test cell could be seen, provided adequate means to verify that the cell had been filled. A grain industry member expressed the belief that compared to how test weight measurements are being made now; the worry about a sensor was trivial. As long as the GMM could produce an accurate TW measurement when properly used, whether the hopper had a sensor or not was not important. Some thought this was a facilitation of fraud issue and favored making the sensor requirement retroactive. Others thought that making the code retroactive would unfairly penalize users of existing NTEP meters with TW capability.

Cassie Eigenmann of DICKEY-john, supporting making the sensor requirement retroactive, pointed out that all existing DICKEY-john GMM's covered by an NTEP CC were hard coded to add the words "approx" or "approximate" to the display and print out of TW measurements. She asked how devices displaying "approximate" TW would be regulated if the sensor requirement was nonretroactive. Weights and measures members were at first divided on this question. Some were of the opinion that they would permit the continued use and display of "approximate" TW if the device met the tolerance requirements, since "approximate" was added at the request of jurisdictions permitting a display of TW when tolerances didn't exist for regulation. Others were concerned about what would happen in a court case when printed tickets presented in evidence of a claim showed "approximate". States that presently do not permit "approximate" TW to be displayed or recorded indicated they would not change their policy.

On a related issue, Don Onwiler, Nebraska Dept. of Agriculture, Div. of Weights and Measures, proposed that Sec.5.56(b) of Handbook 44 be amended to add tolerances for grain moisture meters with test weight per bushel capability. Because new devices with test weight per bushel capability will be required to determine if sufficient sample volume has been provided for an accurate measurement, and because Section 5.56(b) applies to non-NTEP devices which are not within the purview of the Sector, the Sector decided that it was not appropriate for the Sector to recommend modification of Sec. 5.56(b) of the Code to add tolerances for grain moisture meters with test weight per bushel capability. Weights and Measures members suggested that paragraph T.3. should be revised to clarify that it applies to separate accessory devices (such as a beam balance test weight apparatus) used to determine test weight per bushel of grain samples for the purpose of making density corrections in moisture determinations. Don Onwiler offered to recommend this change to paragraph T.3 at the September meeting of the Central Weights and Measures Association.

Conclusion: By a vote of 9 to 4, the Sector agreed that the addition to paragraph S.2.6. relating to a means of sensing adequate sample volume should be nonretroactive and recommended that the Specifications and Tolerances (S&T) Committee place the GMM developing issue relating to Indications and Recorded Representations of Test Weight per Bushel, on the NCWM interim agenda with the intent to make it a voting item at the NCWM annual meeting in July 2003. The Sector also agreed to modify paragraph N.1.1.(b) of the developing issue to remove the words "at least" and to several editorial changes. The change to N.1.1.(b) was made to insure that only the lowest moisture sample of each grain used in tests of moisture indications would be used in tests of test weight per bushel indications. The final recommendation is shown below.

Recommendation: Modify 5.56(a) Grain Moisture Meter Code Section in NIST Handbook 44 to recognize indications and recorded representations of test weight per bushel as follows:

Amend the following paragraphs:

A.1. This code applies to grain moisture meters; that is, devices used to indicate directly the moisture content of cereal grain and oil seeds. The code consists of general requirements applicable to all moisture meters and specific requirements applicable only to certain types of moisture meters. Requirements cited for "test weight per bushel" indications or recorded representations are applicable only to moisture meters incorporating an optional automatic test weight per bushel measuring feature.

S.1.1. Digital Indications and Recording Elements.

(c) Meters shall be equipped with a communication interface that permits interfacing with a recording element and transmitting the date, grain type, grain moisture results, test weight per bushel results and calibration version identification.

(d) A digital indicating element shall not display, and a recording element shall not record, any moisture content values or test weight per bushel values before the end of the measurement cycle.

(e) Moisture content results shall be displayed and recorded as percent moisture content, wet basis. Test weight per bushel results shall be displayed and recorded as pounds per bushel. Subdivisions of ~~this~~ these units shall be in terms of decimal subdivisions (not fractions).

(f) A meter shall not display or record any moisture content or test weight per bushel values when the moisture content of the grain sample is beyond the operating range of the device, unless the moisture and test weight representations include~~s~~ a clear error indication (and recorded error message with the recorded representation).

S.1.3. Operating Range. - A meter shall automatically and clearly indicate when the operating range of the meter has been exceeded. The operating range shall specify the following:

(c) Moisture Range of the Grain or Seed. The moisture range for each grain or seed for which the meter is to be used shall be specified. ~~A moisture~~ Moisture and test weight per bushel value~~s~~ may be displayed when the moisture range is exceeded if accompanied by a clear indication that the moisture range has been exceeded.

S.1.4. Value of Smallest Unit. - The display shall permit ~~constituent~~ moisture value determination to both 0.01 % and 0.1 % resolution. The 0.1 % resolution is for commercial transactions; the 0.01 % resolution is for type evaluation and calibration purposes only, not for commercial purposes. Test weight per bushel values shall be determined to the nearest 0.1 pound per bushel.

S.2.4.1. Calibration Version. - A meter must be capable of displaying either calibration constants, a unique calibration name, or a unique calibration version number for use in verifying that the latest version of the calibration is being used to make moisture content and test weight per bushel determinations.

S.2.6. Determination of Quantity and Temperature. - The moisture meter system shall not require the operator to judge the precise volume or weight and temperature needed to make an accurate moisture determination. External grinding, weighing, and temperature measurement operations are not permitted. In addition, if the meter is capable of measuring test weight per bushel, determination of sample volume and weight for this measurement shall be fully automatic, *and means shall be provided to ensure that measurements of test weight per bushel are not allowed to be displayed or printed when insufficient sample volume is available to provide an accurate measurement.*

S.4. Operating Instructions and Use Limitations. - The manufacturer shall furnish operating instructions for the device and accessories that include complete information concerning the accuracy, sensitivity, and

use of accessory equipment necessary in obtaining a moisture content. Operating instructions shall include the following information:

(d) the kind or classes of grain or seed for which the device is designed to measure moisture content and test weight per bushel;

N.1.1. Transfer Standards.[1] - Official grain samples shall be used as the official transfer standards with moisture content and test weight per bushel values assigned by the reference methods. The reference methods for moisture shall be the oven drying methods as specified by the USDA GIPSA. The test weight per bushel value assigned to a test weight transfer standard shall be the average of 10 test weight per bushel determinations using the quart kettle test weight per bushel apparatus as specified by the USDA GIPSA. Tolerances shall be applied to the average of at least three measurements on each official grain sample. Official grain samples shall be clean and naturally moist, but not tempered (i.e., water not added). (Amended 1992)

N.1.2. Minimum Test. - A minimum test of a grain moisture meter shall consist of tests~~: (a) with~~ using samples (need not exceed three) of each grain or seed type for which the device is used, and for each grain or seed type shall include the following:

(a) tests of moisture indications ~~(b) with~~ using samples having at least two different moisture content values within the operating range of the device, and if applicable,

(b) tests of test weight indications, with the lowest moisture samples used in (a) above.

T.3. For Test Weight Per Bushel Indications or Recorded Representations. - The maintenance and acceptance tolerances on test weight per bushel indications or recorded representations shall be ~~0.193 kg/hL or 0.15 lb/bu. The test methods used shall be those specified by the USDA GIPSA~~ as shown in Table T.3. Tolerances are (+) positive or (!) negative with respect to the value assigned to the official grain sample.

Table T.3. Acceptance and Maintenance Tolerances Test Weight per Bushel	
Type of Grain or Seed	**Tolerance (pounds per bushel)**
Corn, oats	**0.8**
All wheat classes	**0.5**
Soybeans, barley, rice, sunflower, sorghum	**0.7**

UR.1.1. Value of the Smallest Unit on Primary Indicating and Recording Elements. - The resolution of the moisture meter display shall be 0.1 % moisture and 0.1 pounds per bushel test weight during commercial use.

UR.3.4. Printed Tickets.

(b) The customer shall be given a printed ticket showing the date, grain type, grain moisture results, test weight per bushel, and calibration version identification. The ticket shall be generated by the grain moisture meter system.

5. Review Latest Draft of Evaluation Procedure Outline (EPO) and Test Procedures for the Field Evaluation of NTEP GMM Devices (air-oven reference method)

Background: At the March 1998 GMM/NIR Sector meetings three working groups were established to develop Examination Procedure Outlines (EPOs) and Field Evaluation Test Procedures (Inspection Procedures) for GMM and NIR devices to provide guidance to States on implementing NIST Handbook 44 (HB44) as it applies to these devices. The

output of the working groups was first reviewed at the Sector's September 1999 meeting. At the Sector's August 2000 meeting Revised drafts of the Grain Moisture Meter (GMM) Field Evaluation Test Procedures for the air oven reference method and the meter-to-meter method were distributed for review. Because of time limitations, only the meter-to-meter method was reviewed in detail. Following that meeting, the GMM Inspection Procedure – Air-oven Reference Method was split into two separate procedures: The first based on HB-44, §5.56(a), applicable to all NTEP meters as well as any meters manufactured or placed into service after January 1, 1998; and the second based on HB-44, §5.56(b), applicable to all other meters. A similar change was made in the corresponding EPOs. Revised drafts (dated May 2001) were reviewed by the Sector at its August 2001 meeting.

Subsequent to the Sector's 2001 meeting, OWM discussed formatting for EPOs considering what would be best for field inspectors. During these discussions it was noted that EPOs should be in outline form and should remain relatively short so that an inspector has a quick reference to code requirements while testing is being performed. In contrast to EPOs, field manuals should contain more detail to include pictures of the device and more instructions for testing. Field manuals are also intended to be used as teaching tools.

Discussion: In the latest round of editing, Diane Lee, NIST/OWM, has revised the GMM Inspection Procedure to address comments and suggestions from the Sector's August 2001 meeting. The revised Inspection Procedure has been rearranged and incorporated into a draft Field Manual titled. ***Examination of Grain Moisture Meters***. The GMM EPO also has been revised to address comments and suggestions from the Sector's August 2001 meeting. It has been incorporated into the Field Manual as Appendix A. The Field Manual includes the following sections: (1) Foreword, (2) References, (3) Definitions, (4) Testing Methods (a description of the test method), (5) Testing Apparatus/equipment, (6) Inspection of Commercial Devices (intended to include pictures, diagrams, or outline drawings), (7) Preparation and Testing of Commercial Devices, (8) Test Report Forms, (9) Reporting a Test, and (10) Appendix A, GMM EPO.

Richard Pierce, GIPSA, noted that the EPO included several checklist items that duplicated evaluations performed during NTEP testing. Ms. Lee pointed out that the phrase "if conditions exist such that they can be evaluated" precedes such checklist items. She explained that these were included, because they represented situations that might be encountered during routine field evaluation. For example, paragraph 6.11, relating to the requirement that power interruption does not cause indicating or recording of values outside of tolerance, would apply only if a power interruption were encountered while the inspector was performing normal accuracy tests on the device.

One attendee mentioned that a significant number of GMM rejections during field test are caused by high moisture grain samples that are beginning to deteriorate. There is a limit to how long high moisture samples can be stored and still remain stable when removed from storage and put into use. The stability problem may not be evident when the samples leave the laboratory, but it becomes evident after the samples have been used several times.

Conclusion: The Sector was in general agreement that Section 6.2 Official Samples should incorporate additional precautions relating to the use of high moisture samples. Specific suggestions related to high moisture samples included:

> 6.2.1.4. There is some evidence that moisture level of samples may begin to change after 24 drops (18 drops for high moisture corn and soybeans), as such samples should not be used for more than 24 drops. Samples with moistures over 18 % for corn and over 16 % for soybeans are not recommended for use.

Editorial revisions and suggestions relating to other issues in the main body of the Field Examination Procedure included:

> 3.1. The method for testing grain moisture meters that is addressed in this handbook is using grain samples with known moisture values. The grain samples must be maintained when using this method to ensure that the samples retain their original moisture values and do not deteriorate biologically.
>
> 4.11. Certified digital heat probe thermometer, probe, and carrying case
>
> [**Note**: This requirement is not applicable to NTEP meters.]

and in Appendix A,

4.3 T.3. **Test Weight per Bushel Tolerance.** - The tolerance for test weight per bushel is shown in Table T.3. The tolerance is assigned (plus or minus) to the average of three measurements. Yes ☐ No ☐ NA ☐

[**Note**: The above change assumes that the NCWM will approve the Sector's recommendations to modify the GMM Code in section 5.56(a) of HB-44 to recognize indications and recorded representations of test weight per bushel. See preceding agenda item 4.(b)]

Inspection Report – Will need provisions for 3 TW indications, average TW, reference (or standard) TW, and TW error when the GMM Code in section 5.56(a) of HB-44 is amended to recognize indications and recorded representations of test weight per bushel.

Inspection Report – Change heading of next to last column of data field to make it clear that this is where the moisture value of the transfer standard is to be entered:

-% moisture (standard)

Time constraints did not allow a complete review of the draft. Additional comments and suggestions should be forwarded to Diane Lee at diane.lee@nist.gov by November 15, 2002.

Manufacturers were urged to forward line drawings/diagrams of their devices via e-mail to Diane Lee at diane.lee@nist.gov for inclusion in the next draft. Especially useful would be drawings of key-pads, control panels, and line drawings of the device identifying components likely to be used, examined, or accessed during a field inspection.

6. A Message from the NCWM Board of Directors

Don Onwiler, Nebraska Department of Agriculture, Division of Weights & Measures, representing the NCWM Board of Directors (BOD), informed the Sector that the National Type Evaluation Program (NTEP) is working well, largely due to the efforts of the staff of NIST's Office of Weights and Measures and NCWM, Inc.'s NTEP Director, Steve Patoray. NTEP is solvent; however, the BOD believes that the major work of the GMM & NIR Sectors has been completed and it questions whether annual Sector meetings will be required in the future. The GMM Sector contributes only $500 annually to NTEP. The BOD figures the total staff costs associated with the GMM/NIR Sector is about $15,000. In a cost cutting effort for 2002, no state members received funding for travel to attend this GMM/NIR Sector meeting. However, the Board paid Don Onwiler's travel costs to attend the sector meeting and to provide the sector with an explanation of the BOD's cost cutting efforts, answer questions and address the concerns of the sector.

Discussion: Sector members were disturbed about what they heard. Several members believed that the cost of the Sector meeting was a small portion of the $15,000 cited as the cost of Sector support. The 2000, 2001, and 2002 meetings have all been held in Kansas City, MO at the National Weather Service Training Center with no cost for the meeting room or for digital projectors when needed. Sector meeting agendas and meeting summaries are distributed by e-mail. Other than cookies, soft drinks, and Steve Patoray's time and travel, the cost of a Sector meeting should be very small now that funding of public member travel had been withdrawn. One member expressed the hope that the Board would obtain a detailed breakdown of costs directly related to the Sector's recent meeting before making any decisions about withdrawing support for annual meetings. There was concern that support for the GMM NTEP certificate program would be the next thing to be withdrawn. The Sector has always known that there would never be a large number of GMM (or NIR) CC's, but the value of the program to regulating agencies, producers, the grain trade, and industry is many times greater than the annual cost of the program. Rich Pierce, GIPSA, reported that GIPSA and OWM continue to support the program, with each providing $18,000 per year for the NTEP Phase II program. He said GIPSA was interested in expanding the NTEP program to encompass additional devices. GIPSA is making increased use of cross-utilized equipment, in which devices owned by industry are also used by GIPSA for on-site official inspection. The NTEP program is a critical element in that regard. Don Onwiler responded that NCWM is committed to continuing the NTEP program for grain moisture meters. There is no reason for the Sector to go away, but it may not need to meet every year. Diane Lee, NIST-OWM, suggested that it might be possible for OWM to host a technical session for NIST Handbook 44

issues that need to be resolved or that require additional discussion if the NCWM BOD chooses not to host a sector meeting. Dr. Charles Hurburgh, Jr., ISU, suggested that the possibility of obtaining funding through Federal grant programs, for some of the work done by the Sector, should be explored. He noted that requests for funding of projects involving joint efforts of regulators, producers, the grain trade, and industry are usually received positively by the funding authority.

In order to promote greater uniformity in commercial grain inspection results, Congress passed the Grain Quality Incentives Act of 1990 that authorized the Federal Grain Inspection Service to work in conjunction with the National Institute for Standards and Technology and the National Conference on Weights and Measures to:

1) identify inspection instruments requiring standardization;
2) establish performance criteria for commercial grain inspection instruments;
3) develop a national program to approve grain inspection instruments for commercial inspection; and
4) develop standard reference materials or other means necessary for calibration or testing of approved instruments.

In 1992, partly through the efforts of Sid Colbrook, Illinois Department of Agriculture, who was then NCWM Chairman, the GMM and NIR Sectors were established. The Sectors became not only working groups for the development of device standards and test/evaluation methods; they also provided a forum for manufacturers, user groups, state regulators, GIPSA/FGIS, and NIST-OWM to air issues of mutual concern relating to grain inspection and measurement, including Handbook 44 issues and the GMM ongoing calibration maintenance program. If the NCWM Board views the current purpose of the Sectors as limited to dealing with Publication 14 issues uncovered during NTEP testing, then another forum will have to be found for these other issues of interest (and importance) to members of the Sector.

7. Update on NTEP Type Evaluation and OCP (Phase II) Testing

Rich Pierce of the Grain Inspection, Processors and Stockyards Administration (GIPSA), the NTEP Participating Laboratory for Grain Moisture Meters, reported that there were currently no active applications for examination of new devices.

The number of meter types in the ongoing calibration maintenance program remains at five, the same as last year. Phase II calibration data are being collected for 2002 crop samples on the following meter types.

DICKEY-john Corporation	GAC2000NTEP, GAC2100, GAC2100A
Foss North America, Inc.	Infratec 1227, Infratec 1229
Foss North America, Inc.	Infratec 1241
Motomco, Ins.	919E, 919E-S
The Steinlite Corporation	SL 95

With five types in the OCP (Phase II), the cost to manufacturers remains at $3,600 per type.

8. A Quality Control Procedure for Grain Analysis at a Country Elevator

Dr. Charles Hurburgh, Jr., Agricultural & Biosystems Engineering - Iowa State University, described a quality control system implemented by Farmers Cooperative Elevator Company at its Odebolt, Iowa facility. The system was developed under a grant from the Iowa Grain Quality Initiative with the intention of learning how to develop a quality system and then to replicate it at 32 other locations in northwest Iowa. The initial concept was to use the quality management system for market differentiation – to be able to certify the identity of specialty crops through a documented identity preservation system. During the early stages of the project it became apparent that the quality system had benefits as a management system and had improved operations to the extent that the system was worth implementing even without the prospects of market differentiation through identity preservation. In fact, Dr. Hurburgh estimated that the system has generated two dollars for every one dollar invested.

Four important criteria were deemed necessary for the system: 1) it must be a certified system; 2) it must have established credibility; 3) there must be 3rd party auditing; and 4) it must have international recognition. The system implemented is based on the American Institute of Baking (AIB) International Gold Standard Certification Program which, with certification and auditing through AIB's Quality System Evaluation, includes about 80 % of the requirements of ISO-9000. Some of the key elements of the system include: written work procedures, flowcharts for sampling and grading

processes, setting tolerances for grade factors, using grade factor control charts and comparison charts (in-house measurements compared to official measurements) for both inbound and outbound grade factors. The objective being to make house grades just as accurate as official grades, and to provide documented evidence of this equivalence.

Quality control data was used to evaluate the accuracy of house grades. The initial target was that no more than 5 % of the individual tests would be out of tolerance. Operator training and incentives were based on these data. Control charts and comparison charts made it easy to identify trends and apply corrections before the trends became problems – continuous data is more useful than spot checks. Better accuracy on inbound measurements resulted in more accurate inventory records and assisted in merchandising. The documentation of quality control (QC) data gave customers confidence in house grades.

The widespread implementation of quality management systems (QMS) like the one in Odebolt, Iowa could have major implications on regulatory programs such as those used for grain moisture meters and (soon) near-infrared grain analyzers. If documented references are used, a certified QMS may create more useful data than annual device inspections. The structure of regulatory programs may change to auditing and verification that a quality system is in place. Review of data may replace testing of devices and reference standards may replace monitoring.

Discussion:
Following Dr. Hurburgh's presentation, Don Onwiler, Nebraska Dept. of Agriculture, Division of Weights & Measures, suggested that in the case of prepackaging scales (automatic weighing systems) there is already precedence for process verification rather than device inspection. In some states such scales are not checked; instead, the packaged product is checked for correct weight.

9. Time and Place for Next Meeting
The next meeting is tentatively planned for the week of August 18, 2003 in the Kansas City, MO area. Meetings will be held in one of the meeting rooms at the National Weather Service Training Center if available. A tentative schedule is shown below.

Wednesday, August 20	1:00 pm - 5:00 pm	GMM Sector Meeting
Thursday, August 21	8:00 am - 12:00 noon	GMM Sector Meeting
Thursday, August 21	1:00 pm - 5:00 pm	Joint Session GMM & NIR Analyzer
Friday, August 22	8:00 am - 12:00 noon	NIR Grain Analyzer Sector Meeting

Appendix D

National Type Evaluation Technical Committee (NTETC)
Near Infrared (NIR) Grain Analyzer Sector

August 22-23, 2002 - Kansas City, MO

Meeting Summary

Agenda Items

★ 1. NIST/Office of Weights and Measures Reorganization
2. Report on the 2002 NCWM Interim and Annual Meetings
   a. S&T Items 357-1A and 357-1B
   b. Specialty or Proprietary Calibrations
3. Type Evaluation Issues – Pub 14, Table 2 - Tolerances for Barley, Corn, Soybeans
4. Proposed Changes and Additions to Publication 14 – Identification Marking Requirements
5. Proposed Changes and Additions to Publication 14 to Add Additional Grains and Criteria for Moisture Basis
6. Dual Certification – Could a Single Certificate be Used?
★ 7. A Message from the NCWM Board of Directors
★ 8. A Quality Control Procedure for Grain Analysis at a Country Elevator
★ 9. Time and Place for Next Meeting

Note: Because of common interest, items marked with a star (★) will be considered in joint session of the NIR Grain Analyzer and the Grain Moisture Meter Sectors

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1. NIST/Office of Weights and Measures Reorganization

Discussion: As part of a broader reorganization within NIST Technology Services (TS), the Office of Weights and Measures (OWM) has been raised from the program level with the Office of Measurement (now the Measurement Services Division) to the Division level within the TS organization structure. Henry Oppermann has been named Chief of the new Weights and Measures Division. In addition to national weights and measures matters, OWM will be responsible for NIST's Metric Program and for international matters relating to legal metrology, including U.S. participation in the OIML. This will provide a closer tie between national and international interests in standards matters.

2. Report on the 2002 NCWM Interim and Annual Meetings

2.a S&T Items 357-1A and 357-1B

At the NCWM Interim Meeting held January 27-30, 2002, the Committee on Specifications and Tolerances (S&T) considered the Sector's proposal to amend the scope of the Tentative Code to include a code exemption for specialty crops and to recommend that the amended Tentative Code be made permanent. During the interim meeting the original proposal, Agenda Item 357-1, was separated into two parts to facilitate review of the issues.

Agenda Item 357-1A - The S&T Committee recommended that the status of the Near Infrared Grain Analyzer Code be changed from tentative to permanent. This item was given a voting (V) status for the 2002 NCWM Annual Meeting.

Agenda Item 357-1B - The S&T Committee opposed the proposal to exempt specialty crop from the entire NIST Handbook 44 (HB-44) NIR Code on the basis that it has no technical merit and would set a precedence for anyone wanting to gain exemptions simply because they operate on a contractual basis. Additionally, the proposal included no definition for specialty crop. To address specialty crop transactions where industry is concerned about the proprietary nature of calibration information, the Committee recommended amending NIST

HB 44 NIR Code, paragraph S.1.2 to include "If more than one calibration is included for a given grain type, the calibrations must be clearly distinguished from one another." This item was given Informational (I) status.

For additional background refer to Committee Reports for the 87th Annual Meeting, NCWM Publication 16, April 2002 and to OWM Position Statement, "2002 S&T Interim Agenda Item 357-1 - Tentative Status of NIR Grain Analyzers Code."

At the 87th Annual Meeting held July 14 – 18, 2002 the Conference voted to accept Agenda Item 357-1A, elevating the Near Infrared Grain Analyzer Code to permanent status, effective January 1, 2003.

2.b. Specialty Crops and Proprietary Calibrations

Discussion: Sector members discussed NCWM Conference Agenda Item 357-1B at length. In an attempt to arrive at a definition of "specialty crop" it was suggested that a specialty crop might be one in which the constituents recognized by the CC for that crop type (e.g., soybeans: protein, & oil) could not be measured accurately using the normal calibration because the specialty crop had a spectral response that differed significantly from the spectral response of normal varieties of that crop. High oleaic soybeans (soybean varieties developed specifically to yield high concentrations of oleaic acid) were cited as a good example of a specialty crop requiring special oil and protein calibrations. In contrast, "high oil" corn was not considered a good example of a specialty crop, although seed companies may market it as such. It was pointed out that although "normal" corn typically has an oil content in the 3-4 % range, the GIPSA corn oil calibration contains low (3-4 %), mid-range (5-6 %), and high (>7 %) oil samples from three major seed companies. Sector members were in general agreement that it would be misleading to imply that this, or similar, "standard" calibrations are somehow unsuitable for use with high-oil corn samples. There was similar agreement that, from a regulatory point of view, it would not be desirable to allow the use of multiple calibrations (on the same device) for essentially the same commodity.

The Sector searched for wording that would restrict the unnecessary use of multiple calibrations for the same basic grain type but would still permit the use of proprietary calibrations where there was a legitimate need. The following wording was proposed as an amendment to paragraph S.1.2 of NIST HB 44, NIR Code, "If a non-NTEP calibration is included for a given grain type, it must be clearly distinguished from other calibrations. The calibration description must clearly identify the unique end use property addressed by the calibration." Several variations of the foregoing were also considered.

Conclusion: In the end, the Sector decided that it would be best to add new text to current paragraph S.1.2. of the NIR Analyzer Code, as shown in the recommendation below, to address specialty crop transactions where industry is concerned about the proprietary nature of calibration information. This is the same wording recommended by the S&T Committee in Conference Agenda Item 357-1B.

Recommendation: Amend paragraph S.1.2. as follows:

S.1.2. Selecting Grain Class and Constituent. – Provision shall be made for selecting, and recording the type or class of grain and the constituent(s) to be measured. The means to select the grain type or class and constituent(s) shall be readily visible and the type or class of grain and constituent(s) selected shall be clearly and definitely identified in letters (such as HRWW, HRSW, etc. or PROT, etc.). A symbol to identify the display of the type or class of grain and constituents(s) selected is permitted provided that it is clearly defined adjacent to the display. Minimum acceptable abbreviations are listed in Table S.1.2. Meters shall have the capability (i.e., display capacity) of indicating the grain type using a minimum of four characters in order to accommodate the abbreviations listed in Table S.1.2. If more than one calibration is included for a given grain type, the calibrations must be clearly distinguished from one another.

3. Type Evaluation Issues – Pub 14, Table 2 - Tolerances for Barley, Corn, Soybeans

Background: At its August 2001 meeting, the Sector recommended the addition of Table 2 listing tolerances applicable to the Sample Temperature Sensitivity test as well as tolerances for Accuracy, Precision, and Reproducibility. Only wheat tolerance values were known at that time. Consideration of tolerance values for barley, corn, and soybeans was deferred pending further investigation.

Discussion: The Table 2 Accuracy, Precision, and Reproducibility tolerance values for protein in all classes of wheat are based on the following:

Accuracy Tolerance:	1/2 the HB 44 acceptance tolerance applied to individual samples
Repeatability Tolerance:	1/4 the HB 44 acceptance tolerance applied to individual samples
Reproducibility Tolerance:	1/3 the HB 44 acceptance tolerance applied to individual samples

Dr. Richard Pierce, GIPSA, representing the NTEP Laboratory, reported that it was reasonable to use the above multipliers for the repeatability and reproducibility tolerances for barley, corn, and soybeans, but due to uncertainties with the standard reference methods for the larger grains and oil seeds, accuracy tolerances would have to be increased for corn and soybeans beyond the values obtained using the above multipliers.

The tolerance value of ± 0.35 for the Sample Temperature Sensitivity Test for all classes of wheat was not originally expressed as a fraction of the HB 44 acceptance tolerance applied to individual samples, but Dr. Pierce indicated that an appropriate tolerance for this test would be ± 0.45 for all the constituents of the added grain types.

Accordingly, the repeatability and reproducibility tolerances proposed for barley, corn, and soybeans, were derived using the multipliers mentioned above and rounding the results to the next highest 0.05. Accuracy tolerances proposed for barley were also derived using the multipliers mentioned above and rounding the results to the next highest 0.05. Accuracy tolerances proposed for corn and soybeans were derived by first using the multipliers mentioned above, rounding the results to the next highest 0.05, and then adding an additional allowance to account for uncertainties in the standard reference methods. The calculation of the overall accuracy tolerance for Corn and Soybeans is shown below:

Grain Type	Constituent	1/2 the acceptance tolerance applied to individual samples (rounded up to the next highest 0.05)	Additional allowance	Overall accuracy tolerance
Corn	Protein	0.45	0.05	0.50
	Oil	0.40	0.10	0.50
	Starch	0.55	0.45	1.00
Soybeans	Protein	0.45	0.10	0.55
	Oil	0.40	0.05	0.45

Recommendation: Add tolerance values for barley, corn, and soybeans to Table 2 as shown.

Table 2. Tolerances

Grain Type	Constituent	Sample Temperature Sensitivity Test Tolerance	Accuracy Tolerance	Repeatability Tolerance	Reproducibility Tolerance
Durum Wheat	Protein	± 0.35	0.30	0.15	0.20
Hard Red Spring Wheat	Protein				
Hard Red Winter Wheat	Protein				
Hard White Wheat	Protein				
Soft Red Winter Wheat	Protein				
Soft White Wheat	Protein				
"All-Class" Wheat Calibration	Protein				
Two-rowed Barley	Protein	± 0.45	0.40	0.20	0.25
Six-rowed Barley	Protein				
"All-Class" Barley Calibration	Protein				
Corn	Protein	± 0.45	0.50	0.25	0.30
	Oil	± 0.45	0.50	0.20	0.25
	Starch	± 0.45	1.0	0.30	0.35
Soybeans	Protein	± 0.45	0.55	0.25	0.30
	Oil	± 0.45	0.45	0.20	0.25

4. Proposed Changes and Additions to Publication 14

4.a. Identification Marking Requirements

Background: The 86th National Conference on Weights and Measures (NCWM) in 2001 adopted changes to the General Code section of Handbook 44 that require corresponding changes to the Grain Moisture Meter Check List in Publication 14. The changes include:

- a specification of acceptable abbreviations for the word "Model"
- a requirement that devices be permanently marked with the applicable Certificate of Conformance (CC) number or a corresponding CC addendum number.

[For a detailed discussion of the above changes see the report 86th NCWM. NIST *Special Publication 976*.]

Conclusion and Recommendation: The Sector agreed to recommend amending and modifying Publication 14, NIR Checklist, Section 1. General**,** to combine related marking requirements and to address the above issues. In addition, the Sector recommended moving the paragraph related to Code Reference G-S.1.1. to a more appropriate location following the list of marking requirements. Recommended changes are shown below.

1. General

Code Reference: G-S.1. Identification

Virtually all measuring equipment (except separate parts necessary to the measurement process but not having any metrological effect) must be clearly and permanently marked with the manufacturer's name or trademark, model designation, and serial number. Additionally, devices that have (or will have) an NTEP Certificate of Conformance (CC) Number, must be marked with the CC number or a corresponding CC addendum number. "Permanent" markings addresses two aspects: (1) the printed information will withstand wear and cleaning, and (2) if the markings are on a plate or badge, then the marking badge must be "permanently" attached to the device. Permanently attached means that the identification information required by G-S.1. is not easily removed from the badge. If it is removed, then it must be obvious that the badge or plate containing this information has been removed. All markings must be clear and easily readable. The following test procedure shall be used to determine the permanence of the identification markings.

Permanence of Lettering: The lettering for the markings are subjected to the following tests to simulate accelerated wear. The markings are then compared with a typical set of labels exhibiting various degrees of wear, graded from minimal effect (1) to excessive unacceptable wear (7).

Attempts are made to remove the marked information, whether on a badge (plate) or on the device itself, using the following means:

1. Rub over one letter of the marking at least 20 times using an ink eraser in the same manner and force as one would normally exert while erasing an inscription written with a ballpoint pen.

2. Clean the marking or badge with the following cleaners presumed to be "readily available."

   a. Disinfecting cleaning liquid and a damp cloth.
   b. "Soft" household cleaning powder and a damp cloth.
   c. Window cleaning fluids and a damp cloth.

Permanence of Attachment of Badge: Attempt to remove the badge by pulling it off or prying off a metal badge that is attached using only adhesive; removal must be "difficult" at all temperatures. If the badge can be removed, it must show obvious evidence that the badge was removed. Acceptable indications are destruction of the badge by tearing, permanent and extensive wrinkling, or repeated exposure of the word "VOID" upon removal of the badge.

As a practical matter, remote constituent displays are not required to have serial numbers because they typically only repeat the moisture information received from the measuring element. Similarly, external printers are not required to have serial numbers because they do not alter the information received from the measuring element.

If the required information is located on the back of a device, the same information must also appear on the side, front, or top. The bottom of a device is not an acceptable surface. The identification marking must be permanent and attached with pop rivets, adhesive, or other permanent means. Removable bolts or screws are not permitted. A foil badge may be used provided that it is durable, difficult to remove, and exhibits obvious evidence of an attempt to remove the marking or badge.

The system must be clearly and permanently marked with the following information on an exterior surface that is visible after installation, with the following information:

1.1 The name, initials or trademark of the manufacturer. A remote display is required to have the manufacturer's name or trademark and model designation. (Code Reference GS.1.(a)) Yes ☐ No ☐ NA ☐

1.2 A model designation that positively identifies the pattern or design of the device. The Model designation shall be prefaced by the word "Model", "Type", or "Pattern." These terms may be followed by the term "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The abbreviation for the word "Model" shall be "Mod" or "Mod." (Effective January 1, 2003). (Code Reference G-S.1.(b)&(c)) Yes ☐ No ☐ NA ☐

1.3 A nonrepetitive serial number prefaced by words "Serial Number" or an abbreviation of that term. Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser.No, and S No.). (Code Reference G-S.1.(d),(e), & (f)). Yes ☐ No ☐ NA ☐

1.4 The NTEP Certificate of Conformance (CC) Number or a corresponding CC addendum number for devices that have (or will have) a CC. The number shall be prefaced by the terms "NTEP CC," "CC," or "Approval." These terms may be followed by the term "Number" or an abbreviation of the word "Number". The abbreviation shall, as a minimum, begin with the letter "N" (e.g., No or No.). (Code Reference G-S.1.(g). Effective January 1, 2003). Yes ☐ No ☐ NA ☐

The device must have an area, either on the identification plate or on the device itself, suitable for the application of the CC number. If the area for the CC number is not part of an identification plate, note its intended location and how it will be applied.

Location of CC Number if not located with the identification information:

_____

_____

1.5 If the information required by G-S.1. is placed on a badge or plate, the badge or plate must be permanently attached to the device. (See criteria below for Permanence of Attachment of Badge.) (Code Reference G-S-1.) Yes ☐ No ☐ NA ☐

1.6 Identifying information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device. Yes ☐ No ☐ NA ☐

1.7	All markings must be clear and easily readable.	Yes ☐ No ☐ NA ☐
1.8	The lettering for all markings must be permanent. Record the grade for the permanence of markings. _____.	Yes ☐ No ☐ NA ☐
1.9	If the markings for other than device identification required by G-S.1. are placed on a badge or decal, then the badge or decal must be durable (difficult to remove at all temperatures).	Yes ☐ No ☐ NA ☐

Code Reference: G-S.1.1. Remanufactured Devices and Remanufactured Main Elements

Refer to the Section Policy on Remanufactured and Repaired Devices in the NCWM Publication 14 Administrative Policy.

4.b. Miscellaneous Editorial Changes

Discussion: The Sector reviewed the original draft of the 2002 issue of the Near Infrared (NIR) checklist in Publication 14. Several typographical errors were noted.

Conclusion and Recommendation: The Sector recommended changes to correct typographical errors and to remove text referring to sample temperature sensitivity from the first paragraph of part I. Basic Instrument Tests. This change was overlooked when sample temperature sensitivity was moved to part II in an earlier change. The Sector also recommended:

- Adding text defining "room temperature" to part II. Sample Temperature Sensitivity;
- Changing equations and variable definitions to use a "bar" over variables that are intended to indicate an "average" or "mean", and add missing definition of variables for SEP equation.
- Deleting part IV. Tolerances for Calibration Performance in its entirety. This change was recommended at the Sector's 2001 meeting but had not been made in the 2002 review copy provided to the Sector.

Recommended changes follow:

Type Evaluation Test Procedures and Tolerances

I. Basic Instrument Tests

Basic instrument tests will be conducted using a stable moisture, mid-range protein HRW wheat sample to check the effect of power supply fluctuations, storage temperature, leveling, warm-up time, humidity, instrument stability, and instrument temperature sensitivity. All instrument tests will be conducted on each of the two instruments submitted by a manufacturer. For purposes of these tests, room temperature will be defined as 22 ºC ± 2 ºC.

II. Sample Temperature Sensitivity.

Testing is required to verify that accurate results are provided when the sample and instrument are at different temperatures. This will be referred to as the sample temperature sensitivity test. Tests will be conducted with the instrument at room temperature and the sample temperature varying from room temperature + ΔT_H to room temperature ΔT_C, where ΔT_H is the manufacturer-specified difference for grain above room temperature, and ΔT_C is the manufacturer-specified difference for grain below room temperature. In no case will room temperature + ΔT_H be allowed to exceed 45 °C, but ΔT_H need not equal ΔT_C. For purposes of these tests, room temperature will be defined as 22 ºC ± 2 ºC.

Accuracy. The first replicate for each sample will be used to calculate the Standard Error of Performance (SEP) for each instrument with respect to the reference method. Each instrument will be tested individually.

$$SEP = \sqrt{\frac{\sum_{i=1}^{n}(y_i - \bar{y})^2}{n-1}}$$

where,

$\bar{x}_i$ = average predicted constituent concentration for sample i (3 replicates)

r_i = reference constituent concentration for sample i

y_i = $\bar{x}_i - r_i$

$\bar{y}$ = average of y_i

n = number of samples in the test set for the constituent calibration being evaluated (n = 50, see Note 1 below regarding "all class" calibrations.)

Repeatability. The Standard Deviation (SD) of the three replicates will be calculated and pooled across samples for each class. Each instrument will be tested individually. The equation used to calculate SD is:

$$SD = \sqrt{\frac{\sum_{i=1}^{n}\sum_{j=1}^{3}(P_{ij} - \bar{P}_i)^2}{2n}}$$

where,

P_{ij} = predicted constituent concentration for sample i and replicate j

$\bar{P}_i$ = average of the three predicted constituent concentration values for sample i

n = number of samples in the test set for constituent calibration being evaluated (n = 50, see Note below regarding "all class" calibrations.)

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Reproducibility. The results for each of the three replicates obtained for samples in the test set will be averaged for each instrument and the Standard Deviation of the Differences (SDD) between instruments will be calculated using the following equation:

$$SDD = \sqrt{\frac{\sum_{i=1}^{n}\left(d_i - \bar{d}\right)^2}{n-1}}$$

where,

d_i = $\bar{P}_{1i} - \bar{P}_{2i}$

$\bar{P}_{1i}$ = average of three replicates for sample i on instrument 1

$\bar{P}_{2i}$ = average of three replicates for sample i on instrument 2

$\bar{d}$ = average of the di

n = number of samples in the test set for constituent calibration being evaluated (n = 50, see Note below regarding "all class" calibrations.)

and delete all of part IV. Tolerances for Calibration Performance.

5. Proposed Changes and Additions to Publication 14 to Add Additional Grains and Criteria for Moisture Basis

Background: The 86th National Conference on Weights and Measures in 2001 adopted changes to the Handbook 44 tentative code for Near Infrared Grain Analyzers that require corresponding changes to Publication 14, Near Infrared Grain Analyzer Checklist**, §2. Indicating Elements, Recording Elements, and Recorded Representations** and **§3. Design of NIR Analyzers.** The changes include:

- adding requirements for corn protein, oil, and starch; barley protein; and soybeans protein and oil
- adding criteria for moisture basis

[For a detailed discussion of these changes see NIST Special Publication 976, *Report of the 86th National Conference on Weights and Measures Annual Meeting.*]

Discussion: The draft copy of the proposed changes to the NIR Grain Analyzer Checklist included two paragraphs relating to Code Reference: UR.2.3. Printed Tickets:

Code Reference: UR.2.3. Printed Tickets

2.17 If the analyzer converts constituent results to a manually entered moisture basis, the "native" concentration and the "native" moisture basis must appear on the printed ticket in addition to the converted results and the manually entered moisture basis.

2.18 The information presented on the ticket is arranged in a consistent and unambiguous manner.

Steve Patoray, NTEP Director, reminded the Sector that NTEP does not evaluate User Requirements. A review of the NIR code in Handbook 44 (HB-44) revealed that, under the circumstances described in UR.2.3, there was nothing in the specifications that required the device to be capable of transmitting the "native" moisture basis and constituent concentration (at that basis) or that information on the ticket be arranged in a consistent and unambiguous manner when the device either contains a built-in printer or when a printer is offered by the manufacturer as an optional accessory.

Consideration of the requirements of UR.2.3. led to a discussion of why a user might want to manually enter a moisture basis and whether a manually entered moisture basis should be "flagged" on the ticket.

It was explained that NIR calibrations can be derived using constituent concentration data expressed on any one of a variety of moisture bases. As an example, in the U.S., wheat protein is commonly traded on a 12 % moisture basis. Partly for this reason, some manufacturers have chosen to develop their wheat protein calibrations on a 12 % moisture basis. Russian contracts, however, frequently specify protein values on a dry basis (0 % moisture basis). Other contracts may specify protein on an "as-is" basis. By entering the desired moisture basis using the instrument keyboard, the instrument can produce indications (and recorded representations) not only of the wheat protein value at its "native" moisture basis (in this example, 12 %) but also at the keyboard entered moisture basis, whether the basis is 0 % or any other value. The conversion from "native" moisture basis to any other moisture basis (whether entered via the keyboard or selected for a particular grain at time of set-up) is a straightforward mathematical conversion. It could also be accomplished using a pocket calculator with knowledge of: 1) the moisture basis of the NIR instrument's protein result and 2) the desired moisture basis.

Of greater concern than a keyboard entered moisture basis, which will result in calculation of the correct protein value for the indicated moisture basis (even if the indicated moisture basis is an erroneously entered value), is the fact that some instruments offer several options for processing the measured value produced by the calibration selected for use. Typically, the options include:

1. **No transformation.** - Results are displayed without modification.

2. **Transformation to a "fixed" moisture basis.** - In some instruments, the installer, when setting up this mode, selects one moisture basis from a list of "standard" moisture bases. In other instruments, choosing this mode prompts the installer to enter, via the keyboard, the fixed moisture basis that will be used. In either instance, once this mode has been set up for use with a given calibration, the same specified moisture basis is used to transform all measurements made using that calibration. There are 2 subcategories to this option. The selection of the correct subcategory depends on whether or not the native calibration had been derived on a fixed moisture basis.

    a. Constituent measurement at a fixed native moisture basis (other than "as is") is transformed to a different "fixed" moisture basis for display on the instrument. The installer must specify the native moisture basis for the calibration at time of installation. The instrument does not have to measure moisture in this case.

    b. "As is" constituent measurement at an internally measured "as is" moisture value is transformed to a different "fixed" moisture basis for display on the instrument. This subcategory requires that the instrument measure moisture.

3. **Transformation to a "variable" moisture basis.** - Same as 2a and 2b above except that the target moisture basis is not stored in device memory for use in transforming the measured value produced by the calibration to its value at the target moisture basis. Instead, the user enters the target moisture basis via the keyboard for each sample measured by the device. The result of a measurement will not be displayed until the user has entered the moisture basis desired for that sample.

To obtain correct results, instrument option settings must be appropriate for the calibration used. Selection of the wrong option for a given calibration will result in incorrect constituent values for that calibration. Paragraph S.2.5.2 of the NIR Code requires that CC's (and user instructions) indicate the instrument settings that are appropriate for use with each calibration. These settings are considered "metrologically significant" and are to be sealable [S.2.5.2]. Some members questioned if the option setting should also appear on the printed ticket so that, in the event of challenges or complaints, the ticket would contain sufficient information to resolve the issue. Others were of the opinion that errors due to improper set up would be discovered during field inspection.

Rich Pierce, GIPSA, speaking for the NTEP Laboratory, stated that for practical reasons, instruments submitted for NTEP evaluation must be capable of being set up to transmit results at the standard moisture bases listed in Table N.1.1. of the NIR code. Once set up, instruments must not require manual entry of either a moisture measurement or a target moisture basis.

In reviewing the checklist, several members suggested that the words, "at the specified moisture basis" be inserted at the end of the first sentence of item 2.5 for correctness, and to emphasize that the total mass depends not only on the constituent mass but also upon the mass of moisture at the specified moisture basis. Thus, the percent of total mass represented by the constituent will also depend on the specified moisture basis.

Conclusion: The Sector agreed that references to user requirements should not appear in the checklist. They also agreed that HB 44 should be amended to add specifications requiring the device to be capable of transmitting the "native" moisture basis and constituent value in addition to the constituent value and keyed-in moisture basis as described in UR2.3.(b). The Sector did not decide on the exact text for that code change. No final decision was made on the suggestion to flag manually entered moisture bases or the suggestion to include option settings on the printed ticket. These will be considered at a future meeting. The Sector agreed that the NIR Grain Analyzer Checklist of 2002 should be amended and modified as shown below, including the suggested addition to item 2.5.

Recommendation: Amend and modify Publication 14, NIR Grain Analyzer Checklist, §2. Indicating Elements, Recording Elements, and Recorded Representations and §3. Design of NIR Analyzers as shown below.

2. Indicating Elements, Recording Elements, and Recorded Representations

Code Reference: S.1.1. Digital Indications and Recording Elements

2.1 The analyzer shall be equipped with a digital indicating element. Yes ☐ No ☐ NA ☐

2.2 The minimum height for digits used to display constituent values is 10 mm. Yes ☐ No ☐ NA ☐

2.3 The analyzer is equipped with a communication interface that permits interfacing with a recording element and can transmit the date, grain type or class, constituent values, the moisture basis for each constituent value (except moisture), and calibration version identification. Yes ☐ No ☐ NA ☐

2.4 A digital indicating element shall not display, and recording element shall not record, any constituent value before the end of the measurement cycle. Yes ☐ No ☐ NA ☐

2.5 Constituent content is recorded and displayed as a percent of total mass at the specified moisture basis. The moisture basis is also displayed and recorded for each constituent content result (except moisture). Yes ☐ No ☐ NA ☐

2.5.1 If a whole grain analyzer that is calibrated to display results on an "as is" moisture basis does NOT display or record a moisture value, it clearly indicates that results are expressed on an "as is" moisture basis. Yes ☐ No ☐ NA ☐

2.5.2 Ground grain analyzers must ALWAYS display and record a moisture measurement for "as is" content results (except moisture). Yes ☐ No ☐ NA ☐

2.6 Digital and recording elements shall not display or record any constituent values beyond the operating range of the device unless the constituent value representation includes a clear error indication (and recorded error message with the recorded representation). Yes ☐ No ☐ NA ☐

2.7 If an NIR analyzer is used to determine a moisture value, either to determine the moisture of an "as is" constituent content measurement or to convert from one moisture basis to another, the moisture measurement must be concurrent with the measurement of other constituents. Yes ☐ No ☐ NA ☐

Code Reference: S.1.2. Selecting Grain Class and Constituent

2.8 The means to select and display the grain type or class and constituent(s) shall be readily visible and the type or class of grain and constituents selected shall be clearly and definitely identified in letters (such as HRWW, HRSW, SWW, etc., or PROT, etc.) or with symbols clearly defined adjacent to the display. The device shall be capable of indicating grain type using a minimum of four characters. Yes ☐ No ☐ NA ☐

2.8.1 If the device uses abbreviations for grain names, they conform to the minimum acceptable abbreviations listed below: Yes ☐ No ☐ NA ☐

Grain Type	Minimum Acceptable Abbreviation
Durum Wheat	DURW
Hard Red Spring Wheat	HRSW
Hard Red Winter Wheat	HRWW
Hard White Wheat	HDWW
Soft Red Winter Wheat	SRWW
Soft White Wheat	SWW
Soybeans	SOYB
Two-rowed Barley	TRB
Six-rowed Barley	SRB
Corn	CORN

Code Reference: S.1.3. Operating Range
An analyzer shall automatically and clearly indicate when the operating range of the device has been exceeded. Analyzers shall not display constituent values when the operating temperature ranges are exceeded. The statement of operating range shall be specified in the operator's manual. A 5 EC tolerance is applied to temperature ranges when testing to verify that results are not displayed or recorded when the temperature range is exceeded.

2.9 The ambient temperature range over which the analyzer may be used is specified and covers a range no less than 10 EC to 30 EC. No constituent values may be displayed when the temperature range is exceeded. An appropriate error message shall be displayed when the temperature of the analyzer is outside its specified operating range. Yes ☐ No ☐ NA ☐

2.10 The constituent range at the moisture basis specified in Table N.1.1 is specified for each grain or seed for which the analyzer is to be used. If a constituent value is displayed when the constituent range is exceeded the device gives a clear indication that the constituent range has been exceeded. Yes ☐ No ☐ NA ☐

Table N.1.1. Constant Moisture Basis for Type Evaluation and Field Inspection

Grain Type or Class	*Constituents(s)*	*Moisture Basis*
Durum Wheat, Hard Red Spring Wheat, Hard Red Winter Wheat, Hard White Wheat, Soft Red Winter Wheat, Soft White Wheat	*Protein*	*12 %*
Soybeans	*Protein* *Oil*	*13 %*
Two-rowed Barley *Six-rowed Barley*	*Protein*	*0 % (dry basis)*
Corn	*Protein* *Oil* *Starch*	*0 % (dry basis)*

2.11 For whole grain analyzers only (this item is not applicable to ground grain instruments). The temperature range is specified for each grain or seed for which the analyzer is to be used. The specified range covers a range no less than 10 EC to 30 EC. No constituent values may be displayed when the temperature range is exceeded. An appropriate error message is displayed when the temperature of the grain sample exceeds the range for the grain. Yes ☐ No ☐ NA ☐

2.12 For whole grain analyzers only (this item is not applicable to ground grain instruments). The maximum allowable difference in temperature between the instrument environment (ambient temperature) and the sample for which an accurate constituent determination can be made is specified. The minimum temperature range shall cover at least 10 EC. For temperature differences outside this range, constituent values are not displayed and an appropriate error message is displayed. Yes ☐ No ☐ NA ☐

Code Reference: S.1.4.1. Operating Temperature

2.13 An analyzer shall not display or record any usable values until the operating temperature necessary for accurate determination has been attained, or Yes ☐ No ☐ NA ☐

2.14 The analyzer shall bear a conspicuous statement adjacent to the indication stating that the analyzer shall be turned on for a time period specified by the manufacturer prior to use. Yes ☐ No ☐ NA ☐

2.15 If the analyzer will not meet tolerance requirements because there is an upper internal operating temperature limit that could be exceeded when operating within the ambient temperature range specified by the manufacturer, a means of sensing and indicating an over-temperature condition shall be provided. Yes ☐ No ☐ NA ☐

Code Reference: S.1.5 Value of Smallest Unit

2.16 The display permits constituent value determination to both 0.01 % and 0.1 % resolution. (The 0.1 % resolution is for commercial transactions; the 0.01 % resolution is for calibration purposes only, not for commercial purposes.) Yes ☐ No ☐ NA ☐

3. Design of NIR Analyzers

Code Reference: S.2.5.1. Calibration Transfer

3.6 Instrument hardware/software design and calibration procedures permit calibration development, and calibrations can be mathematically transferred between instruments of like models. Yes ☐ No ☐ NA ☐

Code Reference: S.4. Operating Instructions

Operating instructions shall be furnished by the manufacturer with each device and accessories. Complete information concerning the accuracy, sensitivity, and use of accessory equipment necessary in obtaining a constituent value shall be included.

In addition, operating instructions shall include the following information:

3.13	Name and address or trademark of the manufacturer.	Yes ☐ No ☐ NA ☐
3.14	The type or design of the device for which the operating instructions are intended to be used.	Yes ☐ No ☐ NA ☐
3.15	Date of issue.	Yes ☐ No ☐ NA ☐
3.16	The kind of classes of grain or seed for which the device is designed to measure constituent values.	Yes ☐ No ☐ NA ☐
3.17	The limitations of use, including but not limited to constituent range, grain or seed temperature, kind or class of grain or seed, instrument temperature, voltage and frequency ranges, electromagnetic interference, and necessary accessory equipment.	Yes ☐ No ☐ NA ☐
3.18	The appropriate user selectable options or settings for each calibration installed in the device.	Yes ☐ No ☐ NA ☐

6. Dual Certification – Could a Single Certificate be Used?

Background: Of the five Grain Moisture Meter (GMM) types with active NTEP Certificates of Conformance (CC's) two are whole-grain Near Infrared (NIR) Instruments with the potential to seek certification as NIR Grain Analyzers. In a previous Sector meeting, the question was raised as to whether a single CC could be issued to cover devices certified as both GMM's and NIR Grain Analyzers. Because of time constraints consideration of this question was postponed to a future meeting.

Discussion: In deciding whether a single CC could be issued to cover devices certified as both GMM's and NIR Grain Analyzers, there are two requirements to consider:

1) CC's for GMM's automatically expire July 1. To maintain "active" status, meters must remain in the NTEP on-going calibration program and the CC's must be re-issued annually with valid calibration constants for moisture.

2) NIR Grain Analyzers that display a measured whole grain moisture value are required to comply with the requirements of the GMM Code and be type approved as a grain moisture meter.

When an instrument has been approved under both codes, it would seem that NIR Grain Analyzer CC's are subordinate to GMM CC's, because failure to maintain an "active" GMM CC would automatically invalidate the corresponding NIR Grain Analyzer CC. A single CC, such as a "GMM CC with NIR Grain Analyzer Certification" would have to be re-issued annually (and whenever a calibration change is made), there would be no ambiguity regarding the NTEP status of the instrument and its calibrations. With a single certificate, Weights and Measures (W&M) personnel would have only one CC number to check. Manufacturers would have only one CC to maintain per instrument type. Marking requirements would be simplified. The maintenance fee structure for a CC with a "certification" for compliance with another code could be set to recover any loss in NCWM, Inc. revenue that would result from the elimination of the second certificate.

Conclusion and Recommendation: The Sector agreed to ask the NTEP Committee to consider recommending that NCWM, Inc. authorize issuing a single CC for devices successfully type evaluated under two inter-related codes (e.g., a "Grain Moisture Meter CC with Near Infrared Grain Analyzer Certification" or, simply, "NIR Grain Analyzer with Dual Certification").

7. A Message from the NCWM Board of Directors

Don Onwiler, Nebraska Department of Agriculture, Division of Weights & Measures, representing the NCWM Board of Directors (BOD), informed the Sector that the National Type Evaluation Program (NTEP) is working well, largely due to

the efforts of the staff of NIST's Office of Weights and Measures and NCWM, Inc.'s NTEP Director, Steve Patoray. NTEP is solvent; however, the BOD believes that the major work the GMM & NIR Sectors has been completed and it questions whether annual Sector meetings will be required in the future. The GMM Sector contributes only $500 annually to NTEP. The BOD figures the total staff costs associated with the GMM/NIR Sector is about $15,000. In a cost cutting effort for 2002, no state members received funding for travel to attend this GMM/NIR Sector meeting. However, the Board paid Don Onwiler's travel costs to attend the sector meeting and to provide the sector with an explanation of the BOD's cost cutting efforts, answer questions and address the concerns of the sector.

Discussion: Sector members were disturbed about what they heard. Several members believed that the cost of the Sector meeting was a small portion of the $15,000 cited as the cost of Sector support. The 2000, 2001, and 2002 meetings have all been held in Kansas City, MO at the National Weather Service Training Center with no cost for the meeting room or for digital projectors when needed. Sector meeting agendas and meeting summaries are distributed by e-mail. Other than cookies, soft drinks, and Steve Patoray's time and travel, the cost of a Sector meeting should be very small now that funding of public member travel had been withdrawn. One member expressed the hope that the Board would obtain a detailed breakdown of costs directly related to the Sector's recent meeting before making any decisions about withdrawing support for annual meetings. There was concern that support for the GMM NTEP certificate program would be the next thing to be withdrawn. The Sector has always known that there would never be a large number of GMM (or NIR) CC's, but the value of the program to regulating agencies, producers, the grain trade, and industry is many times greater than the annual cost of the program. Rich Pierce, GIPSA, reported that GIPSA and OWM continue to support the program, with each providing $18,000 per year for the NTEP Phase II program. He said GIPSA was interested in expanding the NTEP program to encompass additional devices. GIPSA is making increased use of cross-utilized equipment, in which devices owned by industry are also used by GIPSA for on-site official inspection. The NTEP program is a critical element in that regard. Don Onwiler responded that NCWM is committed to continuing the NTEP program for grain moisture meters. There is no reason for the Sector to go away, but it may not need to meet every year. Diane Lee, NIST-OWM, suggested that it might be possible for OWM to host a technical session for NIST Handbook 44 issues that need to be resolved or that require additional discussion if the NCWM BOD chooses not to host a sector meeting. Dr. Charles Hurburgh, Jr., ISU, suggested that the possibility of obtaining funding through Federal grant programs, for some of the work done by the Sector, should be explored. He noted that requests for funding of projects involving joint efforts of regulators, producers, the grain trade, and industry are usually received positively by the funding authority.

In order to promote greater uniformity in commercial grain inspection results, Congress passed the Grain Quality Incentives Act of 1990 that authorized the Federal Grain Inspection Service to work in conjunction with the National Institute for Standards and Technology and the National Conference on Weights and Measures to:

1) identify inspection instruments requiring standardization;
2) establish performance criteria for commercial grain inspection instruments;
3) develop a national program to approve grain inspection instruments for commercial inspection; and
4) develop standard reference materials or other means necessary for calibration or testing of approved instruments.

In 1992, partly through the efforts of Sid Colbrook, Illinois Department of Agriculture, who was then NCWM Chairman, the GMM and NIR Sectors were established. The Sectors became not only working groups for the development of device standards and test/evaluation methods; they also provided a forum for manufacturers, user groups, state regulators, GIPSA/FGIS, and NIST-OWM to air issues of mutual concern relating to grain inspection and measurement, including Handbook 44 issues and the GMM ongoing calibration maintenance program. If the NCWM Board views the current purpose of the Sectors as limited to dealing with Publication 14 issues uncovered during NTEP testing, then another forum will have to be found for these other issues of interest (and importance) to members of the Sector.

8. A Quality Control Procedure for Grain Analysis at a Country Elevator

Dr. Charles Hurburgh, Jr., Agricultural & Biosystems Engineering - Iowa State University, described a quality control system implemented by Farmers Cooperative Elevator Company at its Odebolt, Iowa facility. The system was developed under a grant from the Iowa Grain Quality Initiative with the intention of learning how to develop a quality system and then to replicate it at 32 other locations in its northwest Iowa. The initial concept was to use the quality management system for market differentiation – to be able to certify the identity of specialty crops through a documented identity preservation system. During the early stages of the project it became apparent that the quality system had benefits as a management system and had improved operations to the extent that the system was worth implementing even without the

prospects of market differentiation by identity preservation. In fact, Dr. Hurburgh estimated that the system has generated two dollars for every one dollar invested.

Four important criteria were deemed necessary for the system: 1) it must be a certified system; 2) it must have established credibility; 3) there must be 3rd party auditing; and 4) it must have international recognition. The system implemented is based on the American Institute of Baking (AIB) International Gold Standard Certification Program which with certification and auditing through AIB's Quality System Evaluation includes about 80 % of the requirements of ISO-9000. Some of the key elements of the system include: written work procedures, flowcharts for sampling and grading processes, setting tolerances for grade factors, using grade factor control charts and comparison charts (in-house measurements compared to official measurements) for both inbound and outbound grade factors. The objective being to make house grades as just accurate as official grades, and to provide documented evidence of this equivalence.

Quality control data was used to evaluate the accuracy of house grades. The initial target was that no more than 5 % of the individual tests would be out of tolerance. Operator training and incentives were based on these data. Control charts and comparison charts made it easy to identify trends and apply corrections before the trends became problems – continuous data is more useful than spot checks. Better accuracy on inbound measurements resulted in more accurate inventory records and assisted in merchandising. The documentation of QC data gave customers confidence in house grades.

The widespread implementation of quality management systems (QMS) like the one in Odebolt, Iowa could have major implications on regulatory programs such as those used for grain moisture meters and (soon) near-infrared grain analyzers. If documented references are used, a certified QMS creates more useful data than annual device inspections. The structure of regulatory programs may change to auditing and verification that a quality system is in place. Review of data may replace testing of devices and reference standards may replace monitoring.

Discussion: Following Dr. Hurburgh's presentation, Don Onwiler, Nebraska Dept. of Agriculture, Division of Weights & Measures, suggested that in the case of prepackaging scales (automatic weighing systems) there is already precedence for process verification rather than device inspection. In some such states scales are not checked; instead, the packaged product is checked for correct weight.

9. Time and Place for Next Meeting

The next meeting is tentatively planned for the week of August 18, 2003, in the Kansas City, MO area. Meetings will be held in one of the meeting rooms at the National Weather Service Training Center if available. A tentative schedule is shown below.

Wednesday, August 20	1:00 pm - 5:00 pm	GMM Sector Meeting
Thursday, August 21	8:00 am - 12:00 noon	GMM Sector Meeting
Thursday, August 21	1:00 pm - 5:00 pm	Joint Session GMM & NIR Analyzer
Friday, August 22	8:00 am - 12:00 noon	NIR Grain Analyzer Sector Meeting

Appendix E

National Type Evaluation Technical Committee
Measuring Sector Annual Meeting

October 11-12, 2002, Richmond, Virginia

Final Summary

Carry-over Items

1. Recommendations to Update NCWM Publication 14 to Reflect Changes to NIST Handbook 44

Source: NIST/WMD

Background: The 87th National Conference on Weights and Measures (NCWM) adopted the following items that will be reflected in the 2003 Edition of NIST Handbook 44 and NCWM Publication 14. These items are part of the agenda to inform the Measuring Sector of the NCWM actions and recommend changes to NCWM Publication 14.

Recommendation: The Sector reviewed the following recommended changes to Publication 14 based on changes to NIST Handbook 44:

A) S.3.2.(b) Exceptions for Diversion of Measured Liquid

During its 2002 Annual Meeting, the NCWM agreed to amend Handbook 44 LMD Code paragraph S.3.2. Exceptions as follows:

S.3.2. Exceptions. - The provisions of S.3.1. Diversion Prohibited shall not apply to~~:~~

~~(a)~~ truck refueling devices when diversion of flow to other than the receiving vehicle cannot readily be accomplished and is readily apparent. Allowable deterrents include, but are not limited to, physical barriers to adjacent driveways, visible valves, or lighting systems that indicate which outlets are in operation, and explanatory signs;

~~(b) other devices, when all discharge outlets designed to operate simultaneously are 3.8 cm (1.5 in) in diameter or larger.~~

Recommendation: The Sector was asked to consider the removal of the reference to discharge lines with a diameter of 3.8 cm (1 ½ in) or larger in Code reference S.3.2. and paragraph 10.5 from Section 10 on page LMD-33 of the Checklist and Test Procedures of NCWM Publication 14, Measuring Devices, Chapter 2, 2002 edition as follows:

10. Discharge Lines and Discharge Line Valves

Code Reference: S.3.2. Exceptions

If suitable means are provided to prevent the diversion of liquid flow to other than the receiving vehicle, devices that are specifically installed for fueling trucks are exempt from the provisions of S.3.1. and may have two outlets operating simultaneously. ~~Similarly, the requirements of S.3.1. do not apply to devices on which all discharge outlets designed to operate simultaneously are 3.8 cm (1 1/2 in) in diameter or larger.~~

10.4.	For devices that are specifically installed for fueling trucks, two outlets may be operated simultaneously only if suitable means are provided to ensure that diversion of flow to other than the receiving vehicle cannot readily be accomplished and is readily apparent. Such means include, but are not limited to, physical barriers to adjacent driveways, visible valves or lighting systems indicating which outlets are in operation, and explanatory signs.	**Yes** ☐ **No** ☐ **NA** ☐
~~10.5.~~	~~For other devices, two outlets may be simultaneously operated only if all discharge outlets designed to operate simultaneously are 3.8 cm (1 1/2 in).~~	~~**Yes** ☐ **No** ☐ **NA** ☐~~

Discussion/Conclusion: There was no discussion on the amended language for Publication 14, Section 10. The Sector recommends that the NTEP Committee amend Publication 14, Section 10 as shown above.

B) S.4.4.1 Discharge Rates and S.4.4.2. Location of Marking Information

During its 2002 Annual Meeting, the NCWM agreed to amend Handbook 44 LMD Code paragraph S.4.4. Retail Devices as follows:

S.4.4. Retail Devices.

S.4.4.1. Discharge Rates. - On a retail device with a designed maximum discharge rate of ~~100~~ 115 L (~~25~~ 30 gal) per minute or greater, the maximum and minimum discharge rates shall be marked on an exterior surface of the device and shall be visible after installation. The minimum discharge rate shall not exceed 20 % of the maximum discharge rate.
[Nonretroactive as of January 1, 1985.]

S.4.4.2. Location of Marking Information; Retail Motor-Fuel Dispensers. – The required marking information in the General Code, Paragraph G-S.1. shall appear as follows:

(a) Placement of this information shall not be on a portion of the device that can be readily removed or interchanged without the use of a tool separate from the device

(b) The information shall appear 24 to 60 inches from the base of the dispenser when placed on the outside of the device.

(c) When placed behind an access door or panel the information shall appear 24 inches to 60 inches from the base of the dispenser in a readily legible position. The use of a dispenser key shall not be considered a tool separate from the device.
[Nonretroactive as of January 1, 2003]

Recommendation: The Sector was asked to consider amending Code Reference S.4.4. in Section 11 on page LMD-33 of the Checklist and Test Procedures of NCWM Publication 14, Measuring Devices, Chapter 2, 2002 edition and add Code Reference S.4.4.2. as follows:

11. Marking

Code Reference: S.4.4.1. Marking Requirements For Retail Devices Only

11.2	On a retail device with a designed maximum discharge rate of rates ~~100~~ 115 L/min (~~25~~ 30 gpm) or greater, the maximum and minimum discharge rates shall be marked on an exterior surface of the device and be visible after installation. The minimum rate shall not exceed 20 % of the maximum discharge rate.	**Yes** ☐ **No** ☐ **NA** ☐

Code Reference: S.4.4.2. Location of Marking Information

11.3	The required marking information in the General Code, Paragraph G-S.1. shall be located as follows:	**Yes** ☐ **No** ☐ **NA** ☐
	(a) Placement of this information shall not be on a portion of the device that can readily removed or interchanged without the use of a tool separate from the device.	**Yes** ☐ **No** ☐ **NA** ☐
	(b) When placed on the outside to the device the information shall appear 24 to 60 inches from the base of the dispenser.	**Yes** ☐ **No** ☐ **NA** ☐
	(c) When placed behind an access door or panel the information shall appear 24 to 60 inches from the base of the dispenser in a readily legible position. The use of a dispenser key shall not be considered a tool separate from the device.	**Yes** ☐ **No** ☐ **NA** ☐

Discussion/Conclusion: During the 2002 Measuring Sector meeting, there was no discussion on the recommendation to amend Publication 14, Section 11. The Sector recommends that the NCWM NTEP committee approve the changes shown above.

The Sector also noted that marking requirements for discharge rates are required to be located on an external surface of the device without any reference to being located within a specified height range. The Sector members also indicated that it is also appropriate to include the markings for discharge rates required in paragraph S.4.4.1. with the other markings in accordance with the requirements of paragraph S.4.4.2. One NTEP laboratory stated that some weights and measures officials have incorrectly interpreted paragraph S.4.4.1. to mean that a flow rate greater than or less than 20 % of the maximum discharge is not acceptable. The Sector agreed to forward to the S&T Committee through the SWMA a proposal to modify S.4.4.1. that includes an example of how the requirement should be applied as follows:

S.4.4.1. Discharge Rates. - On a retail device with a designed maximum discharge rate of 115 L (30 gal) per minute or greater, the maximum and minimum discharge rates shall be marked ~~on an exterior surface of the device and shall be visible after installation~~ in accordance with S.4.4.2. The minimum discharge rate shall not exceed 20 % of the maximum discharge rate.

Example: With a marked maximum discharge rate of 230 L/m (60 gpm), the marked minimum discharge rate shall be 45 L/m (12 gpm) or less (e.g., 40 L/m (10 gpm) is acceptable). A marked minimum discharge rate greater than 45 L/m (12 gpm) (e.g., 60 L/m (15 gpm)) is not acceptable.

C) Recognize Mass Units of Measurement

During its 2002 Annual Meeting the NCWM agreed to amend the Handbook 44 Cryogenic Liquid-Measuring Devices Code to recognize units of mass as follows:

S.1.1.2. Units. - A device shall indicate and record, if equipped to record, its deliveries in terms of: kilograms or pounds; liters or gallons of liquid at the normal boiling point of the specific cryogenic product; cubic meters (cubic feet) of gas at a normal temperature of 21 °C (70 °F) and an absolute

pressure of 101.325 kPa (14.696 psia); or decimal subdivisions or multiples of the measured units cited above.

S.1.1.3. Value of Smallest Unit. - The value of the smallest unit of indicated delivery, and recorded delivery, if the device is equipped to record, shall not exceed the equivalent of:

(a) for small delivery devices
(1) 1 L
(2) 0.1 gal
(3) ~~0.1 m^3 of gas~~1 kg
(4) ~~10 cubic feet of gas~~ 1 lb
(5) 0.1 m^3 of gas
(6) 10 cubic feet of gas

(b) for large delivery devices
(1) 10 L
(2) 1 gal
(3) ~~1 m^3 of gas~~ 10 kg
(4) ~~100 ft^3 of gas~~ 10 lb
(5) 1 m^3 of gas
(6) 100 ft^3 of gas

S.2.4. Automatic Temperature or Density Compensation. - A device shall be equipped with automatic means for adjusting the indication and/or recorded representation of the measured quantity of the product, to indicate and/or record in terms of: kilograms or pounds; or liters or gallons of liquid at the normal boiling point of the specific cryogenic product; or the equivalent cubic meters (cubic feet) of gas at a normal temperature of 21 °C (70 °F) and an absolute pressure of 101.325 kPa (14.696 lb/in^2 absolute). ***When a compensator system malfunctions, the indicating and recording elements may indicate and record in uncompensated volume if the mode of operation is clearly indicated, e.g., by a marked annunciator, recorded statement, or other obvious means.****
[*Nonretroactive as of January 1, 1992.]

Code Reference: S.1.1.2. Units

7.7	The device shall indicate, and record if equipped to record, its deliveries in terms of: kilograms or pounds; liters or gallons of liquid at the normal boiling point of the specific cryogenic product; cubic meters, or cubic feet of gas at a normal temperature of 21 °C (70 °F) and an absolute pressure of 101.325 kPa (14.696 psia); subdivisions or multiples of the measured units cited above.	**Yes** ☐ **No** ☐ **NA** ☐

Code Reference: S.1.1.3. Value of Smallest Unit

The value of the smallest unit of indicated delivery and recorded delivery if the meter is equipped to record, shall not exceed the equivalent of:

7.8	(a) for small delivery devices (max. rated flow *75* gpm or less) (1) 1 L (2) 0.1 gal (3) 1 kg (4) 1 lb (5) 0.1 m^3 of gas (6) 10 cu. ft of gas	**Yes** ☐ **No** ☐ **NA** ☐

7.9 (b) for large delivery devices (max. rated flow greater than *75* gpm) **Yes** ☐ **No** ☐ **NA** ☐
(1) 10 L
(2) 1 gal
(3) 10 kg
(4) 10 lb
(5) 1 m^3 of gas
(6) 100 ft^3 of gas

Discussion/Conclusion: During the 2002 Measuring Sector meeting, there was no discussion. The Sector recommends that the NCWM NTEP committee approve the changes shown above.

D) Repeatability on Milk Meters

During its 2002 Annual Meeting the NCWM agreed to include repeatability test notes and tolerances in the Handbook 44 Milk Meters Code as Follows:

N.4.1.1. Repeatability Tests. – Tests for repeatability should include a minimum of three consecutive test drafts of approximately the same size and be conducted under controlled conditions where variations in factors, such as temperature, pressure, and flow rate are reduced to the extent that they will not affect the results obtained.

T.3. Repeatability. - When multiple tests are conducted at approximately the same flow rate and draft size, the range of the test results for the flow rate shall not exceed 40 % of the absolute value of the maintenance tolerance and the results of each test shall be within the applicable tolerance. *See also N.4.1.1.*

Recommendation: The Sector was asked to consider adding a new Section K on page LMD-77 of the Checklist and Test Procedures of NCWM Publication 14, Measuring Devices, Chapter 2, 2002 edition and re-letter existing Sections K through N as follows:

K. Repeatability on Milk Meters (Code Reference N.4.1.1. and T.3.)

When multiple tests are conducted at approximately the same flow rate and draft size, the range of the test results for the flow rate shall not exceed 40 % of the absolute value of the maintenance tolerance and the results of each test shall be within the applicable tolerance.

Tests for repeatability shall include a minimum of three consecutive test drafts of approximately the same size and be conducted under controlled conditions where variations in factors, such as temperature, pressure, and flow rate are reduced to the extent that they will not affect the results obtained.

~~**K.**~~**L. Field Evaluation and Permanence Test For Turbine Meters**

~~**L.**~~**M. Permanence Tests for Mass Flow Meters**

~~**M.**~~**N. Testing of Lubricating Oil Meters**

~~**N.**~~**O. Testing of Hot Oil Meters**

Discussion/Conclusion: During the 2002 Measuring Sector meeting, there was no discussion. The Sector recommends that the NCWM NTEP committee approve the changes shown above.

2. Test Draft Size for Initial and Permanence Test for Mass Flow Meters

Source: Maryland NTEP Laboratory

Background: At its last meeting the Sector asked the NTEP Laboratories to review the requirement that all test drafts except a test draft for testing Minimum Measured Quantity (MMQ), be equal to at least the quantity that is delivered in one minute at the maximum flow rate, and if appropriate, make recommendations for changes to be considered by the Sector at this meeting. At the June 2002 NTEP Laboratory Meeting, the Measuring Labs agreed that when appropriate scales of different capacities are available, the test draft sizes at lower flow rates do not need to equal one minute of flow at the maximum flow rate of the device under test.

The Sector was asked to consider modifying Section L. on page LMD-78 and LMD-79 of the Checklist and Test Procedures of NCWM Publication 14, Measuring Devices, Chapter 2, 2002 edition as follows:

L. Permanence Tests for Mass Flow Meters

The following tests are considered to be appropriate for mass flow meters:

Test Drafts. When only one appropriate scale is available for gravimetric testing ~~Any~~ any test draft (except a test draft for testing the MMQ) shall be equal to at least the quantity that is delivered in one minute at the maximum flow rate. If more that one appropriate scale is available for gravimetric testing, ~~The~~ all test drafts at each flow rate tested shall be equal in quantity ~~regardless of~~ and equal to at least one minutes flow at the ~~rate of flow~~ flow rate being tested. Establish proper flowmeter calibration conditions - steady state conditions at each flow rate. Collect the test data for the selected flow rates. The indication shall be on the basis of apparent mass. A test draft for the test of the MMQ shall be made with a draft size equal to the MMQ at the marked minimum flow rate for the meter being evaluated.

Discussion/Conclusion: A member stated that in some cases a single scale could be acceptable for testing with drafts of less than one minutes flow. Multiple range scales and high resolution Class II scales may be appropriate if the uncertainty is within stated limits. The Sector concurred and agreed to recommend the following guidelines on test draft sizes to the NCWM NTEP Committee for addition to Publication 14.

Test Drafts. ~~Any test draft (except a test draft fro testing the MMQ) shall be equal to at least the quantity that is delivered in one minute at the maximum flow rate. The test drafts shall be equal in quantity regardless of the rate of flow. Establish proper flowmeter calibration conditions - steady state conditions at each flow rate. Collect the test data for the selected flow rates. The indication shall be on the basis of apparent mass. A test draft for the test of the MMQ shall be made with a draft size equal to the MMQ at the marked minimum flow rate for the meter being evaluated.~~ **All test drafts shall meet the following criteria**

(a) The minimum quantity for any test draft shall be equal to or greater than the amount delivered in one minute at the flow rate being tested, and

(b) any test draft shall be equal to or greater than ten times the division size of the available reference scale(s) divided by the applicable draft tolerance in percent for the device under test. As a formula:

Minimum draft size ∃10 (scale "d") /Applicable Draft Tolerance for one minutes flow

For example: With a scale division of 0.1 lb (or 1 lb with 10:1 expanded resolution or by using error weights) and an applicable tolerance of 0.2 %, the minimum draft must be equal to or greater than 500 lb.

With a scale division of 0.5 lb (or 5 lb with 10:1 expanded resolution / error weights) and an applicable tolerance of 0.3 %, the minimum draft must be equal to or greater than 1667 lb.

Gravimetric Standard. As a general guideline for the gravimetric standard, the value of the scale division should not be larger than one-tenth of the tolerance times the smallest test draft. The combined error of the standard used for testing measuring instruments shall not exceed 20 % of the maximum permissible error to be applied. Using known weight (field standard), determine the error present in the weighing instrument over the

weighing range that will be used in the test. The inherent error, if present, is to be factored out of the measurement. The scale will then be used as a transfer standard.

3. Testing Required for an Electronic Indicator with a CC, Interfaced with a Measuring Element with a CC not Previously Evaluated Together

Source: NTEP Measuring Laboratories

Background: At the May 2001 NTEP Laboratory Meeting, one of the participating laboratories asked for input regarding what testing should be required if the manufacturer of an indicator wanted the CC to recognize the indicator for use with different types of measuring devices, such as PD meters, turbine meters, and mass flow meters. Dan Reiswig (CA NTEP Laboratory) agreed to provide a draft of changes to the Liquid-Measuring Devices Checklist and Procedures that included requirements for indicators intended to be used with more than one device type.

Dan Reiswig was not able to attend the September 2001 Measuring Sector Meeting. The Sector agreed to carry this item forward to the agenda for its next meeting. The following groups and individuals agreed to provide input: the NTEP Measuring Laboratories, Measurement Canada, RichTucker (Tokhiem representing GPMA), John Skuce (FMC-Smith Meter representing MMA), Mike Keilty (Micro Motion), and David Hoffman (Toptech).

At the June 2002 NTEP Laboratory Meeting, the laboratories agreed that an initial performance test conducted by an approved NTEP Laboratory is required. The testing criteria applied should be the same as that applied to a new metering system. Subsequent permanence testing should be at the discretion of NTEP based on the initial performance and could be conducted by a local Weights and Measures Official under the direction and control of the NTEP evaluator performing the initial test.

Prior to the 2002 NTEP Laboratory Meeting Rich Tucker (Tokhiem representing GPMA) submitted the following for consideration by the labs.

Testing Required for an Electronic Indicator with a CC Interfaced with a Measuring Element with a CC not previously Evaluated Together.

Significant Assumptions
The metering element has already been through NTEP so all the accuracy, permanence, and flow rate information has been tested and meets all requirements of Handbook 44.

The Electronic Indicator has already been through NTEP and all electronic functions and other requirements have been tested and meets all requirements of Handbook 44.

For the Dispenser, the manufacturer can only request flow rates that fall within the meter approval flow limits and products.

With the above scenario, the only open issue is the electronic interface to the pulser and the electronic calculator. The electronic calculator receives pulses directly from the pulser. The calculator converts the pulses into a volume by knowing how many pulses make up a gallon of delivery. For an example Tokheim uses almost explicitly 1000 pulses per gallon of delivery. This is not a standard so other manufacturers use other pulse counts. So the only verification is to make sure the manufacturer has set up the software correctly to match the pulser output and meter delivery.

Test
Run calibration test drafts to verify compatibility

Testing Options (The manufacturer will, at its option, do the following)
Have a representative from the NTEP go to a test site or the Manufacturers lab to verify compatibility. The manufacturer shall submit data from its lab testing and follow-up test data from an initial verification at one of the first installed sites. Data supplied would be a copy of the Weights and Measures calibration tests performed at the time the equipment is placed in service.

The Sector was asked to consider adding a new Section T to Publication 14, Technical Policy for Liquid-Measuring Devices as follows:

T. Testing Required for an Electronic Indicator with a CC Interfaced With a Measuring Element With a CC not Previously Evaluated Together.

An authorized NTEP Laboratory must conduct an initial evaluation following the same performance criteria required for a new device. Subsequent permanence testing may be at the discretion of NTEP based on the initial performance of the system being evaluated. Subsequent permanence testing if required may be performed by a local Weights and Measures Official under the direction and control of the NTEP Official performing the initial evaluation.

Discussion/Conclusion: The manufacturers represented want to keep the amount of required testing to a minimum. Several expressed the view that the system will either work or not work properly depending on whether or not the indicator and the measuring element can communicate. If the system is acceptable on an initial inspection, a permanence test is not necessary. The only thing that may cause the system to stop working appropriately is an electronic component failure. The NTEP Laboratories are not comfortable with only an initial evaluation. The Sector agreed that a work group should be formed to consider the issues and provide a proposal for consideration prior to the Spring 2003 meeting of the NTEP Laboratories. The work group members are; Maurice Forkert (Tuthill Transfer Systems), Mark Butler (Micro Motion), Peter Goodier (Syltone), David Hoffman (TopTech Systems Inc.), Rodney Cooper (Actaris Neptune), Charlene Numrych (Liquid Controls), Dave Resch (FMC Measurement Solutions), Mike Keilty (Endress & Hauser Flowtec AG), and Dan Reiswig (CA NTEP Laboratory). Measurement Canada and NIST agreed to provide input as needed.

4. On Screen Display of Model and Version Number for Software

Source: NTEP Measuring Laboratories

Background: At the May 2001 NTEP Laboratory Meeting, the laboratories discussed marking requirements for software-based devices, such as electronic cash registers (ECR) or control consoles connected to liquid measuring devices. In some cases the indicator for the system is a generic computer display. If the required markings are physically placed on the display at the time of installation and then at some future time the display is replaced, the required markings may be lost. The laboratories agreed that a real time display of the model and software version information on the display screen is preferable. The laboratories also agreed that the information could either be displayed continuously or by pressing a single key or a series of keys if instructions for access are clearly provided when a series of keystrokes is required. The laboratories agreed to develop and forward a proposal to modify G-S.1. to allow real time display of the model and software version number for software-based systems to the Measuring Sector for consideration at its next meeting.

The Sector reviewed the proposal. Ted Kingsbury (Measurement Canada) stated that Canada has a similar requirement for specifications relating to metrological software used in software-based measurement systems. The requirements do not apply to software in devices that are built-for-purpose. Built-for-purpose devices are defined in the Canadian specifications.

The Sector agreed to forward the following recommendation to the NCWM S&T Committee for addition to NIST Handbook 44. The Sector also forwarded a definition for "built-for-purpose device," based on the Canadian definition to be included in the recommendation to the S&T Committee.

The Sector recommended the following modification to Handbook 44, Section 1.10. General Code, G-S.1:

G-S.1. Identification. - All equipment, except weights and separate parts necessary to the measurement process, but not having any metrological effect, shall be clearly and permanently marked for the purposes of identification with the following information:

(a) the name, initials, or trademark of the manufacturer or distributor;

(b) a model designation that positively identifies the pattern or design of the device;

(c) the model designation shall be prefaced by the term "Model," "Type," or "Pattern." These terms may be followed by the term "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).
[Nonretroactive January 1, 2003] **(Added 2000)**

[Note: Prefix lettering may be initial capitals, all capitals or all lower case.]

(d) except for equipment with no moving or electronic component parts, a nonrepetitive serial number;
[Nonretroactive as of January 1, 1968]

(e) the serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number; and
[Nonretroactive as of January 1, 1986]

(f) the serial number shall be prefaced by the words "Serial Number" or an abbreviation of that term. Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No, and S No.).
[Nonretroactive as of January 1, 2001]

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device.

Note: For software-based devices not built-for-purpose the required markings may be shown on the display screen provided the required information is either displayed continuously or by pressing a single key or a series of keys. When a series of keystrokes is required clear, instructions for accessing the marking information must be provided.

Definition: **built-for-purpose device. Any main element which was manufactured with the primary intent that it be used as, or as part of, a weighing or measuring device or system.**

At the 2002 NCWM Interim Meeting, the S&T Committee also received the following proposal from the NTETC Weighing Sector.

G-S.1. Identification. - All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect, shall be clearly and permanently marked for the purposes of identification with the following information:

The required markings may be shown on the display screen provided the required information is displayed either continuously or by an operator action (such as keyboard entries, touch pad, etc). Clear instructions for accessing the information shall be provided, as a minimum, on the Certificate of Conformance unless the information is continuously displayed during normal operation.

The manufacture and model designation shall either be continuously displayed or permanently marked on the device.

G-S.7. Lettering. - All required markings and instructions shall be distinct and easily readable and shall be of such character that they will not tend to become obliterated or illegible.

The required markings may be shown on the display screen provided the required information is displayed either continuously or by an operator action (such as keyboard entries, touch pad, etc). Clear instructions for accessing the information shall be provided, as a minimum, on the Certificate of Conformance unless the information is continuously displayed during normal operation.

At the 2002 NCWM Annual Meeting, the S&T Committee asked that the NTETC Weighing and Measuring Sectors review both proposals and attempt to agree on a single proposal that is acceptable to all parties. The Measuring Sector will review both proposals and make recommendations to the S&T Committee for an appropriate compromise.

Discussion/Conclusion: At its September 2002 Meeting, the NTETC Weighing Sector developed a new proposal based on both of the proposals submitted last year. That proposal was forwarded to the NTETC Measuring Sector for review and comment. The Measuring Sector reviewed the proposal developed by the Weighing Sector and concurred with the intent of the proposal. One member indicated that the software version number is more important for identification purposes than a serial number. The Measuring Sector recommended some changes to the Weighing Sector proposal and agreed to forward it to the NCWM S&T Committee for consideration. The modified proposal to amend G-S.1. as shown below was also sent to the Weighing Sector members along with a ballot requesting approval of the modifications. The results of the ballot was (9) affirmative, (2) negative, and (3) abstain in favor of the Measuring Sector language.

G-S.1. Identification. - All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect, shall be clearly and permanently marked for the purposes of identification with the following information:

(a) the name, initials, or trademark of the manufacturer or distributor;

(b) a model designation that positively identifies the pattern or design of the device;

(c) the model designation shall be prefaced by the term "Model," "Type," or "Pattern." These terms may be followed by the term "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The abbreviation for the word "Model" shall be "Mod" or "Mod."
[Nonretroactive January 1, 2003]
(Added 2000) (Amended 2001)

[Note: Prefix lettering may be initial capitals, all capitals or all lower case.]

(d) except for equipment with no moving or electronic component parts and software-based not built-for-purpose devices, a nonrepetitive serial number;
[Nonretroactive as of January 1, 1968]

(e) the serial number shall be prefaced by words, an abbreviation, or a symbol that clearly identifies the number as the required serial number; and
[Nonretroactive as of January 1, 1986]

(f) the serial number shall be prefaced by the words "Serial Number" or an abbreviation of that term. Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No, and S No.).
[Nonretroactive as of January 1, 2001]

(g) For devices that have an NTEP Certificate of Conformance (CC) Number or a corresponding CC addendum number, the NTEP CC shall be prefaced by the terms "NTEP CC," "CC," or "Approval." These terms may be followed by the term "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).
[Nonretroactive as of January 1, 2003]

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device.
(Amended 1985, 1991, 1999 and 2000)

Add new paragraph G-S.1.1. and renumber existing paragraph G-S.1.1. as follows:

G-S.1.1. Software-Based, Not Built–For–Purpose Devices. - ***For software based, not built–for–purpose devices, the following shall apply:***

(a) the manufacturer or distributor and the model designation may be continuously displayed or marked on the device*, or

(b) the Certificate of Conformance (CC) Number may be continuously displayed or marked on the device*, or

(c) all required information in G-S.1. Identification. (a), (b), (c), (g), and the software version designation may be continuously displayed. Alternatively, a clearly identified System Identification, G-S.1. Identification, or Weights and Measures Identification may be accessible through the "Help" menu. Required information includes that information necessary to identify that the software in the device is the same type that was evaluated.

****Clear instructions for accessing the remaining required information shall be listed on the CC. Required information includes that information necessary to identify that the software in the device is the same type that was evaluated.***

[Nonretroactive as of January 1, 200X]

G-S.1.~~1~~2. Remanufactured Devices and Remanufactured Main Elements. - All remanufactured devices and remanufactured main elements shall be clearly and permanently marked for the purpose of identification with the following information:

(a) the name, initials, or trademark of the last remanufacturer or distributor;

(b) the remanufacturer's or distributor's model designation if different than the original model designation. **[Nonretroactive as of January 1, 2002]**

Add a new definition for "built-for-purpose" devices as follows:

built-for-purpose device. Any main device or element which was manufactured with the intent that it be used as, or part of, a weighing or measuring device or system.

New Items

5. Marking of Product Measured on Meters in Multi-Product Dispensers

Source: Maryland Weights and Measures

Background: At the June 2002 NTEP Laboratory Meeting, one of the participating laboratories indicated that field officials in their jurisdiction are sometimes not able to determine which measuring element is associated with a particular grade or blend of fuel on multi-product dispensers. During a field examination of a multi-product dispenser one grade or blend is rejected for not meeting performance requirements and the official does not know which measuring element to mark or tag as rejected. During the performance of a subsequent inspection following adjustment or repair of the device the field official may be required to test all grades and blends offered through the rejected dispenser to determine that the correct measuring element and only that element was adjusted.

The Sector was asked to consider the following proposed, developed by Maryland weights and measures and the Technical Advisor, to modify Handbook 44, Section 3.30. Liquid-Measuring Devices UR.2.5. as follows:

UR.2.5. Product ~~Storage~~ Identification.

UR.2.5.1. Measuring Element Identification.

(a) The measuring elements of any multi-product dispenser shall be permanently, plainly, and visibly marked as to product being measured.

(b) When the measuring elements of any multi-product is marked by means of a color code, the color code key shall be conspicuously displayed at the place of business.

(Added 200X)

UR.2.5.2. Product Storage Identification.

(a) The fill connection for any petroleum product storage tank or vessel supplying motor-fuel devices shall be permanently, plainly, and visibly marked as to product contained.

(b) When the fill connection device is marked by means of a color code, the color code key shall be conspicuously displayed at the place of business.

(Added 1975 and Amended 1976 and renumbered 200X)

Discussion: One of the NTEP Laboratories stated that it is often difficult to identify which meter is associated with a particular product on dispensers with multiple measuring elements. One manufacturer questioned why it was necessary to physically mark a meter if it has no mechanism for adjustment and no means for a attaching a physical seal directly to the meter. This manufacturer stated that for their equipment it is possible to identify a particular meter in the audit trail.

Conclusion: The Sector modified the proposal to require a measuring element without an individual physical seal within any multi-product dispenser be plainly and visibly identified as to the product being measured. The Sector agreed to forward the following proposal to the S&T Committee through the SWMA with the recommendation that the item be given the status of information item or developing issue.

The Sector recommended amending NIST Handbook 44, Section 3.30. Liquid-Measuring Devices UR.2.5 as follows:

UR.2.5. Product ~~Storage~~ Identification.

UR.2.5.1. Measuring Element Identification.

(a) The measuring elements with an individual physical seal of any multi-product dispenser shall be plainly and visibly identified as to product being measured.

(b) When the measuring elements of any multi-product dispenser is marked by means of a color code, the color code key shall be conspicuously displayed at the place of business.
(Added 200X)

UR.2.5.2. Product Storage Identification.

(a) The fill connection for any petroleum product storage tank or vessel supplying motor-fuel devices shall be permanently, plainly, and visibly marked as to product contained.

(b) When the fill connection device is marked by means of a color code, the color code key shall be conspicuously displayed at the place of business.

(Added 1975 and Amended 1976 and renumbered 200X)

6. Multiple Measuring Elements with a Single Provision for Sealing Adjustable Components

Source: Maryland Weights and Measures

Background: At the June 2002 NTEP Laboratory Meeting, one of the participating laboratories indicated that field officials in their jurisdiction are having difficulty with multi-product dispensers that have only one sealing mechanism for two or more measuring elements. If field officials reject a meter for not meeting performance requirements they have no way of determining what measuring elements have been recalibrated when they return to re-inspect the dispenser after a service agency has made adjustments or repairs on the rejected device. If a physical seal is broken or has been replaced the official must test all products to verify that no tampering or misadjustment has occurred on any measuring element.

The Sector was asked to consider the recommendation in agenda item 5, developed by Maryland Weights and Measures and the Technical Advisor, to modify Handbook 44, Section 3.30. Liquid-Measuring Devices UR.2.5.

Discussion/Conclusion: A manufacturer of devices that utilizes a single security seal for the adjustment mechanism of multiple measuring elements agreed that at present there is no way for a field official to easily identify what element or elements have been adjusted. The adjustment information is recorded in memory but that information is not readily accessible through the audit trail. The Sector agreed to forward the following proposal to the S&T Committee through the SWMA with the recommendation that the item be given the status of information item or developing issue.

The Sector recommended adding the following new paragraph to NIST Handbook 44, Section 3.30. Liquid-Measuring Devices S.2.2.1. Multiple Measuring Elements with a Single Provision for Sealing.

> **S.2.2.1. Multiple Measuring Elements with a Single Provision for Sealing. - A change to the adjustment of any measuring element within any multi-product dispenser with a single provision for sealing multiple measuring elements must be identified.**

7. Tolerance for Product Depletion Test

Source/Background: At the September 2001 Measuring Sector Meeting during the discussion of agenda item 5 comparing single compartment testing to split compartment testing a member suggested that it would be appropriate to have separate tolerances for a product depletion test. The Sector agreed to discuss that as a separate agenda item if time permitted. During further discussion of the need for specific tolerances for a product depletion test, a member pointed out that the present criteria is affected by the test draft size. It is possible for a meter to fail at particular draft size; and by sufficiently increasing the draft size for a subsequent test, the same meter could pass without any repairs or adjustments being made. Ross Anderson (NY) indicated that NEWMA at one point had developed a proposal to the tolerance for a product depletion test on the rated maximum flow rate for the meter. That proposal was not available for review. The Sector agreed to include the discussion of a product depletion test tolerance on the agenda for the next Sector meeting. Ross Anderson agreed to prepare a proposal for Sector consideration at that meeting.

Since the 2001 meeting New York began a study to compare the results of a product depletion test conducted on the same meter using different size provers. Mr. Anderson will update the Sector on the progress of the study and may be able to provide guidance to the Sector on how to proceed.

Discussion/Conclusion: Mr. Anderson was unable to attend the Sector meeting. The Sector did review the proposal from NEWMA to modify N.4.2. and to add new paragraphs N.4.5. and T.5. shown below. Several Sector members disagreed with the NEWMA proposal for a tolerance based on one minute of flow at the maximum flow rate for the device under test. The Sector believes that the allowable error for a product depletion test should not be dependent on the size of the test draft. The Sector agreed that the item should be carried over to the agenda for the next Sector meeting to allow time for completion of the study being conducted by New York.

NEWMA Proposal:

> **N.4.2. - Special Tests (except Milk Metering Systems).** "Special" tests shall be made to develop the operating characteristics of a measuring system and any special elements and accessories attached to or associated with the device. Any test except as set forth in N.4.1. or N.4.5. shall be considered a special test. Special test of a measuring system shall be made as follows:

(a) at a minimum discharge rate of 20 % of the marked maximum discharge rate or at the minimum rate marked on the device whichever is less,

(b) to develop operating characteristics of the measuring system ~~during a split-compartment delivery~~.
(Amended 1978)

N.4.5. Product Depletion Test - The effectiveness of the vapor eliminator shall be tested by depleting the product supply and continuing until the lack of fluid causes the meter register to stop absolutely. The test shall be completed by switching to another compartment with sufficient product on a multi-compartment vehicle, or by adding sufficient product to a single compartment vehicle. When adding product to a single compartment vehicle, allow appropriate time for any entrapped vapor to disperse before continuing the test.

T.5. Product Depletion Test - The difference between the results of the normal test and the product depletion test shall not exceed 0.5 % of the equivalent of one minute of flow at the maximum rated flow rate for the system.

8. Product Family Tables for MAG Meters

Source: Liquid Controls LLC

Background: At present, there is no product family criteria for Mag Meters. If a manufacturer wants a CC which covers multiple products, testing must be conducted on each product. Liquid Controls is asking the Sector to consider the adoption of a product family of liquids criteria for MAG Meters and will provide a specific proposal for Sector consideration at the September 2002 Meeting.

Discussion/Conclusion: Liquid Controls provided a handout base on input from an Italian mag meter manufacturer for the members to review as a starting point for developing a product family table for mag meters. One member stated that the performance for mag meters is very installation dependent. Measurement Canada indicated having had difficulty trying to categorize products. Some of the key factors include corrosiveness, coating factors, and abrasiveness. At present they prefer to test each product separately. The Sector agreed to form a small work group to develop the issue, collect data, and provide input for the next Sector meeting. Measurement Canada agreed to prepare a list of concerns for the work group. The work group members are; Mike Keilty (Endress & Hauser), Charlene Numrych (Liquid Controls), Paul Glowacki (Murray Equipment), Krone America (TBD), California NTEP Laboratory (TBD), and Measurement Canada.

9. Use of Discount and Loyalty Cards and Discounts for Actions After the Completion of a Retail Motor-Fuel Delivery

Source: NTEP Laboratories

Background: At the June 2002 NTEP Laboratory Meeting, the laboratories agreed that there is a need for guidance for determining whether or not a specific discount program or application is appropriate and meets NTEP requirements.

Examples include: The change to a discount price when a club card is inserted and the automatic return to the nonmember price at the completion of the delivery; a change in the posted price to include a discount for the purchase of a car wash or other item when a credit card is used at the pump but is not available at the pump in a post pay situation; a discount to the unit price for the purchases of certain items after the delivery has been completed.

The Laboratories did not have a specific recommendation, but asked the Sector to organize a work group to identify the issues and develop consistent guidelines and requirements for the use of various discount programs.

Discussion/Conclusion: At the meeting, one of the NTEP Laboratories provided examples of problems with the use of loyalty cards. One example was that of a super market selling fuel where the unit price could be discounted after the delivery was completed by purchasing one or more specific items. The Laboratories asked if tests need to be developed for the use of loyalty cards during type evaluation. One manufacturer stated that marketing schemes come from device users not the device manufacturers. The manufacturers have no control over the various types of loyalty card programs. The Sector agreed that a work group should be formed to develop the issue and provide input for the next Sector meeting.

The work group members are; Gary Castro (CA NTEP), Rich Tucker (Tokheim), Mike Roach (VeriFone), Steve Covington (AutoGas Systems), Gordon Johnson (Gilbarco), Dresser Wayne (TDB), and Mike Belue (Belue Associates).

10. Acceptable Symbols or Wording to Identify Unit Price, Total Price, and Quantity on a Retail Motor-Fuel Dispenser

Source: Maryland NTEP Laboratory

Background: At the June 2002 NTEP Laboratory Meeting, one of the participating laboratories requested guidance on what are acceptable symbols or wording to identify the unit price, total sale, and quantity delivered on a retail motor-fuel dispenser. The Laboratories recommended that the question be added to the 2002 Measuring Sector Agenda.

Recommendation: The Sector was asked to consider the following proposal to modify to NCWM Publication 14, Chapter 2 Measuring Devices.

A. Add a new Paragraph 7.41.1. as follows:

7.41 The unit price shall be expressed in dollars and decimals of dollars using a dollar sign. A common fraction shall not appear in the unit price, (e.g., $1.299 not $1.29 9/10). Yes ☐ No ☐ NA ☐

7.41.1. Examples of Acceptable Unit Price Identity

Unit Price, Price per Gallon (or Liter), $/Gallon (or Liter), $/Gal , Price/Gal (or Liter). This list is neither exclusive or all inclusive. NTEP may or may not approve other forms of identity.

B. Add a new Paragraph 7.43. as follows:

7.43. Examples of Acceptable Delivered Quantity Identity

Total Gallons (Liters), Total Gal, Gallons, Gal. This list is neither exclusive or all inclusive. NTEP may or may not approve other forms of identity.

C. Add a new paragraph 7.44. as follows:

7.44. Examples of Acceptable Total Price Identity

Total Sale, Sale $, Total $, $. This list is neither exclusive or all inclusive. NTEP may or may not approve other forms of identity.

Discussion/Conclusion: The Sector was unable to reach a consensus on a list of acceptable symbols or wording to identify the unit price, total sale, and quantity delivered on a retail motor-fuel dispenser. The GPMA agreed to develop guidelines and provide input on this issue for the Sector to consider. The Sector agreed to carry this item over for the agenda of its next Sector meeting.

11. NTEP Laboratory Recommendations for Changes to NCWM Publication 14

Source: NTEP Laboratories

Background: At the June 2002 NTEP Laboratory Meeting, the laboratories identified a need for several minor editorial changes to Publication 14 to clarify particular sections or paragraphs.

Recommendation: The Sector was asked to consider the following modifications to NCWM Publication 14 as shown in the following items:

A. Modify Section B. Tolerance Application, Normal Test on page LMD-2 as follows:

B. Tolerance Application

Normal Test Tolerances

~~Based on Handbook 44, for~~ For the purposes of calculating tolerances, normal tests conducted in an NTEP evaluation may be performed at any flow rate down to:

[50 % of the rated maximum flow rate + the rated minimum flow rate]/2

For example: For a meter with a rated maximum flow rate of 60 gallons/minute (gpm) and a minimum flow rate of 12 gpm, the maximum discharge rate developed in an actual installation may be as low as 30 gpm. Therefore, for NTEP tests, calculate the "breakpoint" between normal and special tests as:

[(50 % x 60) + 12]/2 = 21

Thus, in the example, NTEP test runs at flow rates between 60 and 21 gpm are considered normal tests.

C. Modify paragraph 5.4.2. on page LMD-21 as follows:

Code Reference: S.1.5.3. Width

5.4. Width of the index of an indicator:

5.4.1. The width of the index shall not exceed the width of narrowest graduation. This requirement applies to liquid measuring devices covered in Handbook 44 Section 3.30. Liquid-Measuring Devices ~~(effective 2002).~~ **Yes** ☐ **No** ☐ **NA** ☐

~~5.4.1. The width of the index shall not exceed the width of widest grad uation. This requirement applies to liquid measuring devices not covered in Handbook 44 Section 3.30. Liquid-Measuring Devices (effective 2002).~~ **Yes** ☐ **No** ☐ **NA** ☐

D. Modify paragraph 7.7.2 on page LMD-24 to include examples of rounding as follows:

7.7.2. The indicated or recorded quantity, unit price, and total sales price values shall be in mathematical agreement to the closest cent (i.e., within each element, the values indicated or recorded must meet the formula [quantity x unit price = total sales price] to the closest cent). **Yes** ☐ **No** ☐ **NA** ☐

Examples: $1.5549 rounds to $1.55
$1.5551 rounds to $1.56
$1.5550 may round to either $1.55 or $1.56

E. Modify the note to paragraph 16.2.5. on page LMD-36 as follows:

16.2.5. Authorize with card #1 (do not turn the "handle" on) and interrupt power for at least 10 seconds. This should de-authorize the dispenser. **Yes** ☐ **No** ☐ **NA** ☐

Resupply power; turn the "handle" on; try to dispense. The dispenser shall not deliver product.

Note: The term "handle" generically refers to the handle, flapper, start button, on/off switch, or other mechanism used to activate or deactivate the dispenser.

F. Add a note to 16.2.6. on page LMD-35 as follows:

16.2.6. Authorize with card #1; turn the "handle" on, and then interrupt power. This should de-authorize the dispenser. **Yes** ☐ **No** ☐ **NA** ☐

Resupply power and authorize the dispenser with card #2. Then, complete a delivery.

Verify that the transaction is charged to card #2.

Note: This test is not required if the device under test complies with paragraph 16.1.

Discussion/Conclusion: The Sector supported the changes suggested by the NTEP Laboratories recommends that the NCWM NTEP committee approve the changes shown above.

During the discussion of the above changes a member noted that the tolerances shown in Section I on page LMD-77 of Publication 14 also need to be updated to be consistent with Handbook 44. The Sector agreed and recommended that the tolerances be changed to 1.0 % of the test draft for mechanical automatic temperature compensating systems; and 0.5 % of the test draft for electronic automatic temperature compensating systems.

12. Definition for Cryogenic Liquid-Measuring Device

Source: NIST/OWM

Background: In 1986 paragraph A.1. of Section 3.34. Cryogenic Liquid-Measuring Device and the definition for cryogenic liquid-measuring devices were modified to include on-board-weighing systems for measuring cryogenic liquid. In 1995 the reference to scales for measuring cryogenic liquids was removed from paragraph A.1., but not from the definition for cryogenic liquid-measuring device.

The Sector was asked to review the following proposal to modify the following NIST Handbook 44 definition for cryogenic liquid-measuring device and if acceptable, forward it to the S&T Committee for consideration.

cryogenic liquid-measuring device. A system including a ~~mechanism or machine of (a) the~~ meter of the positive displacement, turbine, or mass flow type~~, or (b) a weighing type of device mounted on a vehicle,~~ designed to measure and deliver cryogenic liquids in the liquid state. Means may be provided to indicate automatically, for one of a series of unit prices, the total money value of the liquid measured.[3.34]
(Amended 1986, 200X)

Discussion/Conclusion: During the meeting a member recommended that "meter of the positive displacement, turbine, or mass flow type" be changed to "liquid measuring element" to recognize other measurement technologies. The Sector concurred and agreed that the following proposal be forwarded to the NCWM S&T Committee for consideration.

The Sector recommends modifying the NIST Handbook 44 definition for cryogenic liquid-measuring device as follows:

cryogenic liquid-measuring device. A system including a liquid measuring element ~~mechanism or machine of (a) the meter of the positive displacement, turbine, or mass flow type, or (b) a weighing type of device mounted on a vehicle,~~ designed to measure and deliver cryogenic liquids in the liquid state. Means may be provided to indicate automatically, for one of a series of unit prices, the total money value of the liquid measured.[3.34]
(Amended 1986, 200X)

13. Next Meeting

The Sector discussed the time and location for its next meeting.

Discussion/Conclusion: The Sector recommended that the next meeting of the NTETC Measuring Sector be scheduled for October 3-4, 2003 at the Hyatt Charlotte in Charlotte, NC immediately prior to the next Southern Weights and Measures Association Annual Meeting.

Additional Item

14. Update LMD Section of Publication 14

During the meeting a member stated that the entire LMD Section of Publication 14 should be reviewed, updated, and reorganized as necessary. When conducting evaluations of some devices it is necessary to look in several places to find all the requirements that may apply. The Sector concurred and agreed to add it to the agenda for the next Sector Meeting.

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Appendix F

National Type Evaluation Technical Committee
Weighing Sector Annual Meeting

September 29 to October 1, 2002, Annapolis, MD

Final Summary

Reference Item	Attachment Description
Attachment to Item 1	Scale Manufacturers Association Letter dated September 20, 2002
Attachment to Item 16	Proposals for Vehicle Scale Test Procedures

Carry-Over Items

1. CLC on Livestock Scales

Background: For additional background information, refer to the October 2001 Weighing Sector Summary Agenda Item and the Report of the 77th Annual Meeting of the National Conference on Weights and Measures (NCWM), Specifications and Tolerances Committee (S&T) Agenda Item 320-1B. As a result of the vote of the NCWM, the item was been returned to the S&T Committee and the Weighing Sector for additional development.

The Sector should make a recommendation to the NCWM S&T Committee that the proposed amendment to the CLC definition be treated as a separate agenda item. The Sector may also want to consider reducing the amount of test load prescribed in proposed paragraph N.1.3.4.2. to approximately 500 d. This number has been selected because it complies with the minimum load requirements in paragraph UR.3.8. Minimum Load for Weighing Livestock, test loads can be safely applied to the scale, and the minimum test load is an adequate test load to verify that individual load bearing points are accurately adjusted. The NIST Technical advisor suggested the following language for consideration by the Sector:

> N.1.3.4.2. Prescribed Test Pattern and Test Loads for Livestock Scales with More Than Two Sections and Combination Vehicle/Livestock Scales. A minimum test load of 5000 kg (10 000 lb) or one-half of the rated section capacity, whichever is less, shall be placed, as nearly as possible, successively over each main load support as shown in the diagram below. For livestock scales manufactured between January 1, 1989, and January 1, 2003, the required loading shall be no greater than one-half CLC. (Two-section livestock scales shall be tested consistent with N.1.3.8.)

Discussion: At its 2002 meeting, the Weighing Sector supported the recommendation that the definition for concentrated load capacity (CLC) be considered as a separate agenda item from the proposals for paragraphs N.1.3.4., N.1.3.4.1., N.1.3.4.2., and N.1.3.8.

The Sector also discussed the proper test patterns and test loads described in Handbook 44 Scales Code paragraph N.1.3.4.2. Prescribed Test Pattern and Test Loads for Livestock Scales with More Than Two Sections and Combination Vehicle/Livestock Scales. The Sector considered the Central Weights and Measures Association recommendation that the shift test load be 12.5 % of scale capacity, but no more than ½ section capacity, to be an adequate test of a main load support. The NIST Technical Advisor recommended that a minimum test load of 10 000 lb be specified to facilitate the safe application of test weights while applying a load that more closely simulates the potential concentration of livestock in the corner of the scale. The Sector noted that a test load of 12.5 % of scale capacity that does not exceed the ½ section capacity is an appropriate test of the performance of the load support and also addresses the safety concerns associated with stacking weights. Public sector members expressed concerns that the test load changes to N.1.3.4.2. should include language that allows the field official or an NTEP evaluator to apply test loads for load supports of up to ½ section capacity.

The Scale Manufacturers Association (SMA) distributed a letter dated September 20, 2002 documenting their concerns on S&T Agenda Item 320-5. The letter stated that the test loads were too large; the test patterns were undefined; and that the shift test pattern for livestock scales be simply defined as it was prior to 1988:

> N.1.3.4.2. Livestock Scales With More Than Two Sections. - A shift test equal to one-half the rated sectional capacity shall be conducted with test loads distributed over each section of the scale. (Two section livestock scales shall be tested consistent with N.1.3.8.)

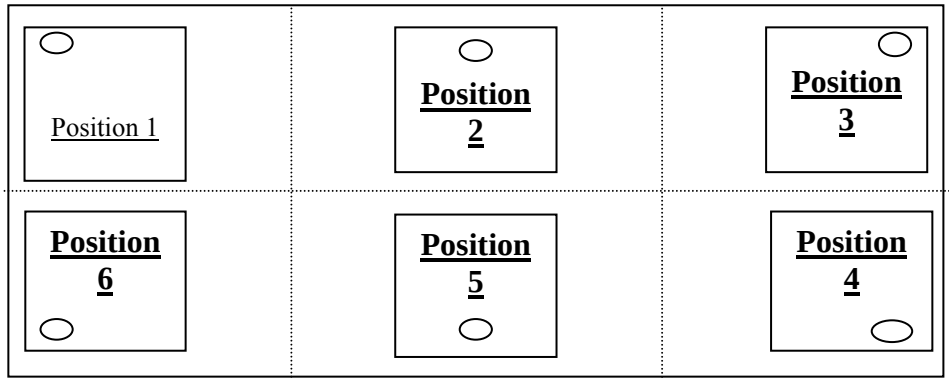
The Weighing Sector discussed the SMA proposal and continues to believe that testing which includes test loads positioned over the main load supports more accurately reflects the actual usage of livestock scales.

One of the private sector members noted that the test loads can not be centered over the main load bearing point and suggested adding lines to the diagram for paragraph N.1.3.4.2. similar to the lines in the diagram for paragraph N.1.3.8. (a) All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers.

Conclusion: At its 2002 meeting, the Weighing Sector agreed to support a separate proposal making the definition for concentrated load capacity a separate agenda item from the item to establish test patterns and test loads for livestock scales. The Weighing Sector agreed with the Central Weights and Measures Association recommendation that a test load

of 12.5 % of scale capacity, not to exceed one-half section capacity is an adequate test of a main load support. The Sector noted that a test load of 12.5 % of scale capacity addresses safety concerns when stacking weights however those test loads are excessive should not be required for subsequent tests. The Weighing Sector proposes an alternate new paragraph N.1.3.4.2. and associated diagram shown in the recommendation above that specifies a minimum test load of 10 000 lb to facilitate the safe application of test weights while applying a load that more closely simulates the potential concentration of livestock in the corner of the scale. The language is also intended to permit weights and measures officials and NTEP laboratories to conduct a shift test of up to 12.5 % of scale capacity.

N.1.3.4.2. Prescribed Test Pattern and Test Loads for Livestock Scales with More Than Two Sections and Combination Vehicle/Livestock Scales. A minimum test load of 5000 kg (10 000 lb) or one-half of the rated section capacity, whichever is less, shall be placed, as nearly as possible, successively over each main load support as shown in the diagram below. For livestock scales manufactured between January 1, 1989, and January 1, 2003, the required loading shall be no greater than one-half CLC. (Two-section livestock scales shall be tested consistent with N.1.3.8.)



2. NCWM Publication 14, Technical Policy E, Modification of Type - Conversion of a Vehicle Scale to a Livestock Scale

Background: See the 2001 NTETC-Weighing Sector Final Summary, agenda item 4, for additional background information.

NCWM Publication 14, Technical Policy E, Modification of Type, - Conversion of a Vehicle Scale to a Livestock Scale (including vehicle scales used to weigh livestock or combination vehicle/livestock scales) requires the device manufacturer to request on the NTEP application that a Certificate of Conformance (CC) cover both a vehicle and livestock scale application. The evaluation must include an NTEP test of the livestock scale if this is a new application. To include the livestock application on an existing CC, NTEP requires at least a "one time" test to 90 % of the CLC rating.

The Sector acknowledges that the S&T Committee reviewed an item that removes the CLC marking requirements and includes section capacity markings for livestock scales. The proposal to remove livestock scales from CLC marking requirements was adopted by the NCWM at its 2002 Annual Meeting. As a result, a vehicle scale used for weighing livestock would also be required to have a section capacity marking, and a livestock scale used to weigh vehicles would also have to have a CLC marking.

This subject was also discussed at the NTEP Participating Laboratories 2002 meeting in Albany, New York. It was determined that a consistent policy is needed, not only for vehicle scales used to weigh livestock, but also platform scales used to weigh single animals and railroad track scales used to weigh highway vehicles. Combination vehicle/axle load scales will not be evaluated because axle scales can't be used to determine legal-for-trade axle weights (unless the vehicle is weighed as a single draft) or are Accuracy Class IIII devices.

Steve Patoray, NTEP Director, suggested an approach used for vehicle scale deck types be considered as a possible solution. An applicant requesting multiple "use applications" at the time an evaluation is requested would have the choice of two separate evaluations or a combined evaluation. If two separate evaluations were the preferred option, the second

evaluation would only consist of an initial evaluation and an applicable follow-up test from NIST Handbook 112 to verify the device is still working correctly after 21-days and that the minimum use requirements have been met. Additionally, the sentence "Only loads which have been applied using a method representative of the scales intended use can be counted." needs to be changed, e.g., dynamic vs. static load, vehicle vs. livestock, railroad cars vs. vehicles, animals vs. pallet load applied by forklift or overhead crane.

At their 2002 meeting, the Sector, considered the following underlined amendments developed by the participating laboratories at their 2002 meeting in Albany, NY.

Section 62. Performance and Permanence Tests for Counter (Bench) Scales (including Computing Scales)

61.11.2. Only static loads which have been applied using a method representative of the scales intended use can be counted.

Section 63. Performance and Permanence Tests for Floor Scales

63.1.3. Only pallet or container loads~~,~~ which have been applied using a method representative of the scales intended use~~,~~ can be counted.

Section 64. Performance and Permanence Tests for Livestock Scales

64.32. Only loads of livestock which have been applied using a method representative of the scales intended use, can be counted.

Section 65(x) Performance and Permanence Tests for (X) Vehicle Scales and Permanently-Installed Axle-Load Load-receiving elements

65(x).7.2. Only static loads~~,~~ which have been applied using a method representative of the scales intended use~~,~~ can be counted.

Section 67. Performance and Permanence Tests for Railway Track Scales Used to Weigh In-Motion

Permanence Tests - Note: There are no minimum use requirements.

Section 68. Performance and Permanence Tests for railway Track Scales Used to Weigh Statically

Permanence Tests - Note: There are no minimum use requirements.

Section 69. Performance and Permanence Tests for Dynamic Monorail Scales

Permanence Testing:

During the permanence period, the system will be run with the following:

- Only livestock carcasses, which have been applied using a method representative of the scales intended use, can be counted.
- At least 100 % of the loads must be above 20 % capacity of the device capacity.
- At least 50 % of the loads must be above 50 % of device capacity.

Discussion: Some of the public sector members expressed continued concern about the differences in the way loads of livestock are placed on vehicle scales. The forces induced by highway vehicles are typically along the length of the scale and that vehicle scales are appropriately designed for the weight and direction of these forces. The forces induced by livestock on vehicle scales are in all directions and it can't be assumed that all vehicle scale designs can continue to perform within tolerance over an extended period of time due to the effect of the direction and violent movement of livestock. A public sector member cited an example of a vehicle scale that was used in an installation where vehicles were making short turns off the end of the scale and that the scale failed to maintain tolerances. The service agent added a side-to-side checking system designed for vehicle scales used to weigh livestock in order to maintain scale calibration.

Another comment indicated that the addition of stock racks and/or concrete barriers as part of the stock racks may be of sufficient weight and location to cause a detrimental effect on the performance of the scale. One of the public sector members also indicated a preference for the compromise test policy and procedures developed by the NTEP Participating Laboratories at their meeting in June 2002 (see background information above).

The Scale Manufacturers Association technical committee disagrees with the positions in the previous paragraph and responded with the following comments as part of a letter to the NCWM S&T Committee dated September 20, 2002:

1. The movement of a vehicle on the scale deck causes the deck to move in an elliptical pattern, which is why all vehicle scales limit transverse as well as longitudinal movement. The recent use of "rocker" type load cells drives this point home. These cells will rotate because of the elliptical deck movement and if rotation is not controlled by design, the cell cable will wind around the cell and break. To conclude that vehicle scales are not checked for transverse movement is simply not factual and to conclude that scale movement created by moving livestock is more abusive to a vehicle scale than the movement of a vehicle is technically incorrect.

2. The load capacity of an average vehicle scale section is 100 000 pounds (50 000 pound capacity load cells). Assuming a 4-section concrete deck scale, the dead load on each section will be in the area of 9 000 pounds and the live load on each section at maximum rated capacity will be less than 50 000 pounds. Total load on the section is 59 000 pounds or only 59 % of section capacity. The addition of racks and gates to the scale adds an additional 4500 to 5000 pounds at most and is well within scale design limits. These modifications are subject to Handbook 44 UR.2.7, UR.4.1., and UR.4.3., and are usually approved by the manufacturers of the scale. In addition, because the live load uses such a small portion of the total output of each load cell, an increase in dead load will not change the linearity of the device.

3. A legal highway truck can have a gross weight of 80 000 pounds. For the sake of this discussion, assume a maximum gross weight of 60 000 pounds. Also assume an average vehicle scale size of 70 feet x 10 feet (700 square feet). The average speed for a vehicle entering onto a vehicle scale load receiver is between 3 and 5 mph. The load receiver is at rest when the front axle of the vehicle first touches the load receiver causing the load receiver to move in the direction of the truck movement. The average 70 foot x 10 foot concrete deck load receiver weighs about 35 000 pounds so the dynamic forces of the load receiver moving from rest is severe. When the truck stops on the load receiver, the inertial force created by stopping the moving 60 000-pound load causes an equal force on the load receiver. The same dynamics take place when the vehicle begins to accelerate to leave the scale. By loading the same 700 square feet of load receiver with cattle the average maximum load would be 77 000 pounds. The cattle enter the load receiver, not as a single 77 000-pound mass like a vehicle; but rather randomly until the load receiver has no space for more. Loaded to 110 pounds per square foot, the cattle cannot move at all. To reduce the load of cattle to 60 000 pounds (same as vehicle) the square footage they would occupy gathered together would be 545 square feet allowing 155 square feet of open area in which to move freely. For these cattle to even simulate the dynamics of the vehicle the entire herd would have to move as one single mass coming onto the scale and leaving the scale in like manner. Experience dictates this is not likely. What if an individual animal ran from side-to-side or attempted to get off the scale by climbing the stock racks? An average head of commercial beef cattle weighs less than 1300 pounds and certainly cannot create dynamic forces that come close to the vehicle scale design limits.

Ross Andersen, New York, strongly believes that vehicle scales can be used with livestock without additional evaluation. It is a platform that weighs.

The NIST Technical Advisor and one of the private sector members noted that the results of testing for permanence using livestock to meet the minimum use requirements might not be repeatable from one evaluation to another. One location may be at a feedlot with passive livestock, where another location might be a livestock receiving and slaughtering facility with very active livestock. It was also noted that it is frequently difficult for an applicant to find a test site that will permit an interruption to their operation to conduct type evaluation testing.

Conclusion: The Sector agreed that there may be differences in test procedures between livestock scales and vehicle scales pending the action of the NCWM at its 2003 Annual Meeting on the proposed new paragraph 2.20. Scales Code paragraph N.1.3.4.2. Prescribed Test Pattern and Test Loads for Livestock Scales With More Than Two Sections. If the item is adopted by the NCWM, NTEP may be able to justify different type evaluation procedures between livestock and vehicle scales based upon the different test procedures in Handbook 44. Additionally, there will be Handbook 44

justification to establish NTEP technical policies for adding an option for weighing livestock to new and existing vehicle scale certificates, and adding an option for weighing vehicles to new and existing livestock scale certificates.

The Sector did not come to a conclusion on the language recommended by the participating laboratories at their 2002 meeting in Albany, NY. Additionally, the Sector could not reach a consensus on whether livestock shall be used as the loads necessary to meet permanence test minimum use requirements, or if static loads such as vehicles, lift trucks, pallets, etc. can be used to meet minimum use requirements.

The Sector Chairman requested a vote. The Sector voted against "requiring livestock be used to meet minimum use requirements for permanence testing" (4 in favor, 10 opposed). Depending on the actions of the NCWM Board of Directors and NTEP Committee, this item will be carried over to the 2003 Weighing Sector.

3. T.7.3.1. Power Supply, Voltage, and Frequency Tests for Automatic Weighing Systems (AWS)

Source: Maryland NTEP Laboratory and NIST Weights and Measures Division (formerly OWM)

Background: This item was resolved with recommended language for voltage testing that was incorporated into Publication 14. The NTEP Participating Laboratories were to discuss the reasoning for not conducting frequency variation tests at their 2002 NTEP Participating Laboratory meeting.

This item was not discussed at the 2002 NTEP Participating Laboratory meeting. Scale Code paragraph T.N.8.3.1. Power Supply, Voltage, and Frequency includes language similar to the AWS Code and has never been included as part of the influence testing required in Publication 14.

Discussion: The NTETC Weighing Sector reviewed the Canadian and OIML voltage requirements. In the Canadian requirements for maximum and minimum specified voltage, devices may be marked with a nominal voltage of 117 V or 225 V or other voltage. When a device is marked with a voltage range the midpoint is taken as the nominal voltage. The device is tested at –15 % and +10 % of the marked nominal voltage. Devices marked with a range are tested to the *greater* of –15 % and +10 % of the midpoint nominal voltage or the maximum and minimum marked voltage range values. OIML R 76-1, Nonautomatic Weighing Instruments, Part 1: Metrological and Technical Requirements – Tests (Edition 1992 E) requires test of the device at –15 % of the maximum marked voltage and +10 % of the minimum marked voltage.

There was also discussion of test requirements for compliance with line frequency variations. Several of the manufacturers indicated that there is no need to do this with today's power supplies built into the scales. The devices can easily meet performance requirement with the narrow range of line frequency variation specified in Handbook 44 and OIML R 76. The manufacturers state that the tests for compliance with line frequency variations are not conducted during OIML R 76 evaluations. The Sector noted that similar requirements and language are also in Handbook 44 codes for Automatic Weighing Systems and Near-Infrared Grain Analyzers.

Conclusion: The Weighing Sector recommended that a proposal to modify paragraph T.N.8.3.1.(a) that require tests over the marked voltage range rather than a specified voltage range be developed. Performance tests would be conducted at the device's marked maximum voltage, minimum voltage, and nominal voltage (voltage value at the midpoint of the range).

NTEP does not test for a change in line frequency of ∀ 0.5 Hz because the test equipment is very expensive. The Sector agreed to recommend continuing the existing policy and consistently apply the same policy to other devices covered by NCWM Publication 14.

The NIST Technical Advisor developed and submitted the following language to the Southern Weights and Measures Association (SWMA) Specifications and Tolerance Committee for consideration at their 2002 Annual Conference. The language is based on OIML R 76 recommendations and test procedures to modify paragraph T.N.8.3.1.(a) as follows:

T.N.8.3.1.(a) Power Supply, Voltage and Frequency.

(a) Weighing devices that operate using alternating current must perform within the conditions defined in paragraphs T.N. 3. through T. N. 7., inclusive, over the line voltage range as marked ~~of 100 V to 130 V or 200 V to 250 V rms as appropriate, and over the frequency range of 59.5 Hz to~~ at 60~~.5~~ Hz.

NIST Technical Advisor note: At their 2002 Annual Meeting, the SWMA recommended alternative changes to paragraph T.N.8.3.1.(a) as follows:

T.N.8.3.1.(a) Power Supply, Voltage and Frequency.

(a) Weighing devices that operate from a main power supply must perform within the conditions defined in paragraphs T.N.3. through T.N.7., inclusive if the power supply varies in voltage from – 15 % to + 10 % of the value marked on the device. If a range of voltage is marked, the device shall operate within the conditions defined in paragraphs T.N.3. through T.N. 7., inclusive at a voltage of + 10 % of the maximum voltage marked on the device and at a voltage of –15 % of the minimum voltage marked on the device ~~using alternating current must perform within the conditions defined in paragraphs T.N.3. through T.N.7., inclusive, over the line voltage range of 100 V to 130 V or 200 V to 250 V rms as appropriate, and over the frequency range of 59.5 Hz to 60.5 Hz~~.

4. Listing of Device Types (Families of Scales with Capacities Above and Below 30 000 lb)

Source: 2001 Carryover Item 8a

Background: At the 2001 NTEP Participating Laboratories meeting, the Participating Labs and the NIST Technical Advisor were assigned to create an outline of device types based upon accuracy class, special use (e.g., vehicle, livestock, etc.), and physical design. Refer to Attachment to Item 4 for a complete draft copy of the outline.

The NIST Technical Advisor and the Participating Labs have made no progress on this item**.**

Discussion: The Sector considered if further development of the outline format is necessary. The Sector noted that one of the concerns has come from the fact that more than 10 types of flat platform scales can be considered as a bench scales in Handbook 44. Additionally, there are several different types of references to vehicle scales, and livestock scales on NTEP Certificates of Conformance (CC) (e.g. livestock or vehicle scales, load-receiving elements, weighing elements, and weighing/load-receiving elements). One of the consequences of the inconsistency of the terminology is trying to search for CCs by device type on the Internet. Some devices and their manufacturers are not listed in queries because of variations in wording.

Several manufacturers are in favor of limiting device types to Handbook 44 Accuracy Class designations with suitability determined by factors such as capacity, minimum interval, minimum use, size and conditions of the installation. For example, a Class III hanging scale can be used in place of a Class III bench scale (if both are suitable for the installation).

Many regulators prefer that Handbook 44 device types continue to be "application driven" rather than "Accuracy Class" driven. They are concerned that scale purchasers assume a scale is suitable for an application, without considering division size, typical usage and etc., if it has an NTEP CC. Purchasers may verify that a scale has a CC (e.g. on the internet) and buy a scale that is unsuitable for the application. This makes it difficult for regulators to reject a scale on suitability requirements after it has been purchased and installed.

One of the participating laboratories indicated that there is inconsistent language used in the certificates and suggested that the idea of templates and "drop down menu selections for device types" be further developed.

There was also a suggestion that the NTEP database be upgraded to include word search capability in order to obtain a more comprehensive list of device type and help the regulator find certificates by "device type." The NTEP Director agreed that a "keyword search" is useful on occasion, but stated that there would be costs involved and added that there would have to be an increased interest of this feature to justify the costs.

Conclusion: The Sector recommends that the NTEP Board of Directors consider adding a "keyword search" capability to the NTEP CC database. The Sector also agreed that Handbook 44 has an excessive number of device types in the Scale Code and that the list of device types could be shortened and used consistently by the participating laboratories and in Handbook 44. The NIST Technical Advisor mailed the list of device types submitted in the 2001 Sector agenda and

requested specific suggestions for developing a shortened list of device types. The NTEP Director, NIST Technical Advisor, and the Sector Chairman will compile the comments and develop a recommendation for the 2003 Participating Laboratories and Weighing Sector meetings.

5. Scope of the Certificate of Conformance

Source: 2001 Weighing Sector Item 8b - See attachment to Agenda Item 5 for the copy of the 2001 Sector Summary for Item 8b.

Background: This item was discussed during the 2001 Sector meeting. There was no consensus on the scope of the Certificate of Conformance and whether the Certificate should list the manufacturer's intended application(s).

Discussion: Ross Andersen, NY, stated that the Certificate of Conformance (CC) should not be application specific or limiting, however, there are application specific devices according to Handbook 44. Some of the Sector members commented that an applicant should be able to request that the device under evaluation be limited to specific applications.

The NTEP Director commented that an applicant to NTEP should indicate what they want covered on the certificate. After that, the participating laboratory will test the device to applicable checklist requirements and will draft the CC according to the features and option that have been evaluated (and passed). Many of the current applications have a place for the applicant to describe the intended use, applications, particular installation requirements, or other observations and comments.

A participating laboratory suggested that the NTEP Application not include "general purpose" as an open-ended description of intended use and that the applicant must make a selection of one or more checkboxes relating to the Handbook 44 application device types.

Some of the participating laboratories indicated that the term "general purpose" listed in the "Application" paragraph of the certificate give the appearance that the device is suitable for any application regardless of division size since Handbook 44 does not provide enough guidance to determine suitability. One of the manufactures stated that scale dealers and distributors should be capable of determining suitable devices to sell to their customers.

The NTEP Director indicated that most states have indicated that the "Application" paragraph of the CC is limiting. One of the participating laboratories indicated that limiting CCs is also a problem in that some devices certified for one application are perfectly suitable for other Handbook 44 applications.

Conclusion: There was no consensus on whether the Certificates of Conformance, as a rule, should limit device applications. The Sector agreed that greater responsibility should be placed on the applicant in providing information on device limitations when filling out the NTEP application. No changes on the scope of the NTEP Certificate of Conformance are recommended by the Sector.

The Sector further recommends that the NTEP application be modified to indicate appropriate boxes to identify the intended use and applications; and add a statement that based on the information provided and the results of the evaluation; NTEP will determine the applicable tests to be conducted and information to be included on the Certificate of Conformance. The Sector did not submit specific amendments to the NTEP Application. This item will be carried over to the next meetings of the NTEP Participating Laboratories and NTETC Weighing Sector.

6. Policy for Initial Test Only vs. Full Evaluation when a Modification is Made which Requires Testing

Source: 2001 Weighing Sector Item 10

Background: See 2001 Sector Summary Agenda Item 10 for additional background information.

Discussion: The NTEP Director reported that NTEP has been implementing the 2001 Sector recommendation and has encountered no major problems. Most of the requests for amendments have involved repeating influence factor or permanence testing. The NIST Technical Advisor and some of the sector members indicated that the policy would promote uniformity among the labs and provide some advance notification to NTEP applicants if the policy were documented and published as part of the NTEP application, administrative policies, or technical policies.

SMA reported that their document is still an "in-house" draft but could be used by the NTEP Director and the participating laboratories as guidelines to assist in making a decision on the extent of NTEP re-evaluations.

There was also discussion that a minimum list of metrologically significant components be developed with a statement relating to a minimum amount of re-evaluation associated with each component. A consensus could be gathered using information from the NTEP Director, participating laboratories, original equipment manufacturers (OEM) and other knowledgeable parties. Manufacturers are typically reasonable and it is to the OEMs benefit to agree on a common list

Conclusion: The Sector recommended that the NTEP Committee consider the following underlined amendments for Publication 14, NTEP Administrative Policy, paragraph D.2.

D.2 Responsibility for Reporting Occurrence of Modification

b. NTEP Options

On the basis of the manufacturer's notification, NTEP will decide whether or not to require an evaluation for approving the modification or issuance of a new Certificate of Conformance (CC). When a metrologically significant modification is to be applied to a device with an existing CC, the manufacturer and NTEP shall attempt to agree upon the extent of reevaluation that might be required before such modification is applied. In the event of a disagreement, a full reevaluation shall take place. NTEP will notify the manufacturer accordingly.

The decision of NTEP can be appealed to the NCWM Board of Directors according to NCWM Publication 14 Administrative Policies, Section T. Appeal and Review Process.

Additionally, SMA Guidelines are to be to be submitted to the Sector by the middle of May 2003 for consideration at the next Sector meeting.

7. NCWM Publication 14 Administrative Procedures – Conformity Assessment

Source: NCWM

Background: At the 2002 Annual Meeting, Mr. Patoray reported that the Work Group was formed and included Dennis Krueger (NCR), Bill West (Ohio NTEP lab), Steve Cook (NIST Technical Advisor), Joe Dhillon, (NIST Conformity Assessment Advisor), Ray Bales (Weigh-Tronix and Scale Manufacturers Association member), and Frank Rusk (First Weigh), with additional input from Rich Tucker (Tokheim and Gasoline Pump Manufacturers Association member). The Work Group met twice and developed a preliminary outline for an NTEP Conformity Assessment Program. Mr. Patoray discussed the ideas and possible direction during a presentation to the NCWM Board of Directors (BOD). The BOD requested that Mr. Patoray present the outline to other interested parties so that they may provide the BOD with additional feedback

Discussion/Conclusion: A presentation on Conformity Assessment was made available for review and comment by interested parties. No action was recommended by the Sector.

8. Multiple Load-Receiving Elements Attached To One Indicator

(This item has been combined with agenda item 10)

Source: 2001 Weighing Sector Agenda Item 13 - NTEP Participating Laboratories

Background: An application was submitted for an indicator with the capability to display the weight reading for up to 32 load-receiving elements. The Digital Electronic Scales Checklist, Section 34 lists the criteria for evaluation of a single indicator connected to two or more load-receiving elements. Currently, indicating elements have been connected with up to four load-receiving elements with the ability to continually monitor or display each one. It is not clear how the operator will be able to monitor 32 scales connected to the indicator. Additionally, it is not clear how the technology actually performs its task. NCWM Publication 14 does not specify how many load-receiving elements must be simulated and or/submitted for type evaluation.

At the 2001 Sector meeting, there appeared to be a consensus that the number of load-receiving elements interfaced with a single indicating element should not be limited by NTEP. However, there was no consensus on specific recommendations for type evaluation procedures. The Ohio Participating Laboratory was requested to evaluate the device in question with all load inputs connected to the indicating element. The inputs would include a combination of at least two scales and simulated power loads on the remaining inputs. The Ohio Participating Laboratory was to draft suggested test procedures for review and comment at the next NTEP laboratory meeting in June 2002. The draft procedures and any additional concerns will be submitted to the Weighing Sector during the 2002 Sector meeting for review and comment.

Discussion: The Sector reviewed on the language submitted by Bill West and Darrell Flocken. The Sector generally agreed with the language at their meeting but wished to reserve final agreement until paragraph numbers were added to the language.

Conclusion: The Sector was balloted on this item which recommended the language in the following underlined text be added to NCWM Publication 14, Weighing Devices Chapter 1, Section 34, Page DES-54 for ZERO and TARE on indicators interfaced to multiple load-receiving elements. The results of the ballot were 6 in favor (with one affirmative vote requesting language clarification) and 4 voters abstaining (one voter abstained pending changes to the wording for clarification) and no negative votes. The following language has been edited for clarification based on the comments.

34. Multiple Load-Receiving Elements (Page DES-54 2002 Edition)

(No changes to current contents before this point!)

34.7. Zero-setting mechanism.

There must be means for setting each load-receiving element to a zero balance indication. The zero-setting mechanism shall not operate independently on a summed weight indication when values for individual load-receiving elements can be displayed.

34.7.1. Individual indications for each load-receiving element - no summed indication. There must be means for setting each load-receiving element to a zero balance condition. Each load-receiving element shall be evaluated as an independent scale and must meet appropriate requirements. **Yes ☐ No ☐ NA ☐**

34.7.2. Single indicator with two or more load-receiving elements that can be selected individually – The indicator must provide some means to monitor zero for each of the load-receiving elements individually, regardless of whether or not they can be summed. (This may require a "center of zero" indication for each load-receiving element.) **Yes ☐ No ☐ NA ☐**

34.7.3 **Individual indications for each load-receiving element - with summed indication**. Each individual load-receiving element display must operate within the guidelines defined in section 34.7.1. or 34.7.4. If the instrument has the ability to operate in a "Sum Only" mode, the summed display must operate within the guidelines in section 34.7.4. **Yes** ☐ **No** ☐ **NA** ☐

In this case, when the system is zeroed;

(a) all indications must be set to zero, including the summed display, or

(b) the zero command must be rejected by the indicator.

34.7.4. **Sum only indication.** The summed display shall be evaluated as an individual scale and must meet appropriate requirements. The indicator may provide a display for each load-receiving element, but the only display that will be considered "legal for trade" will be the summed display. In this case, the total number of divisions for the system shall not exceed 10 000 for Class III and IIIL. **Yes** ☐ **No** ☐ **NA** ☐

When testing these configurations;

- at least two load-receiving elements must be connected to the indicator if the A/D converter for the load-receiving elements is not in the indicator.
- the evaluation will be performed with the maximum number of load-receiving elements requested by the manufacturer (to be covered by the CC) if the indicator has A/D converters for each load-receiving element.
- proper operation shall be confirmed with test weights applied to all individual load-receiving elements, and then in combination if the system has a summed display. Testing may be performed in the laboratory using load cell simulators or load-receiving elements, or a combination of both load cell simulators and load-receiving elements.
- the capacity by division for each load-receiving element in the system must appear adjacent to the weight display or on the display itself.
- each load-receiving element must be identified, and the load-receiving element that is in use must be automatically identified by the indicator and if connected to a printer the recorded representation shall identify the load-receiving element (or elements) from which the weight was obtained.

34.8. **Tare mechanism.**

34.8.1. **Individual indications for each load-receiving element - no summed indication.** Each load-receiving element shall be evaluated as an independent scale and must meet appropriate requirements. **Yes** ☐ **No** ☐ **NA** ☐

34.8.2. **Individual indications for each load-receiving element - with summed indication.** If the instrument has the ability to select individual load-receiving elements and sum, each must operate within the guidelines defined in section 34.8.1. or 34.8.3. **Yes** ☐ **No** ☐ **NA** ☐

34.8.3. Sum only indication. The summed display shall be evaluated as an individual scale and must meet appropriate requirements. **Yes** ☐ **No** ☐ **NA** ☐

When testing these configurations;

- At least two load-receiving elements must be connected to the indicator.
- Proper operation shall be confirmed with test weights applied to all individual load-receiving elements and then in combination if the system has summed display capability. Testing may be performed in the laboratory using load cell simulators and load-receiving elements or a combination of load cell simulators and load-receiving elements.
- The indication for each load-receiving element in the system must indicate whether it is in gross or net mode. If the system is capable of summing the weights, the summed indication must also indicate whether it is in gross or net mode.
- Depending on the application, when tare is entered, it may be appropriate to either (check all that apply):
  - ❑ Switch all indications in the system to net
  - ❑ Switch only the scales involved plus the summed indication to net
  - ❑ Leave all the individual scales at gross and only switch the summed weight to net

  Note: It is not appropriate to switch all scales in the system to net mode if any platforms are at zero load. This would in effect allow taking zero tare on those platforms that are at zero.
- ~~Each load-receiving element must be identified, and the load-receiving element that is in use must be automatically identified by the indicator and if connected to a printer the recorded representation shall identify the load-receiving element (or elements) from which the weight was obtained.~~ (Technical Advisors note. This has been deleted since the information required is the same as paragraphs 34.3 and 34.4)

34.9. Capacity by division markings.

~~34.8.1.~~34.9.1. no change to current contents…..

~~34.8.2.~~34.9.2. no change to current contents….

~~34.8.3.~~34.9.3. no change to current contents…..

~~34.8.4.~~34.9.4. no change to current contents…..

9. G-S.1. Identification, and Table S.6.3. Markings; Software Based Built-for-Purpose Devices

Source: 2001 Weighing Sector Agenda Item 16

Background: At the May 2001 NTEP Laboratory meeting, the Measuring Sector Laboratories discussed marking requirements for "software-based" devices such as electronic cash registers or "smart recording elements" interfaced with devices. In some cases, the indicator for the system is a generic computer display. If the required markings are placed on the display at the time of installation and then at some time future time the display is replaced, the required markings may

be lost. The laboratories agreed that a real time or "software-based" display of the model, capacity, unit of measurement, and other required markings on the display are preferable. The laboratories also agreed that the information could either be continuously displayed or displayed by pressing a single key (a series of keystrokes could be permitted with on-screen prompts and directions). The laboratories forwarded the following proposed language to the Measuring Sector for consideration at its 2001 meeting. The intent of the proposal is to modify Handbook 44 paragraph G-S.1.1 to allow a real time display of the required marking information for software-based systems.

The NCWM Specifications and Tolerances Committee (S&T) has already addressed the issue of capacity marking requirements of video display terminals. At the 77th NCWM Annual Meeting in 1992, the NCWM adopted the following:

> The Committee recommends that Table S.6.3.a. and S.6.3.b. (note 3) be interpreted to permit the required capacity and scale division marking to be presented as part of the scale display (e.g., displayed on a video terminal or in a liquid crystal display), rather than be physically marked on the device. As part of the current language in the tables and this interpretation, the capacity by division statement must be adjacent to the weight display and continuously displayed when in the weighing mode. However, if the weighing mode of the scale permits different menus for selecting operations to be displayed, the weight information and capacity by division statement must be continuously displayed if this display is the customer's only display. These requirements apply to all of the weighing modes that may be selected for commercial transactions. The statement does not have to be displayed when the indicating element operates in modes other than the weighing mode. This does not require a change to Handbook 44. This interpretation will be included in NCWM Publication 14 and NCWM Publication 3.
>
> The statement that the capacity by scale division is not required to be displayed when in modes other than the weighing mode refers to situations where the scale is in the supervisor's mode and manager functions are being performed.

For additional background information, see the Report of the 87th National Conference on Weights and Measures, Specifications and Tolerances Committee agenda item 310-1.

This item is currently before the NCWM S&T Committee. The Committee asked that the NTETC Weighing and Measuring Sectors review both proposals and attempt to agree on a single proposal that is acceptable to all parties. Additionally, the NIST Technical Advisor will develop language for Publication 14, Section 1, Marking-Complete Scales, page DES-13 and Section 2, Marking-Indicating Elements, page DES-18.

Discussion: The Weighing Sector, at its 2002 meeting, discussed this item at length and reviewed comments from the NCWM S&T Committee and from other interested parties at the 2002 NCWM Interim and Annual Meetings. The Sector also discussed the above information and agreed to limit the scope of the proposal to not built-for-purpose devices.

Will Whottlie, Maryland, (NTETC Measuring Sector, NCWM S&T Committee, and SWMA S&T Committee) also participated in the discussions and presented the concerns of the 2001 Measuring Sector, and the regional and national S&T Committees. He stated that Measuring Sector manufacturers were concerned about requiring G-S.1. Identification. information to be continuously displayed in the video terminal since all the area (real estate) on the display is needed for other purposes during the normal mode of operation.

The Weighing Sector discussed the use of keyboard/keypad entries but was concerned that without a standardized access method, there would be no information on the device or system to help locate the appropriate Certificate of Conformance. As a minimum, the device needs to display minimum information needed to find the Certificate of Conformance Number in order to look up, among other things, the instructions for accessing the identification information.

The Weighing Sector agreed that minimum information would not have to be displayed on the device if there was a single standardized method to access the information documented in Handbook 44. The Sector felt that the standardized method should be determined by a consensus of weighing and measuring device manufacturers.

The Weighing Sector considered location of the proposed added language in paragraph G-S.1. Identification. The NIST Technical Advisor suggested that adding another note to G-S.1. may be confusing in that the note may not be clear that it applies to all of G-S.1. The majority of the Sector did not show a strong preference whether the proposed language be part of G-S.1. or be written as a sub paragraph of G-S.1.

Recommendation: The 2002 Weighing Sector recommends the following language be incorporated into Handbook 44 General Code 1.10, paragraph G-S.1.1.- Software Based, Not Built–For–Purpose Devices., renumber existing paragraph G-S.1.1. and add a definition for "built-for-purpose device:"

G-S.1. Identification. -

G-S.1.1.- *Software Based, Not Built–For–Purpose Devices. For software based, not built–for–purpose devices, the manufacturer and a model designation, or the Certificate of Conformance (CC) Number, shall be continuously displayed or permanently marked on the device. Clear instructions for accessing the remaining required information shall be listed on the CC. Alternatively, all required information in G-S.1. Identification. (a) through (g), may be continuously displayed or accessible by (a specified H-44 method such as Help/About).*

Renumber existing G-S.1.1. Remanufactured Devices and Remanufactured Main Elements. to G-S.1.2.

Add a new definition for "built-for-purpose" devices as follows:

built-for-purpose device. Any main element, which was manufactured with the ~~primary~~ intent that it be used as or part of a weighing or measuring device or system.

The NIST Technical Advisor reported the recommendations of the 2002 Weighing Sector to the 2003 Measuring Sector.

The following changes recommended by the Measuring Sector at their 2002 meeting were balloted to the Weighing Sector for their concurrence.

Amend G-S.1. Identification *(d)* as follows:

G-S.1. Identification. -

(d) except for equipment with no moving or electronic component parts and software-based not built-for-purpose devices, a nonrepetitive serial number;
[Nonretroactive as of January 1, 1968]

Add new paragraph G-S.1.1. and renumber existing paragraph G-S.1.1. as follows:

G-S.1.1.- Software Based, Not Built–For–Purpose Devices. *For software based, not built–for–purpose devices, the following shall apply:*

(a) the manufacturer or distributor and the model designation may be continuously displayed or marked on the device, or*

(b) the Certificate of Conformance (CC) Number may be continuously displayed or marked on the device, or*

(c) all required information in G-S.1. Identification. (a), (b), (c), (g), and the software version designation may be continuously displayed. Alternatively, a clearly identified System Identification, G-S.1. Identification, or Weights and Measures Identification may be accessible through the "Help" menu. Required information includes that information necessary to identify that the software in the device is the same type that was evaluated.

**Clear instructions for accessing the remaining required information shall be listed on the CC. Required information includes that information necessary to identify that the software in the device is the same type that was evaluated.*

[Nonretroactive as of January 1, 200X]

G-S.1.~~1~~2. Remanufactured Devices and Remanufactured Main Elements. -

Add a new definition for "built-for-purpose" devices as follows:

built-for-purpose device. Any main device or element which was manufactured with the intent that it be used as or part of a weighing or measuring device or system.

The vote count for the Weighing Sector was as follows:

AFFIRMATIVE: (9), NEGATIVE: (1), ABSTAIN: (3). Five ballots were not returned. The NIST Technical Advisor forwarded the results and comments to the 2003 NCWM S&T Committee for their consideration.

10. Zero and Tare on a Single Indicating Element Interfaced with Multiple Platforms

(This item was combined with the 2002 Weighing Sector Agenda Item 8)

Source: 2001 Sector Agenda Item 18

Background: The Ohio NTEP Participating Laboratory has received several applications for indicating elements with multiple displays interfaced with multiple load-receiving elements that have the ability to simultaneously display the indication of each load-receiving element in addition to a summed weight display.

Publication 14 for Digital Electronic Scales, Section 34.7. Multiple Load Receiving Elements states:

"There must be a means for setting each load-receiving element to a zero balance indication. The zero-setting mechanism shall not operate independently on a summed weight indication when values for individual load-receiving elements can be displayed."

Discussion/Conclusion: This item was combined with agenda item 8. Please see the Discussion and Conclusion for agenda item 8.

11. Screen Savers on Electronic Cash Registers and Point-of-Sale Systems (ECR/POS)

Source: 2001 Sector Agenda Item 19

Background: In the past few years, ECR manufacturers have been adding screen saver features to CRT displays. The function of the screen saver can be metrologically significant because zero information may not be available to the customer and operator at the start of a transaction. Therefore the screen saver feature needs to be evaluated by NTEP to insure compliance to all requirements. This is particularly important if the CRT is also the primary display.

At its 2001 meeting, the Sector agreed to recommend that the three examples listed in the agenda be incorporated into Publication 14 ECRs Interfaced with Scales checklist and, where applicable, in the Digital Electronic Scales Checklist. The NIST Technical Advisor developed language for both checklists. The language was circulated and balloted among the sector members in mid-December 2001 with comments and suggestions due by January 4, 2002.

The Sector voted in favor of recommending language proposed by the NIST Technical Advisor for the 2002 Edition of NCWM 14 to the NTEP Committee (9 Affirm, 3 Neg., 3 Abst.) on the language for the Scales Checklist and (8 Affirm, 3 Neg., 4 Abst.) on the language for the ECR Interfaced with Scales Checklist. Based upon comments received, there appeared to be some confusion in the proposed language to be included in the weighing devices checklist and a technical issue on the language for the electronic cash register interfaced with scales checklist. The participating weighing device laboratories reviewed the proposed language and provided the NIST Technical Advisor with additional guidance.

Ballot Discussion (sleep/screen saver mode on scales): One of the comments during the ballot process indicated that it was not clear if a scale had to comply with one or all of the solutions listed in the proposed language. The NIST Technical Advisor modified the language to make it clear that a scale with a sleep or screen saver mode had to comply with only one of the solutions in the proposed language (see attachment to item 11).

Additional comments indicated that the marking of a legend that describes the indication other than zero (such as a scrolling message or a series of dashes across the display) is a new marking requirement and is not supported by language in Handbook 44.

The NIST Technical Advisor and one of participating laboratories report that it was the intent of the NCWM that a label defining the other than digital zero indication is necessary if the indication representing the zero condition is not clear in its meaning.

The following is from the 1992 Weighing Sector Meeting:

> **Conclusions:** Those commenting on this issue indicated that it is appropriate to allow the use of other than a continuous indication of zero provided that the device inhibits use or otherwise clearly indicates an out-of-balance condition if present. The Committee generally agreed this issue is most appropriately addressed by the NCWM.

The following is from the Report of the 78th of the NCWM Annual Meeting, Specifications and Tolerances Committee Item 320-1 S.1.1. Zero Indication (page 293):

> **Discussion:** Scale manufacturers are designing scales with indications for zero other than a digital representation. Alternative indications may be a zero annunciator, a series of sequencing dashes moving across the display, or a scrolling message moving across the customer display. These latter indications must be clearly defined on the device as the zero indication as required by General Code paragraph *G-S.6.* Marking Operational Controls, Indications, and Features.
>
> When a shared weight display was incorporated into a point-of-sale scanner scale in 1986 and 1987, many Conference members had serious reservations about the absence of a digital zero indication. Since that time, weights and measures officials appear to have become much more comfortable with devices having zero indications other than the digital zero. Comments submitted to the Committee indicate that weights and measures officials are willing to accept alternative forms for indicating the zero balance condition if clearly defined.
>
> Consequently, the Committee recommends that all scales be permitted to indicate the zero balance condition by means other than a digital zero indication; however, scales using other than a digital zero indication for the zero-balance condition must either inhibit the weighing operation or return to a continuous digital weight indication when the scale is no longer at zero. This alternative is also extended to point-of-sale systems, as indicated by deleting the qualifying phrase at the beginning of S.1.1. (c) which previously restricted part (c) to point-of-sale systems.

It appears that the intent of the NCWM was to allow alternate forms of the zero balance condition, provided that it is clearly defined and that the scale "inhibit the weighing operation or return to a continuous digital weight indication when the scale is no longer at zero." **Ballot Discussion (sleep/screen saver mode on ECR interfaced with scales):** One of the comments received during the ballot process indicated that the intent of the of the NCWM S&T Committee in the previous discussion also apply to electronic cash registers interfaced with scales (ECR). Therefore, the screen saver (or other information is displayed on the ECR) is intended to represent a zero indication other than a digital zero, and that the ECR display needs to be labeled with a statement defining the other than zero indication.

The NIST Technical Advisor agreed that the zero indication would have to be defined in the case a transaction could be continued or initiated ***without*** requiring operator intervention, giving the operator and customer time to verify the zero condition of the scale. In many cases, the ECR automatically logs off the cashier requiring the cashier to log back on to the ECR to initiate or continue a transaction. This allows sufficient time for the operator to verify the zero condition of the scale as required in UR.4.1. Balance Condition.

The commenter indicated that field inspectors have reported that ECR operators still ignore the zero indication of the POS scale during the log in process and that items have been on the scale during the log in of an ECR. Additionally, most electronic stand-alone scales display to a zero or an error condition (if weight on the scale is out of range of the zero limits) when turning on a scale where the video display immediately goes from the screen saver/sleep mode to displaying the information sent from the POS scale.

Participating Laboratory Discussion: At the 2002 Participating Laboratories meeting in Albany NY, the weighing devices laboratories discussed this item and information from past discussions of the NCWM S&T Committee. The weighing labs generally agreed that the procedures for evaluating the sleep mode on scales are technically correct. They have not reviewed the amended language in the attachment. Additionally, the weighing labs did not reach a consensus on the ECR sleep/screen saver mode and agreed that the NIST Technical Advisor agreed to develop two versions of the language for ECRs interfaced with scales. One version did not require a label defining the other than zero indication if

the operator is required to log on to the ECR (after the ECR automatically logged off to enter the sleep mode) to continue or initiate a transaction. The other version would require that "zero indication" be defined and labeled regardless of the automatic log off and operator log in procedures (see attachment to item 11).

Discussion: The Sector reviewed the proposed language in the attachment for Sector agenda item 11. The attachment contained language to evaluate sleep modes on scales and two versions for evaluating the sleep/screen saver mode on ECRs interfaced with scales.

The discussion focused on two different issues.

Part 1. Some of the Sector members (both manufactures and participating laboratories) indicated that a zero condition was adequately represented by scrolling messages or other non-weight information; and a label defining the zero indication is not required provided that there are automatic means for the scale to return to an active weighing mode when the scale is in a non zero condition. The NIST Technical Advisor and other sector members agreed that that adequate customer protection was provided. However, the customer does not know what the scrolling messages in place of the weight information (other than a digital zero indication) represents. The Sector members referred to the 1993 Report of the 78th NCWM (S&T Item 320-1), which discussed the need for a descriptive label as required by General Code paragraph G-S.6. Marking Operational Controls, Indications, and Features.

Part 2. In the case of electronic cash registers (ECRs) interfaced with scales, the issue the Sector considered was whether or not the act of logging onto the ECR was considered adequate operator intervention in order to verify the zero condition of the scale prior to a new transaction without requiring a descriptive label. Two versions of the "ECRs Interfaced with Scales" checklist were submitted to the sector. The proposals differed in that version 1 allows the customer to put a load on the scale and then, the operator must log on and check the zero condition of the system (the POS system does not have to label and define the screen saver/sleep mode as zero). Version 2 requires the system to be labeled that the screen saver/sleep mode represents a zero indication; or that the system be interlocked from weighing until a digital zero has been displayed to the customer and operator.

During the discussion of part 2, one of the participating laboratories reported that field inspectors have observed that operators were logging onto ECRs with an operational sleep/screen saver where items were already on the scale. The operators were not checking the zero condition of the scale and proceeded with the transaction.

One of the ECR manufacturers stated that there is a problem with current Publication 14 language and that there are inconsistencies among the participating laboratories. Additionally, after-market modifications are being made to the way the scale display is represented on ECRs. This is a metrological change to the system (and should require a version change) that is frequently not submitted for evaluation or detected by the field official during subsequent testing. Jurisdictions are experiencing problems with minor inconsistencies. Additionally it is aggravating and costly for manufacturers to compete with others that do not comply. The manufacturer also noted that there is a problem with "screen saver" terminology.

Conclusion:

Part 1. The Sector voted on the following:

> Should an indication other than a digital zero be considered a form of zero indication without defining it on the device?
>
> The results were; 1 yes vote (yes this is okay), 15 no votes (this is not okay), and 3 abstaining votes.

Part 2. There was general support of version 2 and little support for version 1 in the attachment for sector item 11. The Sector agreed not to include the proposed language in version 2 because: (1) the proposed language is nearly identical to the language recommended for the DES checklist; (2) it has the same requirements; and (3) the introduction to the ECRs Interfaced with Scale states that ECR checklist is a supplement to the DES checklist. Additionally, the participating laboratories will continue to develop a proposal for reporting size of the weight display, its location, and weight information area on Certificates of Conformance for consideration during the 2003 meeting of the Weighing Sector.

The Sector recommends the following amendments to Publication 14, Chapter 1, Digital Electronic Scales (DES), Section 11. Additionally, the NIST Technical Advisor recommends an additional statement be added to Publication 14, Chapter

6, ECRs Interfaced with Scales, Section 8, Indicating and Recording Elements informing applicants and participating laboratories to refer to Publication 14, Chapter 1 DES for applicable requirement and test procedures for ECRs and systems that provide the only representation of the primary weight indication.

11. Indicating and Recording Elements - General (DES-33)

Code Reference: G-S.5.1., G-S.2., G-S.6., S.1.1., and S.1.12.

11.8.4. ~~When in the "sleep" or "screen saver" mode the zero indication must be defined.~~ Does the scale or indicating element have a screen saver, sleep mode or power save feature?

Yes ☐ No ☐

Note: *Other than a continuous zero indication may be used to indicate zero; however, some indication must be used and the indication must be clearly defined. For example, when in the sleep mode, a scale may display dashes while at zero.* ~~*In this case, a legend must be included adjacent to the display to indicate that the dashes in display indicates the scale is on zero (See also Code Reference S.1.1. Zero Indication).*~~

Manufacturers have been adding screen savers and sleep modes to scales for the purpose of prolonging the useful life of displays or provide promotional or other information on displays during periods of scale inactivity.

Additionally, some scales have automatic shut-off, or power (battery) save modes. These features promote energy conservation or prolong battery life in battery-operated scales. This feature either automatically turns off the scale after a period of inactivity or only turns off the display. If the power or battery save mode only turns off the display to save power, the feature is considered to be a sleep mode and should be evaluated using the screen saver/sleep mode criteria.

The function of a screen saver, sleep mode and power save feature can be metrologically significant because zero information may not be available to the customer and operator at the start of a transaction.

NIST Handbook 44 Scales Code paragraph S.1.1. (c) Zero Indication. states that the zero-balance condition can be indicated by other than a continuous digital zero indication provided that effective 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.

The zero indication must be defined if the zero condition of the scale is represented by other than a digital representation. In this case, a legend must be included as part of, or adjacent to the display to indicate that indications other than a digital zero (e.g. dashes in display or other indications such as scrolling messages) indicate the scale is on zero (See also General Code Reference G-S.6. Marking Operational Controls, Indications, and Features).

The following are examples of acceptable screen saver/sleep mode operations. Checks the method(s) used by the scale or describe the screen saver, sleep mode, or power save feature operation if it is not one of the examples listed below.

- The primary weight indication is continuously displayed while in the screen saver/sleep mode.
- A clearly defined zero annunciator that is active only when the scale is in a zero gross load condition.
- Activation of the sleep or battery/power save mode turns off the scale requiring the operator to turn on the scale before a weighing operation can be performed.
- Activation of the sleep or battery/power save mode only turns off the primary weight display or the primary weight display is replaced by scrolling messages or dashes. The method of indicating a zero balance condition must be clearly defined as the zero indication as required by General Code paragraph G.S.6. Marking Operational Controls, Indications, and Features. The legend must state, "scrolling messages indicates scale is at zero" or similar statement.

If the scale goes off of zero, the scale must either:

- ❑ return to the active weight display, or
- ❑ prevent the initiation of a weighing transaction until the scale has returned to a digital zero indication.
- ❑ _____

At least one of the following methods in 11.8.4.1. through 11.8.4.3. must be used to determine screen saver/sleep mode compliance.

11.8.4.1. The scale shall not enter the screen saver/sleep mode when the scale is at other than a zero load condition unless the scale is automatically powered off. **Yes** ☐ **No** ☐ **NA** ☐

To verify that power has been turned off during the sleep mode, apply a test load on the scale and monitor the condition of the display until the screen saver/sleep mode is enabled and the display goes blank. Changing the load on the scale and depressing operator or customer-operated keys cannot activate the display.

Turned the scale back on with the power switch/button weight on the scale, the scale must return to zero, or display an error code or other meaningless information.

As soon as the scale is ready to weigh, check the "warm-up" accuracy of the scale by placing a test load of one-half scale capacity (or maximum available weight if one-half capacity is not available). The weight indication shall be within applicable tolerance. **Yes** ☐ **No** ☐ **NA** ☐

11.8.4.2. If the primary weight display disappears in the screen saver/sleep mode with the scale at zero and the power to the scale is not automatically shut off, the display must comply with a or b below:

(a) The zero indication or zero annunciator must be displayed, or defined if zero is indicated by other than a digital zero indication or annunciator. **Yes** ☐ **No** ☐ **NA** ☐

If a legend is used to define zero, it must be included adjacent to the display to indicate that the information (dashes, scrolling message, and etc.) indicate the scale is on zero. **Yes** ☐ **No** ☐ **NA** ☐

The screen saver/sleep mode shall be deactivated and the continuous weight display automatically returns under the following conditions unless means are provided to inhibit a weighing transaction until the scale has returned to a digital zero indication: **Yes** ☐ **No** ☐ **NA** ☐

The scale drifts above zero **Yes** ☐ **No** ☐ **NA** ☐
Weight is added to the scale **Yes** ☐ **No** ☐ **NA** ☐
The scale drifts below zero **Yes** ☐ **No** ☐ **NA** ☐
The scale is in an overcapacity condition. **Yes** ☐ **No** ☐ **NA** ☐

(b) Means are provided to inhibit a weighing transaction until the operator has returned the scale to a digital zero indication. **Yes** ☐ **No** ☐ **NA** ☐

8. Indicating and Recording Elements - General (page ECRS-10)

Code Reference: G-S.5.1., G-S.2., and S.1.12.

A point-of-sale (POS) system shall be designed to provide clear, definite, and adequate indications. Its features and operations shall be designed so that they minimize the potential of both intentional or unintentional errors. The price-look-up (PLU) capability shall prevent the interaction of weight and nonweight PLUs, (e.g., weight-related PLUs must require a weight input and nonweight PLUs shall not respond to weight input). Manual weight entries are permitted only under specific conditions. Transaction information shall not be lost or unrecorded in the event of a power failure.

Computing scales that have both the multiple sales accumulation capability and price-look-up capability that can operate simultaneously are considered to be electronic cash registers. These systems shall issue sales receipt tapes that are similar to those issued by cash registers. If the total prices computed using PLUs cannot be included in the sales accumulation capability, the scale is not required to issue a cash register receipt.

An increasing number of POS system manufacturers and distributors have been replacing the primary gross weight indication provided by the POS scale (either built into the scale or a pedestal mounted display) with a primary and continuous gross weight indication included as part of the customer display provided by the POS manufacturer or distributor. The primary and continuous weigh indications, that are the only source of the primary gross weight information, are considered primary indicating elements and shall be evaluated according to Publication 14, Chapter 1, Digital Electronic Scales.

Paragraphs 8.1. through 8.9. remain unchanged.

12. NTEP Evaluations and User Requirements in the Scales Code

Source: Maryland NTEP Participating Laboratory

Background: There has been some recent discussion that NTEP should not be evaluating devices for user requirements.

At its 2001 meeting, the Sector recommended that Steve Cook, NIST Technical Advisor, and Stephen Patoray, NTEP Director, work together and review Publication 14 to verify that all checklist requirements and procedures are referenced to applicable Handbook 44 paragraphs. During the process of converting NCWM Publication 14 2000 edition from WordPerfect to MS Word, the NTEP Director and the NIST Technical Advisor corrected any remaining references to "User Requirements."

Recommendation: The NIST Technical Advisor and NTEP Director have deleted nearly all references to User Requirements and replaced them with appropriate references to Specifications, Tolerances, and Test Notes. No evaluation criteria were deleted. No further action was required on this item.

13. NTEP Technical Policy Publication 14 Section B.5.b. Change Platform Area to Length and Width

Source: 2001 Weighing Sector Item 22

Background: During a discussion of a proposal from the Maryland Participating Laboratory to change Publication 14 Section B.5.b. Weighing Systems, Scales, or Load-receiving elements of 30 000 lb or Less, the Sector asked the SMA technical committee to draft platform size criteria (for scales less than or equal to 30 000 lb) for capacities that are between the capacities submitted for evaluation. For example, if two scales are submitted for evaluation (a 3'x3', 2000 lb and a 8'x10', 10 000 lb), what are the platform size parameters that can accepted on the CC for intermediate capacities (8'x10', 2500 lb)?

Discussion/Conclusion: The participating Laboratories discussed this item prior to the sector meeting and agreed that the only way to interpret the existing guidelines is that any capacity not tested can be as large as the next higher capacity tested. The Sector concurred with the participating laboratories interpretation and reported that there have been no reported problems. The Sector agreed to recommend that Publication 14, Section B. Certificate of Conformance Parameters, guideline 7. Weighing Systems, Scales, or Load-Receiving Elements of 30 000 lb or Less be amended as

follows to clarify that in a family of scales, the next size larger or smaller of the device tested can be covered on the Certificate of Conformance provided they do not exceed the next size of device tested.

7. Weighing Systems, Scales Or Load-Receiving Elements Of 30 000 lb Capacity or Less

Note: When submitting a family of devices that has capacities above and below 30 000 lb, the average of the highest and lowest capacities listed on the application will be determined. If the average is at or below 30 000 lb, the guidelines in Section 7 will be used as the selection criteria. If the average is above 30 000 lb, the guidelines in Section 8 will be used as the selection criteria. Scale families that are evaluated under Section 7 guidelines cannot extend the maximum capacity of the family without further evaluation. The applicant may request that Section 8 criteria be applied to take advantage of the 50 % to 135 % capacity range (8.1.a.) provided all other requirements of Sections 8 and 8.1 are met. The applicant should be aware of the differences in the selection criteria and what can be covered on the Certificate of Conformance based upon the applicable criteria.

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

a. the lowest capacity and the highest capacity[1]
b. the largest platform area for each of the capacities submitted
c. the most resolution (highest number of scale divisions)
d. the smallest scale division value (d).

A CC will apply to all models that:

a. are within the range of capacities,
b. have platform areas up to but not larger than that evaluated at each capacity, with lengths or widths no greater than 125 % of either dimension tested (i.e. If a 5' x 5' scale is tested and passes evaluation, then a 6' x 4' scale could be included on the CC. A 3' x 8' scale could not be included without additional testing),
   ~~i. have platform areas for intermediate capacities not submitted for evaluation up to but not larger than the next higher capacity submitted for evaluation, (i.e. If a 2000 lb 3' x 3' and 10 000 lb 8' x 10' scales were submitted for evaluation, then the CC would cover a 3000 lb capacity scale a platform area up to 80 ft^2).~~
c. have platform areas *for intermediate capacities not submitted for evaluation* down to but no smaller than the next lower capacity submitted for evaluation and no larger than the next higher capacity submitted (i.e. If a 2000 lb 3' x 3', 10 000 lb 8' x 10' and a 25 000 lb 12' x 12' scales were submitted for evaluation, then the CC would cover a 5000 lb capacity scale with a platform area down to 9 ft^2 and up to 80 ft^2),
~~e~~d. have the same number of scale divisions or fewer,
~~d~~e. are within the range of the values of the scale division,
   ~~e~~f. have a platform construction with material similar to that of the equipment evaluated.

New Items

14. Publication 14 Changes to Reflect NCWM Changes to Handbook 44, 2003 Edition

Source: NIST WMD (formerly OWM)

Background: The following items (a to c) represent amendments to NIST Handbook 44 requirements based on changes accepted at the July 2002 NCWM Annual Meeting. Recommendations from the Sector will be submitted to the NTEP Committee for consideration to amend NCWM Publication 14 Technical Policy, Checklists, and Test Procedures.

14.(a). Examples of Manufactured, Repaired, and Remanufactures Devices and Elements

Background: During its 2002 Annual Meeting, the NCWM agreed that the examples of manufactured, repaired, and remanufactured devices and elements be posted on the NCWM or NIST websites for review and comment. The NCWM agreed with the S&T Committee's recommendation that new examples of these devices not currently listed be reviewed by the appropriate NTETC Sector for a recommendation on whether the device needs supplemental markings indicating that it has been remanufactured or that the repair or remanufacture results in a device that is no longer covered by its CC. If the Sector determines that the example results in a device no longer covered by a CC, then the Sector will provide the NTEP Committee references to existing Publication 14 technical policies or technical justification and suggested language to amend existing policies.

Recommendation/Conclusion: The Sector recommended no further action on this item.

14.(b). Definition of "Element"

Background: At its 2002 Annual Meeting, the NCWM adopted the following definition of "element."

> **element. A portion of a weighing or measuring device or system which performs a specific function and can be separated, evaluated separately, and is subject to specified full or partial error limits**.

Recommendation/Conclusion: The Sector agreed that the definition appears to be consistent with existing references to element in NCWM Publication 14 and recommended no further action on this item.

14.(c). S.6.5. Livestock Scales, Nominal Capacity and Marking Requirements

Background: At its 2002 Annual Meeting, the NCWM adopted the following new paragraph for the determination of the nominal capacity and marking requirements for livestock scales manufactured after January 1, 2003.

> ***S.6.5. Livestock Scales. - A livestock scale shall be marked with the maximum capacity of each section of the load-receiving element of the scale. Such marking shall be accurately and conspicuously presented on, or adjacent to, the identification or nomenclature plate that is attached to the indicating element of the scale. The nominal capacity of a scale with more than two sections shall not exceed twice its rated section capacity. The nominal capacity of a two-section scale shall not exceed its rated section capacity*.***
> ****Nonretroactive as of January 1, 2003]***

Recommendation/Conclusion: The Sector reviewed the proposed language developed by the NIST Technical Advisor and agreed to delete the terms "vehicle scale used as livestock scales." The Sector further recommended that NCWM Publication 14, Chapter 1, Section 5 and Section 64 be amended as follows:

Page DES-22 Section 5

5. Marking - Livestock, Vehicle, and Railway Track Scales

Code References: S.6., S.6.5., Table S.6.3.a., and Table S.6.3.b.

5.1.	The section capacity of ~~a~~ railway track and livestock scales shall be marked on or adjacent to the identification badge on the indicating element.	**Yes** ☐ **No** ☐ **NA** ☐
5.2.	~~A v~~Vehicle~~,~~ or axle-load~~, or livestock~~ scales shall be marked with the concentrated load capacity of the scale. Such marking shall be identified as "concentrated load capacity" or by the abbreviation "CLC" and shall be accurately and conspicuously shown:	**Yes** ☐ **No** ☐ **NA** ☐
5.2.1.	On, or adjacent to, the identification or nomenclature plate that is attached to the indicating element of the scale; and	**Yes** ☐ **No** ☐ **NA** ☐

5.2.2. On the load-receiving element of the scale. These capacity markings shall be added to the load-receiving element of any such scale not previously marked at the time of modification. **Yes** ☐ **No** ☐ **NA** ☐

~~5.3. If a vehicle scale is marked with maximum load ratings in addition to the required CLC, the ratings shall not exceed the maximum specified in UR.3.2.1. below and the accompanying table.~~ ~~**Yes** ☐ **No** ☐ **NA** ☐~~

5.3. ~~5.4.~~ The marked nominal capacity on all vehicle~~,~~ and axle-load~~, and livestock~~ scales shall not exceed the concentrated load capacity times the quantity of the number of sections in the scale minus 0.5. **Yes** ☐ **No** ☐ **NA** ☐

5.4 ~~5.5~~ Combination railway track/vehicle, and combination vehicle/livestock scales shall be marked with (1) the nominal capacity and CLC for vehicle weighing, and (2) the nominal capacity and section capacity for railway and livestock weighing. The e_{min} for both vehicle weighing and railway weighing shall also be marked. **Yes** ☐ **No** ☐ **NA** ☐

Note: Combination scales (railway track /vehicle, and vehicle/livestock) shall be marked with all required information.

Page DES-25 Section 5 Marking - Livestock, Vehicle and Railway Track Scale. Delete Table UR.3.2.1. Span Maximum Load (references a User Requirement)

Page DES-84 Section 64 Performance and Permanence Tests for Livestock Scales

64. Performance and Permanence Tests for Livestock Scales

64.1. Initial Type Evaluation (Field) Performance Tests

64.1.1. Performance Tests for Livestock Scales with 2 Sections:

64.1.1.1. Conduct two sets of increasing load and shift tests over each corner at 1/4 the nominal capacity of the scale. Be careful not to exceed the ~~CLC~~ section capacity of a section when loading the weights. Record increasing/decreasing load indications as you add weights to or remove weights from the platform in at least five equal intervals. For the first set, perform this test on each corner and check zero balance before going on to the next corner. For the second set, complete the increasing load build up on one corner and move the weights to the next corner without unloading the scale. For each set when all the weights have been removed, record the return to zero. The scale must return to zero within one-half of a scale division. When analyzing the return to zero, consider the length of time the load was on the scale and for possible temperature changes that may have occurred during the test. Next, conduct an increasing/decreasing load test to the scale nominal capacity or at least to the used capacity by distributing the test load over the platform in at least five equal intervals and record the error for each interval.

64.1.2. Performance Tests for Livestock Scales with More than 2 Sections:

64.1.2.1. At least two complete sets of shift tests shall be conducted over each section. This is to determine the repeatability of the scale. Each set must include determination of error at a minimum of five intervals of test loads up to 90 % of the ~~CLC~~section capacity repeated over each section. For the first set, perform this test on each section, unloading the weights and checking zero balance before going on to the next section. For the second set, complete the increasing load build-up on one section and move the weights to the next section without unloading the scale. Take several readings as the weights are being removed. When all the weights have been removed, record the return to zero. The scale must return to zero within one-half of a scale

division. When analyzing the return to zero, consider the length of time the load was on the scale and for possible temperature changes that may have occurred during the test. Determine scale errors at more points if desired. Avoid decreasing load tests when testing a section. Next, conduct an increasing load test to the scale nominal capacity or at least to the used capacity by distributing the test load over the platform in at least five intervals and record the error for each interval. Be careful not to exceed the ~~CLC~~section capacity or a section when loading the weights and distribute loads across the section. Record decreasing load indications as you remove weights from the platform in at least five intervals.

Conduct decreasing load tests after the sections have been tested to their maximum load and the weights are removed from the scale.

Note: Decreasing load tests only apply to automatic indicating devices.

64.1.3. At least one complete set of shift tests to at least 90 % of the ~~CLC~~ section capacity shall be conducted at mid-span between sections.

64.3. Permanence Test Minimum Use Requirements

64.3.3. For livestock scales with a nominal capacity over 75 000 lb:

64.3.3.1. 50 % of the loads must be above 50 000 lb or 80 % of the ~~CLC~~section capacity, whichever is greater; and

64.3.3.2. 100 % of the loads must be above 20 000 lb or 50 % of the ~~CLC~~section capacity, whichever is greater.

64.3.4. For all other scales:

64.3.4.1. 50 % of the loads must be above 50 % of the scale capacity; and

64.3.4.2. 100 % of the loads must be above 20 % of the scale capacity.

64.3.5. The minimum number of days that a device is required to be in use is 20 days. A minimum number of weighing operations to be conducted each day for the test period is not specified; however, the weighments should represent the scale's normal in-service use.

64.3.6. The device will be tested to at least the ~~CLC~~ section capacity on the second test.

Note: Substitution or strain test methods are acceptable as long as all conditions above are met.

15. Publication 14, Incorporation of OIML R 60 with Exceptions

Source: NTEP Committee

Background: In view of the increased interest for bilateral and mutual recognition of test data agreements, it has been suggested to the NCWM NTEP Committee and the Board of Directors that the incorporation of OIML R 60 Edition 2000 (E) Metrological Regulation for Load Cells into Publication 14 would be a logical step towards these agreements. There are a very few NIST Handbook 44 references to load cells. Therefore, few changes would be necessary to make OIML R 60 compatible with Handbook 44. The load cell test facilities at the NIST Force Group have already demonstrated that they can generate internationally accepted test data. The Force Group also has the ability to test for changes in barometric pressure.

For load cells without electronics (analog load cells), the major differences that must be addressed are:

1. There is an extra tolerance step (Table 2, page LC-3) currently in Publication 14 that is supported by Handbook 44 tolerances for scales. Harmonization would likely require a change to Handbook 44 to support the application of OIML R 60 tolerances.
2. One-hour time dependence test in Publication 14 is not compatible with the OIML R 60 30-minute Creep Test. This may also require a change to Handbook 44 paragraph T.N.4.5. Time Dependence (either as separate language for load cells or as an amendment to the one-hour time requirement to more closely align with R 76 and R 50).
3. There is no equivalent Accuracy Class III L in OIML R 60. This may have to remain in Publication 14 as an exception.
4. Accuracy class marking requirements (A, B, C, D) in OIML R 60. This may also require a change in NIST Handbook 44 (for load cells manufactured after January 1, 200X).
5. Humidity markings and testing in OIML R 60 would require a change in Handbook 44 to support marking and testing of load cells for humidity.

Other differences include the selection criteria for the load cell to be submitted for test and is described on page 16 and Annex B in OIML R 60.

The NIST Technical Advisor is not aware of any discussions regarding the testing of load cells with electronics (digital load cells). Additional OIML R 60 testing includes tests for warm-up time, power supply variations, short-term power reductions, bursts, electrostatic discharge, electromagnetic susceptibility, and span stability.

Recommendation/Conclusion: The Sector discussed the above recommendations. The NTEP Director provided additional background information and indicated that no changes need to be made to Handbook 44 because load cell certificates are based upon data evaluation and the same data can be used to verify compliance with Handbook 44 and OIML R 60. Darrell Tonini stated that he would bring this subject up to the Scale Manufacturers Association Technical Committee and refer their comments to the NTEP Director.

The Sector recommends no action on this item.

16. Vehicle Scale Testing Procedures

Source: NTEP Participating Laboratories

Background: At the 2002 Participating Laboratory Meeting, the various labs demonstrated the procedures used to test vehicle scales. The exercise demonstrated that the participating labs were correctly testing the scales. However the language in the current procedures may cause an evaluator to conduct additional testing. The NTEP Participating Laboratories have amended the existing vehicle scale test procedure that offers additional clarity to the procedures and promotes the uniform application of test weights and test loads.

Discussion: The Sector reviewed and discussed the two proposals to amend the vehicle scale test procedures. The procedures are included with the attachment for Agenda Item 16.

The first proposal breaks up the long paragraphs in Publication 14, 2002 Edition vehicle scale test procedures in (hopefully) easier to follow steps. The second proposal is included in a letter from Ross Anderson, NY, describing the vehicle test procedures that include the steps in a table format and describes test weights and weight cart positions and usage. Ross Anderson will present additional proposed language, at the Sector meeting. The Sector also reviewed a Power Point presentation developed by Ross Anderson. Additionally, the Sector reviewed information provided by the Ohio participating laboratory for possible Checklist Items and Test Report Forms.

The Maryland participating laboratory indicated that section 65.a.3.1.(a) is confusing and recommended deleting the last half of the paragraph.

The manufacturers were concerned about conducting a 5-point increasing load test in conjunction with the shift test. For scales with a large concentrated load capacity rating, this represents a lot of weight on the scale for a long lime and increases the possibility of a zero change due to creep. It was pointed out that Publication 14 recognizes that consideration must be given for the length of time the load was on the scale and possible temperature changes that may

have occurred during the test. *(The NIST Technical Advisor noted the above consideration is located in Section 65a.4.5. Strain Load Test and will add a similar statement to Section 65a.3. Shift Tests in the list of recommended editorial changes to the 2003 Edition of Publication 14.)*

It was noted that the basic differences between the two proposals is that the proposal from Ross Andersen includes the 5-step increasing and decreasing load while conducting the strain test. Publication 14, as written in Section 65a.4., does not include the 5-step increasing load test as part of the strain test.

The discussion shifted to the concern raised in the Ross Andersen proposal regarding the use of weight carts because the position of the fully loaded carts would place a large load in an area of the deck that is smaller than the typical truck wheel span.

Many of the manufacturers indicated that there was no problem with using weight carts in this manner. The maximum amount of weight down the centerline of the scale using typical weight carts would be 20 000 lb to 30 000 lb. The manufactures have a greater concern with placing weight carts end to end thereby increasing the test pattern, which results in an inadequate test to the CLC rating of the scale.

The participating laboratories indicated that applicants should be made aware of the test equipment provided by the labs selected to conduct the evaluation. Applicants are already responsible for providing additional weights and equipment necessary to conduct the evaluation. If the applicant is concerned about the use of weight carts, then they should be responsible for providing adequate test weights and equipment.

Conclusion: This subject will be carried over to the next meetings of the NTEP Participating Laboratories and the NTETC Weighing Sector for further clarification of the strain load test procedures and how to respond to changes to zero when a test load is on the scale for an extended period of time.

The Sector agreed to support the proposal developed by the participating laboratories with the clarification recommended by the Maryland participating laboratory and recommends the following amendments to Publication 14, Chapter 1, Section 65(a)3.1. through 65(a).3.3. (page DES-86):

65a.3.1. Shift Tests. Conduct at least two complete sets of shift tests over each section to at least 90 % of the rated concentrated load capacity (CLC) of the scale. ~~This is to determine the repeatability of the scale. Determine the scale error at a minimum of five equally spaced test loads. Determine scale errors more points if desired. If two weight carts are used, they should travel along the paths the wheels of a vehicle would take when moving across the scale. Decreasing load tests are to be avoided when testing a section. Do not back a truck onto the scale in order to place weights on the inner sections. Conduct decreasing load tests after testing the sections to their maximum load and remove the weights from the scale. Do not exceed the CLC capacity. Distribute the load across the section.~~ A single complete shift test is defined in steps a through d. When analyzing the return to zero, consideration must be given for the length of time the load was on the scale and possible temperature changes that may have occurred during the test.

a. The shift test will be conducted by loading one end section to the first of at least five test loads, moving the load to each section.

b. Record the error moving the load to each section until the opposite end of the scale is reached, recording the error at each section and at each load.

c. ~~d.~~ Repeat the shift test procedure above in steps a, and b above for each weight increment until at least 90 % of the CLC is reached. While at the maximum test load, locate the test weights and record the errors at each section, mid-span between sections, and on modular scales, each on the right and left side of the module connection line located at each section.

d. ~~e.~~ Conduct a decreasing load lest on the section at the end of the scale where the weights can be reloaded.

(**Note**) If possible, the first increment of test weights should equal 500e. If weights cannot be conveniently applied that equal 500e, the first load should equal just below 500e as nearly as possible. The other tolerance breakpoints should be tested if possible.

~~65a.3.3. If a scale consists of modules that are connected together to comprise the weighbridge, conduct shift tests by placing the load so that it straddles the connection between the modules. Later, conduct at least one shift test on the scale with the test load placed first on one side of the connection line off the module then on the other side of the connection line.~~

~~65a.3.4. The results of shift tests must agree within the absolute value of the applicable maintenance tolerances and must be within acceptance tolerances~~

65a.4. Strain Load Test . . . .

17. Publication 14, Section 7, Footnote 1 on DES-3

Source: NTEP Participating Laboratories

Background: In footnote for Publication 14, Section 7 the phrase "narrow range" is confusing and facilitates different interpretations of device selection criteria. The current location of the footnote in (a) makes it impossible to comply with (d) without having to submit a second device. Additionally, there is a problem with the interpretation of the language in the footnote. Is the capacity in the middle of the 2:1 range of capacities submitted for test defined as a narrow range or is a narrow range defined as a 4:1 range of capacities? If the range is 50, 100, and 200, do you test the 100. If the range is only 2:1, which scale is tested, the 100 or the 200? – Footnote is useless or does the footnote supersede the specific requirements in d?

Discussion: There were several suggestions to delete the footnote. However, it was noted that the problem of narrow range families of scales still existed. One of the manufactures suggested establishing upper limits to the range of capacities in defining a family of scales similar to what they have experienced with other countries in addition to better defining what is considered a narrow range and suggested the ratio of capacities be limited to 10:1 when defining the limits to a range of capacities.

There were also concerns among the participating laboratories about eliminating the requirements for testing smallest division size (e_{min}) and largest capacity for families with a narrow range. Many of the Sector members stated that it is not technically correct to test a single device with two different capacities and e_{min} values because it was likely the manufacturer would use different load cells and strengths of steel for the different scales.

The Sector requested that the NTEP Director and NIST Technical Advisor develop criteria and examples to clarify the existing language. The criteria and examples were developed overnight and reviewed the next day. The guidelines established that the highest and lowest capacities must be submitted for evaluation if the range of capacities in the family is 10:1 or less. Additional capacities must be submitted if the range is wider than 10:1. A narrow range is defined as a 2:1 range of capacities. Only one device is required for evaluation if conditions 7(b), 7(c), and 7(d) are met; otherwise, two devices shall be submitted. There was general agreement on the amended criteria, footnotes and examples.

Conclusion: The Sector recommended that Publication 14, Chapter 1, Technical Policies B7 for Weighing Systems, Scales, or Load-Receiving elements of 30 000 lb or Less be amended as follows:

7. Weighing Systems, Scales or ~~Weighing~~ Load-Receiving Elements of 30 000 lb Capacity or Less

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

a. The lowest capacity and the highest capacity[1]

[1] For the family, the range of capacities from lowest to highest shall not exceed a 10:1 ratio. To cover a wider range of capacities additional devices in the family will be tested. If the range of capacities is quite narrow and is a ration of less than or equal to 2:1, it ***may*** be that only one device near the mid-range needs to be submitted. For example, a family of scales with a narrow range of capacities from 500 lb to 1000 lb, the manufacturer could submit one model near the

b. The largest platform area for each of the capacities submitted
c. The most resolution (highest number of scale divisions)
d. The smallest scale division value (d).

[1] ~~If the range of capacities is quite narrow (e.g., 50 lb, 100 lb, and 200 lb) and is a ratio of less than or equal to 2:1, it may be that only a device near mid range needs to be submitted. If the range of capacities is extremely wide (e.g., 10 lb to 10 000), it may be necessary that a device near mid range also be submitted.~~

~~Example: For a family of scales with a range of capacities from 500 lb to 999 lb, the manufacturer could submit one model with a capacity of 750 lb. If the 750 lb model successfully passed full evaluation, the entire family could be covered by the CC. If the range for a family included capacities from 10 lb to 100 lb, the manufacturer would be required to submit three devices. The devices required to be submitted for evaluation would include the highest and lowest capacity as well as one near mid range.~~

For the family, the range of capacities from lowest to highest shall not exceed a 10:1 ratio. To cover a wider range of capacities additional devices in the family will be tested. If the range of capacities is quite narrow and is a ratio of less than or equal to 2:1, it ***may*** be that only one device near the mid-range needs to be submitted. For example, a family of scales with a narrow range of capacities from 500 lb to 1000 lb, the manufacturer could submit one model near the midrange with a capacity of 750 lb. If no midrange device is available, the largest capacity device ***may*** be evaluated. In all cases, requirements found in items b. c. and d. must be met.

Examples: for a family from 10 lb to 100 lb, a 10 lb and a 100 lb would be evaluated
for a family from 10 lb to 1000 lb, a 10 lb, a 100 lb and a 1000 lb device would be evaluated
for a family of 30 x 0.01 lb and 50 x 0.01 lb, the 50 lb device would be evaluated
for a family of 30 x 0.01 lb and 50 x 0.02 lb, the 30 lb device would be evaluated
for a family of 15 x 0.005 lb and 30 x 0.01 lb, the 15 lb device would to be evaluated (meets b, c, & d)
for a family of 2500 x 0.5 lb and 5000 x 1 lb the 2500 lb device would be evaluated (meets b, c, & d)

7.2. A CC will apply to all models that:

18. Define Bench/Counter Scales

Source: NTEP Laboratories

Background: There is some confusion in the classification of bench/counter scales and floor scales and the location of test load while performing a shift test. Bench and counter scale shift tests are conducted with a half capacity test load centered successively at four points equidistant between the center and the front, left, back and the right edges of the load-receiving element (N.1.3.1.). Shift tests on other platform scales are conducted with a one-half capacity test load centered, as nearly as possible, successively at the center of each quadrant. Additionally, manufacturers frequently design a family of scales that can be used on a bench or on the floor. Automatic zero setting mechanism requirements are different based upon the classification of the scale. Bench or counter scales have an automatic zero-setting mechanism (AZSM) limitation of 0.6 e where "other than bench or counter" scales have an AZSM limitation of 1.0 e.

Discussion: The Sector considered amending the current definition of a counter scale that limits the capacity or recognize the differences in the test pattern based upon the number of load bearing points and Handbook 44 shift test paragraphs as shown below: (Note: If it is determined that a capacity limitation is suitable for the definition, the Canadian Technical Advisor would prefer that 100 kg (200 lb) be the limit between bench and floor scale.)

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midrange with a capacity of 750 lb. If no midrange device is available, the largest capacity device ***may*** be evaluated. In all cases, requirements found in the items b. c. and d. must be met.

Examples: for a family from 10 lb to 100 lb, a 10 lb and a 100 lb would be evaluated
for a family from 10 lb to 1000 lb, a 10 lb, a 100 lb, and a 1000 lb device would be evaluated
for a family of 30 x 0.01 lb and 50 x 0.01 lb, the 50 lb device would be evaluated
for a family of 30 x 0.01 lb and 50 x 0.02 lb, the 30 lb device would be evaluated
for a family of 15 x 0.005 lb and 30 x 0.01 lb, the 15 lb device would be evaluated (meets b., c., & d.)
for a family of 2500 x 0.5 lb and 5000 x 1 lb, the 2500 lb device would be evaluated (meets b., c., & d.)

counter scale. One that, by reason of its size, arrangement of parts, and ~~moderate~~ nominal capacity no greater than 100 kg (200 lb), is adapted for use on a counter or bench. Sometimes called "Bench scale" [2.20] (***Note:*** *There are single load cell load-receiving elements up to 600 lb capacities and there are four load cell load-receiving elements down to at least 25 lb capacities.*)

N.1.3.1. Bench or Counter Scales. – For bench or counter scales with a single platform support, a ~~A~~ shift test shall be conducted with a half capacity test load centered successively at four points equidistant between the center and the front, left, back, and right edges of the load-receiving element. Bench or counter scales with four platform supports, a shift test shall be conducted with a half-capacity test load centered, as nearly as possible, successively at the center of each quarter of the load receiving element, or with a quarter-capacity test load centered, as nearly as possible, successively over each main load support.

N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers. - For all scales with four platform supports, a ~~A~~ shift test shall be conducted with a half-capacity test load centered, as nearly as possible, successively at the center of each quarter of the load-receiving element, or with a quarter-capacity test load centered, as nearly as possible, successively over each main load support. For scales with a single platform support, a ~~A~~ shift test shall be conducted with a half-capacity test load centered successively at four points equidistant between the center and the front, left, back, and right edges of the load-receiving element.

The Sector also considered the following alternative language submitted by Bill West and Darrell Flocken:

counter scale. A scale ~~One~~ that, by reason of its size, arrangement of its parts and moderate nominal capacity no larger than 200 lb (100 kg), is adapted for use on a counter, table, or bench,. Sometimes called a "bench scale". A counter scale will be a class III scale. [2.20]

floor scale. A scale designed to be placed on the floor or permanently installed in a pit. Nominal capacity will generally be larger than 200 lb (100 kg). Sometimes called a "platform scale". A floor scale may be either class III or III L, depending on the intended use, as long as all parameters for the intended class are met. [2.20]

The Sector also discussed the bench/counter scale terminology in NCWM Publication 14 2002 Edition, Section 62.3, Shift Test Procedures (page DES 77). The Sector agreed to remove the bench, counter and "other platform scale" terminology and conduct the shift test based upon the design of the scale (single load cell or more than one load support).

Further Sector discussions noted that the classification of bench/counter scales as floor scales has lead to confusion about where to place the test load when performing a shift test. Sometimes the same scale could be placed either on a counter or bench resulting in different shift test positions since paragraph N.1.3.1. describes test load positions for bench/counter that are different than the test load positions described in N.1.3.8. for other (platform) scales. Currently NIST Handbook 44 for bench/counter scale shift tests are conducted with a half capacity test load centered successively at four points equidistant between the center and the front, left, back and the right edges of the load-receiving element (paragraph N.1.3.1.). Shift tests on other types of platform scales are conducted with a one-half capacity test load centered, as nearly as possible, successively at the center of each quadrant. Additionally, manufacturers have indicated that it is an unfair test to place one-quarter scale capacity on the corners of a single load cell scale when compared to placing one-quarter scale capacity in the corners of a scale with four load supports.

Conclusion: The Sector agreed to submit a recommendation to the NCWM S&T Committee amending the definition of counter scales and paragraphs N.1.3.1. and N.1.3.8. as follows:

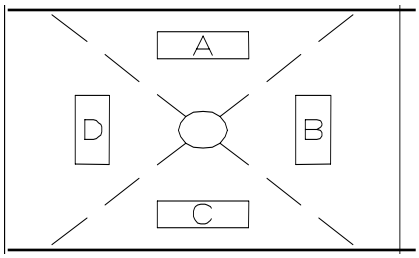
counter scale. ~~One that~~ A scale, that by reason of its size, arrangement of parts, and ~~moderate~~ nominal capacity no greater than 100 kg~~, is adapted for use on a counter or bench~~. Sometimes called "bench scale" [2.20]

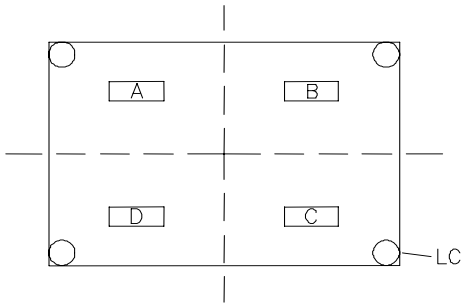
N.1.3.1. Bench or Counter Scales. – For bench and counter scales with a single platform support, a ~~A~~ shift test shall be conducted with a half capacity test load centered successively at four points equidistant between the center and the front, left, back, and right edges of the load-receiving element. For bench and counter scales with four platform supports, a shift test shall be conducted with a half-capacity test load centered, as nearly as possible, successively at the center of each quarter of the load receiving element, or with a quarter-capacity test load centered, as nearly as possible, successively over each main load support.

N.1.3.8. All Other Scales Except Crane Scales, Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers. - For all scales with four platform supports, a ~~A~~ shift test shall be conducted with a half-capacity test load centered, as nearly as possible, successively at the center of each quarter of the load-receiving element, or with a quarter-capacity test load centered, as nearly as possible, successively over each main load support. For scales with a single platform support, a ~~A~~ shift test shall be conducted with a half-capacity test load centered successively at four points equidistant between the center and the front, left, back, and right edges of the load-receiving element.

Additionally, the Sector recommends the following changes to NCWM Publication 14, Section 62.3, page DES-77 as follows:

~~**Bench, Counter or Hanging Scales**~~ ~~**Other Platform Scales**~~
~~(one single load cell)~~ ~~(More than one single load cell)~~
Platform Scales With One Single Load Cell **Platform Scales With More Than One Load Support**





19. Definitions of Hanging and Crane Scales

Source: NTEP Participating Laboratories

Background: It has been recognized that there are some inconsistencies in NIST Handbook 44 and NTEP Certificates of Conformance (CC) with reference to crane scales. Table 3 footnote 3 indicates that a crane scale can have a capacity as low as 500 lb. The only difference appears to be that hanging scales can only be installed where suspended from fixed supports and crane scales can only be installed in overhead track-mounted cranes. CCs have been issued with capacities of scales from 250 lb to 5000 lb, with both III and III L Accuracy Class designations, and both hanging and crane scale device classifications. The NIST Technical Advisor has observed large-capacity scales installed on overhead track-mounted cranes that can just as easily be installed on other types of cranes and supporting structures. The participating laboratories are of the opinion that the condition of the scale support (overhead crane, fixed support, etc.) should not be a factor in determining device type.

Discussion/Conclusion: The Sector agreed to make the following recommendation to the S&T Committee to remove the crane scale definition, define hanging scale, remove the reference to crane scale from Table 7a and paragraph N.1.3.8., and change remaining crane scales references to hanging scale in NIST Handbook 44:

Add a definition of hanging scale and remove the definition of crane scale, and amend Table 3 Parameters for Accuracy Classes footnote 3, paragraph N.1.3.8. and paragraph T.N.3.4., and Tables 7a and 7b as follows:

hanging scale. A scale designed to weigh loads while they are suspended from a hook on the scale or loads resting on a platter or platform that is suspended from the scale. Hanging scales may be any capacity and may be Class III or III L, whichever is appropriate for the intended use, as long as all parameters for the intended class are met. Sometimes called "crane scale."

~~crane scale. One with a nominal capacity of 5000 pounds or more designed to weigh loads while they are suspended freely from and overhead, track-mounted, crane. [2.20]~~

[3] The values of a scale division for ~~crane~~ Class III L hanging and hopper (other than grain hopper) scales shall not be less than 0.2 kg (0.5 lb). The minimum number of scale divisions shall be not less than 1000.

N.1.3.8. All Other Scales Except ~~Crane Scales,~~ Hanging Scales, Hopper Scales, Wheel-Load Weighers, and Portable Axle-Load Weighers.

T.N.3.4. ~~Crane~~ Class III L Hanging and Hopper (Other than Grain Hopper) Scales. – The maintenance and acceptance tolerances shall be as specified in T.N.3.1. and T.N. 3.2. for Class III L, except that the tolerance for ~~crane~~ Class III L hanging and construction materials hopper scales shall not be less than 1d or 0.1 % of the scale capacity, whichever is less.

Table 7a. Typical Class or Type of Device for Weighing Operations	
Class	Weighing Application or Scale Type
I	Precision laboratory weighing
II	Laboratory weighing, precious metals and gem weighing, grain test scales
III	All commercial weighing not otherwise specified, grain test scales, retail precious metals and semi-precious gem weighing, animal scales, postal scales, scales used to determine laundry charges, hanging, and vehicle on-board weighing systems
III L	Vehicle, axle-load, livestock, railway track scales, ~~crane~~hanging, hopper (other than grain hopper) scales, and vehicle on-board weighing systems
IIII	Wheel-load weighers and portable axle-load weighers used for highway weight enforcement
Note: A scale with a higher accuracy class than that specified as "typical" may be used. (Amended 1985, 1986, 1987, 1988, 1992, and 1995)	

Table 7b. Applicable to Devices not Marked With a Class Designation	
Scale Type or Design	Maximum Value of d
Retail Food Scales, 50-lb capacity and less	1 ounce
Animal Scales	1 pound
Grain Hopper Scales Capacity up to and incl. 50 000 lb Capacity over 50 000 lb	 10 pounds (not greater than 0.05 % of capacity) 20 pounds
~~Crane~~ Hanging Scales – Capacity 5000 lb and over	not greater than 0.2 % of capacity
Vehicle and Axle-Load Scales Used in Combination Capacity up to and including 200 000 lb Capacity over 200 000 lb	 20 pounds 50 pounds
Railway Track Scales With weighbeam Automatic indicating	 20 pounds 100 pounds
Scales with capacities greater than 500 lb except otherwise specified	0.1 % capacity (but not greater than 50 lb)
Wheel-Load Weighers	0.25 % capacity (but not greater than 50 lb)
Note: For scales not specified in this table, G-UR.1.1. and UR.1. apply. (Added 1985) (Amended 1989)	

20. List of Acceptable Abbreviations and Symbols

Source: New York Participating Laboratory

Background: The participating laboratories reviewed a document titled “General Letters, Symbols mathematical - statistical Symbols, and Markings for Legal Metrology” (German) provided by Darrell Flocken, Mettler-Toledo.

Previous sector meetings discussed the German (CECIP) list but decided that many of the symbols were not acceptable to the group.

Canada’s list is an interpretation of the existing statute, and items not on the list are not acceptable for viewing by the customer.

The NIST Technical Advisor has sent a copy of the document to the participating weighing labs for their suggestions of acceptable symbols and symbols that are not acceptable to be viewed by the customer.

The participating Measuring Device Laboratories are also concerned with the use of symbols. Where practical, proposed lists of symbols should be consistent among the Weighing Devices, Liquid Measuring Devices and other applicable sections in NCWM Publication 14.

Discussion/Conclusion: The participating laboratories reported that there has been no progress on this item. Darrell Tonini (SMA) reported that the SMA Technical Committee was working on a similar document that should be ready in time for the next meeting of the participating laboratories. The NIST Technical Advisor will distribute the SMA document as soon as it becomes available. The Sector Chairman requested that the participating laboratories review and comment on abbreviations in both documents and prepare a proposal for consideration prior to the 2003 meeting of the Weighing Sector. Examples of questionable symbols and abbreviations that are part of an active evaluation will be reviewed by participating laboratories and NTEP Director on a case-by-case basis for a determination of the acceptability of the symbol or abbreviation.

21. Shift Testing on Multi-Interval Scales

Source: Ohio Participating Laboratory

Background: Publication 14, Section 31, page DES-49 does not address shift tests on multi-interval scales. The participating laboratories have been taught to treat each range as a separate scale for the determination of tolerances. Publication 14 is unclear if shift tests for multi-interval devices should be conducted at one-half capacity of each weighing range where the shift test load might end up in the first range; or, if the shift test load should be determined based on the maximum capacity of the scale with the tolerance being based upon the weighing range of the test load.

The NIST Technical Advisor reviewed both OIML and Handbook 44 documents for references to shift tests. Neither document makes any special references to shift test for multi-interval scales.

OIML R 76 paragraph 3.6.2.1. Eccentric loading (page 25) states:

> 3.6.2.1. Unless otherwise specified hereafter, a load corresponding to one-third (1/3) of the sum of the maximum capacity and the corresponding maximum additive tare effect shall be applied." There are no additional references to eccentric loading with respect to multi-interval scales.

NIST Handbook 44 states:

> **N.1.3.1. Bench or Counter Scales.** - A shift test shall be conducted with a half-capacity test load centered successively at four points equidistant between the center and the front, left, back, and right edges of the load-receiving element.

Discussion: Some of the Sector members indicated that it is possible to have two test loads in the same range if testing is performed at ½ capacity of each range. Manufacturers also noted that multi-interval and multiple range scales should be treated differently because a multiple range scale with ***n*** ranges is essentially ***n*** number of scales (where ***n*** represents the number of ranges). A multi-interval scale with more than one minimum interval is still one scale. It is technically incorrect for Publication 14 to state that a multi-interval scale has ranges.

Conclusion: Darrell Flocken, Mettler-Toledo, volunteered to review US/Canadian training manuals to identify differences between U.S. and Canada. Additionally, they agreed to work with the NIST Technical Advisor in developing Publication 14 shift test procedures for multi-interval scales. The 2003 meetings of the participating laboratories and Weighing Sector will review the procedures.

22. Manual Multi-Interval Scale

Source: Ohio Participating Laboratory

Background: NCWM Publication 14, Chapter 1, Section 32, page DES-51discusses the performance of manual multi-interval scales. The participating laboratories, the NIST Technical Advisor, and the NTEP Director are unaware of any such devices and believe that the language has been carried over from earlier editions where manual multi-interval scales were redefined as multiple range scales.

Discussion/Conclusion: The manufacturers reported that no devices of this type are being manufactured. The NIST Technical Advisor reported that this section was drafted prior to the adoption of the current definitions of multi-interval and multiple range devices and that it was intended for scales and indicators that had a physical switch that toggled between two scales or one scale with different capacities and minimum increments. The Sector agreed to recommend that Publication 14 Section 32 Manual Multi-Interval Scales (page DES –52) be deleted.

23. Inconsistent Information on a CC

Source: Maryland Participating Laboratory

Background: It was noted that features and options both metrological and non-metrological are still being included on NTEP Certificates of Conformance (CCs). For example, screen tare should be defined if it is not a well-understood term and "memory recall" should describe what is stored in memory (e.g., tare, gross, net, weights, unit prices, customer information). Features on CCs that have not been successfully tested or evaluated should not be listed on the CC. It was also noted that it is important to list peripheral equipment in test conditions. This subject was discussed during the 1992 Weighing Sector (item 6) but never made it into the Pub 14. Section "Models" to be submitted.

The following is from the June 1992 Weighing Sector Agenda item 6:

6. Identifying the Main Elements of a Scale on Certificates of Conformance

Background and Discussion: It was proposed that CCs for Class III L scales should be written for complete scales (that is, list all of the main elements and components used during the evaluation) and that the CC should not be issued for just the weighing/load-receiving elements. It was also commented that the main elements and load cells used to comprise the complete system must be certified components.

NTEP issues separate CCs for main elements and load cells in order that the manufacturer, installer, and user will have the flexibility of choosing from among compatible main elements that have been evaluated by NTEP. It was stated that this substitution can only be made if information about the indicator used in the evaluation of the weighing/load-receiving element is known; this, along with the use of applicable formulas, would enable the customer and weights and measures official to judge whether or not a given indicator is compatible for substitution. This information has not been consistently identified on the CC in the past.

The primary area of concern with this issue appeared to be that of indicators (separable indicating elements) without NTEP CCs being used during NTEP evaluations of large-capacity weighing/load-receiving elements. It was commented that the load cell(s) used during an NTEP evaluation is (are) required to have a valid NTEP CC and that the indicator should also be required to have a valid CC. NTEP has not always required the indicator used during an NTEP evaluation of a weighing/load-receiving element to have a valid NTEP CC. If an indicator without an NTEP CC performed worse than an indicator with an NTEP CC, then the performance of the weighing/load-receiving element may not be as good. If the manufacturer is willing to risk the results of the evaluation by using a non-NTEP indicator, the NTEP laboratories feel that the manufacturer should be permitted to make this choice. It is expected that use of the weighing/load-receiving element with an indicator that has an NTEP CC (as would be required by the weights and measures official) should be better than the performance observed with the non-NTEP indicator.

Conclusions: **The Committee agreed that CCs should detail the main elements, load cells, and auxiliary devices used during an evaluation, including model designation and other significant parameters, under the "Test Conditions" portion of the CC. The Committee agreed that Certificates should not limit a scale system to the specific combination of load cell, indicator, and weighing/load-receiving element used during the type evaluation; substitutions ("mixing and matching") of metrologically equivalent components should continue to be recognized according to current NTEP policy. Each weights and measures jurisdiction should require that the individual main elements and load cells comprising a weighing system (the indicator, load cell(s), and weighing/load-receiving element) each have a valid NTEP CC and that the components are compatible and suitable for the installation. The Committee agreed that NTEP will continue to permit non-NTEP evaluated indicators and peripheral equipment to be used in the evaluation of a weighing/load-receiving element under certain conditions; however, the load cell used in electronic or electro-mechanical devices must have a current NTEP CC.**

Discussion/Conclusion: The Sector reviewed the above background information and agreed that the language in the conclusion of the June 1992 Sector Summary would benefit field inspectors and NTEP evaluators. The Sector reconfirmed that non-metrological accessories and peripheral equipment (printing elements, video displays, and etc.) used as part of the evaluation should be listed in the "Test Conditions" paragraph as verification that metrological features such as indicated and recorded representations have been evaluated. Additionally, the Sector reconfirmed that the CC does not limit the use of non-metrological peripheral equipment to those listed.

The Sector recommended that the following underlined language be added to the NTEP Publication 14 Administrative Procedures in paragraph P. Certificate of Conformance to facilitate consistent information included on the Certificate of Conformance.

> P.6. CCs should detail the main elements, load cells, and auxiliary devices used during an evaluation, including model designation and other significant parameters, under the "Test Conditions" portion of the CC. Only the standard features and options that have been evaluated will be included on the CC.

Technical Advisor Note: *The NTEP Committee considered the above recommendation during the 2003 NCWM Interim Meeting. The Committee did not agree with the Weighing Sector and stated that the recommended policy does not affect the administration of NTEP and should be considered as a technical policy. The Committee recommends the participating laboratories and Weighing Sector reconsider the item at their next meetings. The NIST Technical Advisor will submit the following addition to Publication 14., Chapter 1, NTEP Technical Policy for Scales for consideration by the participating laboratories during their next meeting:*

B. Certificate of Conformance Parameters (Page DES-1)

> Certificates of Conformance (CC) should detail the main elements, load cells, and auxiliary devices used during an evaluation, including model designation and other significant parameters, under the "Test Conditions" portion of the CC. Only the standard features and options that have been evaluated will be included on the CC.
>
> The following guidelines apply.

24. 85 to 240 VAC Voltage NTEP Submissions

Source: Maryland Participating Laboratory

Background: Handbook 44 paragraph T.N. 8.3.1. Power Supply, Voltage and Frequency currently states:

> **T.N.8.3.1. Power Supply, Voltage and Frequency.**
>
> (a) Weighing devices that operate using alternating current must perform within the conditions defined in paragraphs T.N.3. through T.N.7., inclusive, over the line voltage range of 100 V to 130 V or 200 V to 250 V rms as appropriate, and over the frequency range of 59.5 Hz to 60.5 Hz.

More devices are being submitted to NTEP for evaluation with larger ranges of voltages than those listed in the above paragraph. The Participating Laboratories reviewed language used for Canadian requirements. The consensus of the laboratories is to recommend the Canadian language to amend Handbook 44 paragraph T.N. 8.3.1. Power Supply, Voltage and Frequency. The following language has been submitted by Canada for review.

> **Maximum and minimum voltage specified**
>
> 1. If the nominal voltage is not indicated on the marking plate, 117 volts or 225 volts is deemed to be the nominal voltage. Then, the minimum and maximum voltages are 100 volts or 191 volts (-15 %) and 129 volts or 247.5 volts (+10 %) respectively.
>
> 2. If the marking plate indicates a nominal voltage other than 117 volts, the indicated voltage will be considered as the nominal voltage. The minimum and maximum voltage will be calculated from the **nominal voltage indicated on the plate.**

3. If a voltage range is indicated (i.e. 100 volts to 130 volts), the mid point of the range will be taken as the nominal voltage. The device will be tested to the greater of: 1) the **nominal voltage -15 % / +10 %** or 2) the voltage range indicated on the plate.

   If a voltage range is indicated (i.e., 117 volts to 225 volts), the mid point of the range will be taken as the nominal voltage (i.e., 171 volts). The device will be **tested to the greater** of: 1) the nominal voltage -15 % / +10 % (i.e., 145 volts and 118 volts) or 2) the voltage range indicated on the plate (i.e., 117 and 225 volts).

   Therefore, in this case the greater of the two is 117/225 volts and the device would (only) be tested at these extremes.

4. If the device ceases to indicate weight values while the voltage is well within the -15 % / +10 % range limits, the tests will be performed at the limits of indication.

Discussion: The Sector agreed that testing over the entire range is not supported by current NIST Handbook 44 language. The NTETC Weighing Sector reviewed language used in Canadian requirements. The consensus of the Sector is to recommend that Handbook 44 paragraph T.N. 8.3.1. Power Supply, Voltage and Frequency be amended to eliminate specific voltage ranges. Additionally, there is confusion regarding the frequency range reference in the existing language. NTEP does not test for a change of line frequency of plus or minus one half cycle because testing equipment is very expensive. Manufacturers have stated that power supplies in current weighing devices are capable of performing over a much larger voltage and frequency range than specified in Handbook 44 because they only manufacture or purchase one version of power supply that is suitable for the worldwide marketplace.

Conclusion: The Sector agreed to make the following recommendation to the NCWM S&T committee to amend NIST Handbook 44 Scales Code paragraph T.N8.3.1.(a) Power Supply, Voltage and Frequency as follows:

T.N.8.3.1. Power Supply, Voltage and Frequency.

(a) Weighing devices that operate using alternating current must perform within the conditions defined in paragraphs T.N.3. through T.N.7., inclusive, over the line voltage range as marked ~~of 100 V to 130 V or 200 V to 250 V rms as appropriate, and over the frequency range of 59.5 Hz to 60.5~~ at 60 Hz.

(***Note:*** *The Weighing Sector proposal was considered at the 2002 Annual Meeting of the Southern Weights and Measures Association, Specifications and Tolerance Committee. The committee recommended additional language be added to the proposal stating that a weighing device shall perform at minus 15 % of the lowest stated nominal voltage and at plus 10 % of the highest states nominal voltage.*)

25. Audit Trail Information During Power Failure

Source: Ohio Participating Laboratory

Background: During the evaluation of a device with an electronic means of sealing, the laboratory noted that the device accepted the updated calibration and configuration, but the event counters remained at their previous count if there was a power loss while in the calibration mode. The Participating Laboratories agreed that this could be used fraudulently to avoid giving an indication that a calibration or configuration adjustment had occurred and that NCWM Publication 14 should be amended to look for this condition.

Discussion: The participating laboratories reported that this and similar conditions have been discovered on more than one type of device. In another example, a scale appeared to accept calibration and configuration changes. However, the final act of pressing a button to accept the change was not performed. The scale appeared to be operating with the updated parameters until power was turned off. The scale reverted to the previously stored parameters and event counter information.

One of the manufacturers was concerned about changes to the count indicated on the event counter. Replacement of the event counters or a master reset on a computer causes a change of audit trail information that can be investigated by the field inspector. One of the manufactures stated that it is unlikely that a non-resetable event counter can be set to specific counts in order to match the counter that is being replaced.

Some of the participating laboratories indicated that a change in event counters or a master reset of the computer is not the issue of this item because there is a change in the audit trail information that can be investigated by an inspector. The issue at hand is primarily the intentional or unintentional change in calibration or configuration parameters without advancing the information on the event counters.

The manufacturers understand that an event is when there is a change. The reported problems are likely caused by programmers who did not specify that sealable parameter settings and event counter information should be stored in the event of a power failure (or provide an error indication).

Conclusion: The Sector recognized that replacing printed circuit boards may clear existing audit trail information and that the resultant change in event counter information is in compliance with Handbook 44. It is the responsibility of the inspector to investigate the change(s) before enforcement action can be taken. Additionally, service and repair companies would likely have information available to the inspector documenting changes to calibration and configuration and even the replacement of printed circuit boards and microprocessor chips affecting event counter information.

The Ohio and California participating laboratories agreed to develop language to verify audit trail change information during the event of power interruptions and improper calibration procedures. The language should be available for review and comment prior to the 2003 meeting of the participating laboratories and Weighing Sector.

26. Performance and Permanence Testing

Source: NTEP Director and NIST Technical Advisor

Background: The NTEP Director has noted inconsistencies in the following performance and permanence sections in Chapter 1:

Section 62. Performance and Permanence Tests for Counter (Bench) Scales (including Computing Scales). Section 62.9.5.1. is not consistent with 62.9.10. in that the 500-lb maximum test load is not mentioned in 62.9.10.

Section 63. Performance and Permanence Tests for Floor Scales, Paragraphs 63.2. Initial Review and 62.3 Initial Type Evaluation Permanence Test, and 63.4. Subsequent Type Evaluation Permanence Test. Paragraph 62.4 can be misinterpreted as meaning that if a device fails, the scale is then adjusted and retested as an initial test in 63.2 and test ed 20-30 days later as a subsequent test. The terminology used should be consistent. Similar concerns are noted in paragraphs 65.5.5.

Section 65 (x). Performance and Permanence Tests for . . . Vehicle Scales. . ., paragraphs 65(x).5.1., 65(x).7, and 65(x)7.6. Paragraph 65x.5.1. states that a minimum of 40 000 lb of known test weights are required for the subsequent type evaluation field permanence test and appears to be in conflict with 65x.7.6. that states that the device will be tested to at least the CLC on the second test. Testing to the CLC does not appear to be supported in doing research into past Sector Summaries.

Discussion/Conclusion: The NIST Technical Advisor and NTEP Director will make the referenced editorial corrections and submit the amended language to the Sector and the NTEP Committee prior to publishing the 2003 edition of Publication 14.

27. Center Dump Option on Vehicle Scales

Source: NTEP Director

Background: Clarification has been requested regarding the acceptability of a center dump option on mechanical vehicle scales. The following is from the June 1991, November 1996, and 1997 Sector Summaries:

(June 1991)

C. Several manufacturers have modified the design of a lever system by moving the backbone lever that runs along the longitudinal centerline of the scale to outside the edge of the scale (see attachment). The manufacturers have contended that this change does not require another type evaluation, claiming the design has not changed

significantly. The NTEP policy has been to require these scales to undergo another type evaluation. The NTEP Technical Committee is requested to review this issue as part of the technical policy.

NTEP requires that scales of different designs must be evaluated separately. NTEP laboratories have had to make judgments as to what comprise significant modifications to designs that necessitate additional NTEP testing. For example, NTEP considers a load-cell-based scale with the main girders of the weighbridge under the platform under the path of tires to be significantly different from a scale with the main girders forming side rails for the platform. The specific issue being addressed by this agenda item is the design of mechanical lever systems where the location of the transverse lever is changed. The following figure illustrates the variations (*figure not available*).

The Committee agreed that the design differences in examples B and C were relatively minor and that the two designs were sufficiently similar so that one type evaluation could cover both designs. However, the Committee agreed that the design illustrated in example A required the weighing/load-receiving element to be engineered differently. Consequently, that design had to be evaluated separately. Hence, based on G-S.1. and this decision for type evaluation, the design illustrated in example A shall have a different model designation since a separate type evaluation is required. In the case of examples B and C, the same model designation may be used; but the specific design that was evaluated must be described in the test conditions of the NTEP Certificate. The Committee will continue to rely on the judgment of the NTEP laboratories when a new Type evaluation is required.

4. Modification of Type (1996)

Dump Option

Conclusion: **The Sector heard arguments for and against allowing the modification of an NTEP approved scale with a dumping mechanism without additional testing. Some believed that this would be considered a modification of type and needed additional testing. Others were unsure what effect, if any, this would have on the scales performance. Still others believed that this was not a modification of type and should be allowed. No clear agreement or disagreement was reached in the discussion. The Sector may want to revisit this at a later date. The Sector also asked for input from Scale Manufacturers Association's (SMA) Technical Committee.**

Replacement of Concrete Decks with New Steel Decks

Conclusion: **The Sector agreed that changing deck material (for example, concrete vs. steel) on a scale is a modification of type in some designs of scales and, in those designs, both types of decks would have to be tested to include both types on the Certificate of Conformance. The Sector noted that there are some designs where replacement of the deck material would not affect the performance of the scale.**

b) Adding a dump option (1997)

Background and Discussion:

b) At the last Sector meeting the issue of adding a dump option was not resolved. The SMA Technical Committee was asked to provide input. The sector has been asked to reconsider this item (Attachment; Carry-over Item I b)

Discussion: Comments were made that this is a design consideration, not a performance consideration. Field officials have expressed concern that the addition of this option may, over time, cause performance problems with the repeated lifting and lowering of the deck. The Sector generally agreed that, if it is a new device and new technology, it might require testing. However, since the option does require field verification, there is no reason to require an additional permanence test.

Conclusion: **The Sector agreed that a dump-type option could be added to a scale with an existing NTEP CC without the need to perform additional testing. With a dump option the original load-receiving**

element (deck) is replaced with the dumping mechanism. The original structural weighbridge is still in place and keeps the load-receiving elements (levers or load cells) in place.

Discussion: The past discussions have dealt primarily with mechanical scales with a deck that lifts or tilts off of the weighbridge to dump the commodity.

A member of the railroad industry commented that an improvement to a railway track scale changes the structure of the scale. Many railroads require that existing railway track scales must be brought up to all railroad requirements when these modifications or improvements are made. This sector member considers a center-dump option a modification of type that requires new evaluation. Any proposal to permit such a modification without additional evaluation should apply only to vehicle scales.

Additionally, there are low profile railway track scales that do not meet AREMA standards and are allowed to use the deck plate for structural integrity. Although changes can be done properly without affecting the structural integrity of the scale, that does not mean changes will always be done properly. Therefore, a jurisdiction should verify the changed device complies. Typically, the jurisdictions do not look at the construction or may not have the expertise to evaluate structural changes.

Some of the manufactures commented that modifications should be evaluated and certified by a scale engineer according to Handbook 44 Scales Code paragraph UR.4.3. Scale Modification. One of the Sector members stated that if guidelines are not documented in Publication 14 and the NTEP Director is not familiar with a type of modification, then further testing may be required depending upon the NTEP Director, participating laboratory, or field official that is being asked to make the determination.

The Sector was directed to the existing diagrams in Publication 14 (pages DES-8 and DES-9) that dealt with large capacity scale platforms and whether or not additional evaluations would be required if the manufacturer requested a change to the deck type. Previous Sectors agreed that no additional evaluations would be required for a change in deck material if the deck were not part of the support structure of the weighbridge. Additional evaluation for modification of deck types would be required if the deck is part of the weighbridge support structure.

The Sector was asked if the same rationale could be used to determine if additional evaluations would be required for a "dump through" feature. Many Sector members agreed that this rationale would be a useful guideline for use by the NTEP Director, participating laboratories and field officials. Some of the Sector members stated that the "dump through" feature or option should however be listed on the Certificate of Conformance for the device. Some of the manufacturers disagreed with this stating that it is up to the manufacturer to determine if a modification to the type is metrologically significant.

The Sector also agreed that changes to the position of the lever or load cells would be considered a metrologically significant modification that would require additional type evaluation testing.

Conclusion: There was no clear consensus on this item however, the majority of the Sector voting members voted to recommend that the following language be added to Publication 14, Chapter 1, NTEP Technical Policy for Scales, Section E. Modification of Type (6 yes, 3 no, 5 abstain):

7. Adding a dump-through option/modification, without modifying the lever system or load cell placement, to vehicles scales where the vehicle 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 scales with composite construction; unitized steel deck (vehicle support primarily come from the scale deck) requires an evaluation to be listed on a new or existing CC.

Note. One of the manufacturers voting against the proposed language commented that changes to create a dump scale fall under the structural design requirements in the rail codes. Modifications to create a dump scale are not typically done to a truck scale. The manufacture acknowledges that NCWM comes to the manufacturers for general guidance. The manufacturer further stated that the best policy is to rely on the original equipment manufacturer to report metrologically significant changes.

28. ECR Loyalty Programs

Source: Maryland Participating Laboratory

Background: From the 1998 Weighing Sector Meeting:

NTEP continues to receive questions as to the proper method for presenting information relative to "frequent shopper" discount programs on customer receipts. NTEP has also heard complaints related to the accuracy of price computations on some of the receipts. The Sector was asked to provide guidance to the NCWM for the development of possible requirements or regulations in this area.

Conclusion: The Sector recognized that some issues related to frequent shopper programs are under the purview of the Sector (those functions related to the interface with the point-of-sale scale) and some are under the purview of the Laws and Regulations Committee (those functions related to method of pricing and printing of package labels). The Sector acknowledged the need for input from other groups. Dennis Krueger, NCR, agreed to contact representatives from FMI (Food Marketing Institute) to investigate how the Sector might work with representatives from FMI on this issue. Dennis will work with Steve Cook, (formerly from CA), to bring back recommendations to the Sector on how to proceed further with this issue.

This issue has not been resolved. Nearly every major supermarket chain has some form of member discount program. The NTEP labs and the field inspector need a uniform method of examining this feature.

Handbook 44 indirectly addresses the method of recording member discount prices:

Section S.1.8.4. of Handbook 44 notes:

S.1.8.4. Recorded Representations, Point-of-Sale Systems. - The sales information recorded by cash registers when interfaced with a load-receiving element shall contain the following information for items weighed at the checkout stand:

(a) the net weight,[1]
(b) the unit price,[1]
(c) the total price, and
(d) the product class or, in a system equipped with price look-up capability, the product name or code number.

Unit price is defined in Handbook 44 as:

unit price. The price at which the product is being sold and expressed in whole units of measurement.[3.30] (Added 1992)

The two sections noted above indicate that the unit price noted on the receipt must be the price at which the sale was determined. Noting an original unit price for an item and a total discount for the transaction does not meet HB 44.

ex: regular price is $3.00/ lb and the member price is $1.50 lb
1.00 lb @ 3.00/lb 3.00
-1.50

Discussion: The Sector reviewed the language recommended by the earlier weighing sector and considered making the following recommendation to the NCWM Specifications and Tolerances Committee:

To clarify Handbook 44, amend the footnote to paragraph S.1.8.4. as follows:

S.1.8.4 (a) the net weight [1]
S.1.8.4 (b) the unit price [1]

[1] Weight values shall be identified by kilogram, kg, grams, g, ounces, oz, pound, lb, or the sign "#." For devices interfaced with scales indicating in metric units, the unit price may be expressed in price per 100 grams. If the

system utilizes a member discount feature, the unit price at which the product is being sold must be recorded on the receipt. The net weight of pre-weighed items shall not be altered by the system.

The Sector also reviewed the proposed language for incorporation into NCWM Publication 14 submitted by the Maryland Participating Laboratory.

The Sector members agreed that manipulating weights facilitates fraud. Additionally, NIST Handbook 130 defines net weight as the gross weight minus the weight of the packaging material or container and does not permit the manipulation of a legal measurement. Unintentional manipulation of the original weight (due to mathematical rounding) can also occur when discounts are given because net weights are determined by dividing the original total price by the original unit price.

A member of the Measuring Sector stated that there are similar concerns with discount programs, but the proposed language for Publication 14 would not solve the problems associated with liquid measuring devices

Several Sector members supported the language proposed for Publication 14, stated that it is sufficiently backed up by Handbook 44, and that no changes to Handbook 44 are required for this item.

One of the manufacturers agreed with the proposed language for Publication 14. However, the following note should be deleted because is may be confusing and is not appropriate for a national document:

"Please note that this feature may not be acceptable in some jurisdictions. The suitability of this feature is determined by the enforcement policy of each jurisdiction."

Conclusion: The Sector agreed to recommend that the following underlined language be added to Publication 14, Chapter 6, Section 12 (new):

Section 12 of Electronic Cash Register Interfaced with Scales

Member Discount Program Feature

Code References: G-S.2, G-S.5.1, G-S.5.5, and S.1.8.4

A "member discount" feature applies discounts to applicable items in the store. To receive the discount(s), the customer must be enrolled in the program and must present their member number before the total sales transaction is tendered. This feature applies to weighed and non-weighed items.

Because the feature has a significant potential to facilitate fraud if not properly designed, the following type evaluation criteria must be met.

Check all that apply:

☐ Discounted weighed transactions
☐ Discounted non-weighed transactions
☐ Original net weight (count) and original total price determined at the POS
☐ Original net weight (count) and original total price determined at the pre-packaging scale

12.1	The net weight shall not be altered.	**Yes** ☐ **No** ☐ **NA** ☐
12.2	The total price of all weighed items shall be determined using the original net weight determination.	**Yes** ☐ **No** ☐ **NA** ☐
12.3	All calculations shall be rounded to the nearest cent.	**Yes** ☐ **No** ☐ **NA** ☐
12.4	The receipt shall be clear, easily understood when reading from left to right.	**Yes** ☐ **No** ☐ **NA** ☐
12.5	The receipt shall be mathematically correct for all calculations.	**Yes** ☐ **No** ☐ **NA** ☐

12.6	If the discount is based on a percentage or a fixed cents off of the total price, the receipt shall indicate the following:	
	8.6.1 The original unit price and total price.	**Yes** ☐ **No** ☐ **NA** ☐
	8.6.2 The monetary discount, or the new total price.	**Yes** ☐ **No** ☐ **NA** ☐
	8.6.3 The net weight (If applicable).	**Yes** ☐ **No** ☐ **NA** ☐
	Note: If the Member Discount number is entered before the item to be discounted (or the receipt is not generated until the completion of the customer transaction), the original unit price and the original total price are not required	
12.7	If the discount is based on a percentage or a fixed cents off of unit price reduction (ex. $ .10/lb discount off the original total price), the receipt shall indicate the following:	
	12.7.1 The original unit price and total price,	**Yes** ☐ **No** ☐ **NA** ☐
	12.7.2 The unit price discount,	**Yes** ☐ **No** ☐ **NA** ☐
	12.7.3 The monetary discount or the new total price, and	**Yes** ☐ **No** ☐ **NA** ☐
	12.7.4 The net weight (If applicable).	**Yes** ☐ **No** ☐ **NA** ☐
	Note: If the Member Discount number is entered before the item to be discounted (or the receipt is not generated until the completion of the customer transaction), the original unit price and the original total price are not required.	
12.8	If the discount is based on a discount unit price, the receipt shall indicate the following:	
	12.8.1 The original unit price and the original total price,	**Yes** ☐ **No** ☐ **NA** ☐
	12.8.2 The discount unit price and the discount total price, and	**Yes** ☐ **No** ☐ **NA** ☐
	12.8.3 The net weight (If applicable).	**Yes** ☐ **No** ☐ **NA** ☐
	Note: If the Member Discount number is entered before the item to be discounted (or the receipt is not generated until the completion of the customer transaction), the original unit price and the original total price are not required.	
12.9	If the total price, of a random weight pre-packaged item, is determined by weight and the final calculation is made at the POS system, the information that the calculation is based on must be provided on the receipt.	**Yes** ☐ **No** ☐ **NA** ☐

29. Range of IZSM on Indicating Elements

Source: Maryland Participating Laboratory

Background: Electronic indicating elements have been submitted with an Initial Zero-Setting Mechanism (IZSM) of 100 % of the configured capacity of the indicator. When the participating laboratories inform the manufacturer that the indicator would have to be tested up to the maximum IZSM range with a load-receiving element, they have always reduced the IZSM range.

NTEP does not test load-receiving elements up to 200 % of their configured capacity. Therefore NTEP should not allow an indicating element to have an IZSM range up to 100 % of the capacity of the load-receiving element used during the evaluation of the indicator. The NIST Technical Advisor notes that load-receiving elements, from bench scales to railroad track scale load-receiving elements have not been submitted or tested with an IZSM feature unless the submission was to be treated as a complete scale with a specific indicating element. Therefore, the possibility exists that many load-receiving elements, that consist of only load cell support structures may not comply with an indication element configured with IZSM enabled. Should electronic indicating elements have IZSM? If so, how much? Should IZSM be limited to just complete scales?

The Sector reviewed the following Canadian requirements.

LG-15.04 IZSM Range (Maximum Range of Initial Zero-Setting Mechanism)

The load-receiving element to which an electronic indicator tested and approved separately will be interfaced will not have been tested up to 200 % of Max. Consequently, the maximum Initial Zero-Setting Mechanism range of electronic indicators must be limited to 20 % of Max.

An electronic indicator tested and approved separately is deemed to comply with the requirements when the total range of the Initial Zero-Setting Mechanism (absolute value of -ve portion of the range plus the +ve portion of the range) does not exceed 20 % (or can be set to a maximum of 20 % and sealed) of the DUT's maximum capacity (Max); The IZSM range of a complete electronic device may exceed 20 % of Max if the device performs within tolerances when the IZSM is set at the minimum and maximum points of its range.

When the IZSM range is limited to 20 %, performance tests are conducted once: at the maximum IZSM setting. When the IZSM range exceeds 20 %, certain performance tests are conducted twice: at the minimum and at the maximum setting of the range. See description of the performance tests in Part 3.

Some of the manufacturers stated that IAZM on separable indicating elements is just an electronic starting point and that there should be not performance difference settings up to 100 %. The manufacturer of the load-receiving element has the responsibility to make their device perform with the maximum live and dead load (i.e. a 100 lb load-receiving element with a 500 lb load cell).

Other Sector members stated that if the IZSM is adjustable to 20 % or less on an indication element, no additional testing should be required. If the IZSM is adjustable beyond 20 %, applicant shall provide equipment (load-receiving element, a switch box, etc) to facilitate testing up to the IZSM limit.

Many of the manufacturers were concerned that prohibiting or limiting the size of IZSM on separable indicating elements may restrict the modular “mix and match” approach because the manufacturer of the indicating element may not know the amount of IZSM permitted on devices the indicating element will be interfaced to.

Canada reported that IZSM above 20 % is permitted on indicating elements. However, Canada will test all IZSM above where the IZSM can be adjusted above 20 %.

One of the manufacturers suggested that the Sector review European Cooperation in Legal Metrolog (WELMEC) 2.1 Guide for Testing Indicators.

Conclusion: The Sector discontinued discussion due to lack of time. The Sector has been requested to review US/Canadian checklist requirements for possible harmonization and WELMEC 2.1 Guide for Testing Indicators - (Non-Automatic Weighing Instruments) (http://www.welmec.org/publications/2-1.asp). This item will be carried over to the next meeting of the Weighing Sector.

30. IZSM Test Procedures

Source: Maryland Participating Laboratory

Background: The following is from the 1998 Weighing Sector Report:

Background: At the June 1998 meeting of the NTEP Laboratories the participants were asked to review a procedure for testing the initial zero-setting mechanism (IZSM) of a scale in the field. At this time, there also is no procedure in Publication 14 for testing this feature during an evaluation.

During a September 1998, Asia Pacific Legal Metrology Forum (APLMF) R76 training class a procedure was presented for testing IZSM. That procedure has been revised and adapted for possible inclusion in Publication 14 as outlined in the Appendix G below. Unless the Sector objects, the procedure was proposed to be included in the next edition of Publication 14. (See Attachment below)

Discussion: The Sector Discussed the proposed procedure and pointed out that the last sentence needs to be changed from "determine if the device complies" to "indicates that additional testing should be performed". One of the labs indicated that some field officials have a difficult time determining if a device has an IZSM, particularly when the "on/off" switch is used to activate the zero setting mechanism. The proposed procedure can be used for both lab and field evaluations.

Conclusion: The Sector agreed that the laboratories would (will) begin using the procedure included in Appendix G. The procedure will be incorporated in Publication 14. The last sentence of the draft procedure will be changed from "determine if the device complies" to "indicates that additional testing should be performed." The laboratories are asked to provide feedback to the Sector on any problems they encounter with the procedures.

The 1998 Weighing Sector proposed the following:

1. Change to Handbook 44 Scales Code

S.2.1.5. Initial Zero-Setting Mechanism. -

(a) Scales of accuracy classes I, II, and III may be equipped with an initial zero-setting device.

(b) Complete Scales. An initial zero-setting mechanism shall not zero a load in excess of 20 % of the maximum capacity of the scale unless tests show that the scale meets all applicable tolerances for any amount of initial load compensated by this device within the specified range.

(c) Separable Indicating Element Covered by a Separate CC. The maximum Initial Zero-Setting Mechanism range (absolute value of the maximum load that can be removed from the dead load plus the maximum load that can be added to the dead load) of electronic indicators must be limited to 20 % of the scale capacity.

2. Changes to PUB 14 (2002 edition, page DES-61)

40. Zero Indication

Code References: S.1.1., S.1.1.1., S.2.1.5, and G-S.5.1.

A digital electronic scale must indicate or record a zero balance condition. An out-of-zero-balance indication on both sides of zero is required. The zero balance indication may be a continuous digital zero indication or indicated by some other means, provided the scale either automatically inhibits the scale operation or returns to a digital weight indication when an out-of-zero-balance condition exists. The alternative zero indication must be defined on the front of the device.

A digital zero balance indication shall represent zero within ±0.5 scale division (±0.5 d). A digital indicating scale shall either automatically maintain a "center-of-zero" condition to ±0.25 d or less (through AZSM) or have a supplemental center-of-zero indicator that defines the zero-balance condition to ±0.25 d or less. The center of zero requirement applies to the gross load zero, but the center of zero indication may also be operational at the net load zero.

Neither a + or - sign may appear with the zero indication. Appropriate indications for the zero balance and out-of-zero balance conditions are specified.

If the scale is equipped with an initial zero-setting mechanism (IZSM), then the scale must be tested for compliance with the influence factors with the maximum load zeroed through the IZSM.

~~This is mandatory if the range~~ When the IZSM range (absolute value of the maximum load that can be removed from the dead load plus the maximum load that can be added to the dead load) exceeds 20 % of the scale capacity, performance tests are conducted at the maximum setting of the range.

The IZSM range of a complete electronic scale may exceed 20 % of capacity if the device performs within tolerances.

When the IZSM range is # 20 %, performance tests are conducted once: at the maximum IZSM setting.

40.1	Is the scale equipped with an IZSM?	**Yes** ☐ **No** ☐ **NA** ☐
	If yes, then what is the range of the IZSM?	**Yes** ☐ **No** ☐ **NA** ☐
40.2	The maximum Initial Zero-Setting Mechanism range of an electronic indicator tested and approved separately:	
	40.2.1 does not exceed 20 % of the scale capacity	**Yes** ☐ **No** ☐ **NA** ☐
	40.2.2 can be set to a maximum of 20 % and sealed	**Yes** ☐ **No** ☐ **NA** ☐
40.~~1~~.3	The scale defines zero within ±0.5 d by a continuous zero indication.	**Yes** ☐ **No** ☐ **NA** ☐

Record the type of weight unit, (e.g., lb/kg) selection.
☐ EXTERNAL ☐ INTERNAL ☐ N/A

Record the actual zero width in d (note whether avoirdupois, metric, or other unit).

AVOIRDUPOIS ____ d
METRIC ____ d
OTHER UNITS: Specify Unit _____ ; _____ d

40.~~2~~4	For indicators without a continuous zero indication, an automatic means inhibits the weighing operation or returns the device to a continuous digital indication when the scale is in an out-of-balance condition. ***Note:*** *See also Code Reference G-S.6. elsewhere in this checklist pertaining to marking of indications, and see Code Reference G-S.5.2.2., and S.1.2. elsewhere in this checklist pertaining to identification of the zero indication when a sleep mode is used.*	**Yes** ☐ **No** ☐ **NA** ☐
40.~~3~~.5	A + or - sign must not appear when the scale is indicating zero in any of the available weight units.	**Yes** ☐ **No** ☐ **NA** ☐
40.~~4~~.6	The device automatically maintains the "center of zero" to ±0.25 d, or	**Yes** ☐ **No** ☐ **NA** ☐
40.~~5~~.7	If the device does not automatically maintain the "center of zero", then there is a center of zero indicator that defines zero within ±0.25 d scale division.	**Yes** ☐ **No** ☐ **NA** ☐
40.~~6~~.8	If provided, the "center of zero" indicator is inhibited at all displayed positive weight values other than zero.	**Yes** ☐ **No** ☐ **NA** ☐

Conclusion: The Sector did not have time to review this item and it will be carried over until the next meeting of the Weighing Sector. The Sector is requested to review the above recommendation from the 1997 Weighing Sector. If there

are no major discussions on this item or significant updates to the proposed language, the Sector will consider recommending the above underlined language into NCWM Publication 14, Weighing Devices Technical Policy, Checklist, and Test Procedures.

31. Weight Accumulators

Source: Maryland Participating Laboratory

Background: The following is from the 1997 Weighing Sector final Summary:

Source: NTEP Weighing Labs

Background: Publication 14 does not adequately address the new features that labs are seeing on scales with weight accumulation features.

Recommendation: The Sector was asked to review language in the attachment to item 5 (see below) submitted by the NTEP labs for addition to Publication 14 under the section on scales with weight accumulation features.

Conclusion: The Sector agreed to add the proposed procedure and criteria in the attachments to Publication 14.

The Maryland Participating Laboratory proposed the following language:

Weight Accumulation

This section is not applicable to automatic bulk weighing systems and automatic weighing systems. The weight accumulation feature adds and/or subtracts multiple weighments. Please note that total weight accumulators may not be acceptable in some jurisdictions and is not acceptable in all applications. The suitability of this feature is determined by the enforcement policy of each jurisdiction. Because the accumulation feature has a significant potential to facilitate fraud if not properly designed, the following type evaluation criteria must be met.

Identify the methods of weight accumulation:

- Manual Total: The operator must enable the mechanism for each weighment added to (or subtracted from) the accumulated total.
- Auto Total: Once this mode is enabled, the device will automatically add each weighment to the accumulated total. The auto total feature may not be acceptable in all jurisdictions and is not acceptable in all applications. The auto total feature is not acceptable when the loading or unloading of the device is likely to activate the auto total feature.

1. GROSS and NET weighments cannot be added to (or subtracted from) the same TOTAL accumulator. **Yes** ☐ **No** ☐ **NA** ☐

2. The device has motion detection capability that prevents the device from accumulating weighments before the weight display has stabilized within specified limits. The limits for motion detection are: **Yes** ☐ **No** ☐ **NA** ☐

   (a) ∀ 3 scale divisions for axle load, railway track, vehicle scales, and hopper (other than grain hoppers) scales with a capacity exceeding 22 000 kg (50 000 lb); and **Yes** ☐ **No** ☐ **NA** ☐

   (b) ∀ 1 scale division for all other scales. **Yes** ☐ **No** ☐ **NA** ☐

   It is recommended that the indicator simultaneously display the TOTAL weight and the current weight on the load-receiving element. Devices equipped with accumulation capability must provide a clear indication that a weighment has been entered. This indication may be a TOTAL display

mode, a lighted legend, or an annunciator such as total entered.

3.	The method used to indicate that a weighment has been entered:	
	3.1. A separate continuous indication of the TOTAL weight display mode.	**Yes** ☐ **No** ☐ **NA** ☐
	3.2. The device has selectable "current weight" and "TOTAL weight " display modes with proper descriptors.	**Yes** ☐ **No** ☐ **NA** ☐
	3.3. A lighted legend or annunciator of "weight entered" or a similar statement is used to indicate that a weighment has been added to the TOTAL weight.	**Yes** ☐ **No** ☐ **NA** ☐
	3.3.1. An entry of "zero" should not activate the annunciator, or the item count.	**Yes** ☐ **No** ☐ **NA** ☐
	3.4. Other: _____	**Yes** ☐ **No** ☐ **NA** ☐
	3.4.1. The method is acceptable.	**Yes** ☐ **No** ☐ **NA** ☐
4.	If units are converted, the weight unit selector switch must convert both the current weight display and the TOTAL weight display.	**Yes** ☐ **No** ☐ **NA** ☐
5.	If the device has a current/total switch, the TOTAL weight display must be inhibited when a load is on the platform.	**Yes** ☐ **No** ☐ **NA** ☐
6.	The device shall indicate the number of items accumulated whenever the TOTAL weight is displayed.	**Yes** ☐ **No** ☐ **NA** ☐
7.	If the device can simultaneously accumulate transactions for more than one customer, customer identification codes must be displayed.	**Yes** ☐ **No** ☐ **NA** ☐
8.	The device must return to gross load zero between each weighment accumulated.	**Yes** ☐ **No** ☐ **NA** ☐
9.	The TOTAL key does not act as a repeat key.	**Yes** ☐ **No** ☐ **NA** ☐

Conclusion: The Sector did not have time to review this item and it will be carried over until the next meeting of the Weighing Sector. The Sector is requested to review the above recommendation from Maryland Participating Laboratory.

32. Last Item: Tentative Date and Location of Next Meeting

California is next on the rotation for meeting locations. The next meeting of the NTETC Weighing Sector has been scheduled for September 11-13, 2003, at the Picadilly Inn in Fresno California and will be held prior to the Annual Western Weights and Measures Technical Conference.

Attachments

Attachment to Agenda Item 1

SCALE MANUFACTURERS ASSOCIATION

6724 Lone Oak Blvd. Naples, FL 34109
Tel: 239-514-3441 . Fax: 239-514-3470
Web Site: http://www.scalemanufacturers.org

To: NCWM S&T Committee September 20, 2002

From: SMA Technical Committee

Subject: S&T Item 320-1

Reference Dave Quinn's January 2002 letter, subject as above

As pointed out in Dave Quinn's above referenced letter, S&T Agenda Item 320-1B is "not a single item but a number of normally separate items rolled into one leaving no way to discuss, much less vote, on each individual item. One simply has to look at the title of the agenda item to see the potential problems and complexities". Mr. Quinn states that this " item proposes that for N.1.3.4., (1) the dimensions of the shift test pattern for a vehicle scale be changed, (2) that livestock scales be removed from N.1.3.4., (3) a different shift test pattern be defined for livestock scales with more than two sections, and (4) Table S.6.3. be changed to document the above changes. The item also incorporates "a new revised definition for Concentrated Load Capacity and some new H44 terminology for a "Combination Vehicle/ Livestock" scale for which there is no definition and which, in fact, is not a product produced by any manufacturer. A summary of the current and proposed N.1.3.4. requirements is attached.

Mr. Quinn also correctly points out that "the item also requires accepting the practice of defining devices based on weighing application as opposed to the design criteria required for particular class of scale.

Mr. Quinn goes on to remark "Item 320-1B is also proposing that a vehicle scale designed for weighing load concentrations of 1500 pounds – 2000 pounds per square foot must also be marked as a "livestock" scale if it is to be used to weigh livestock which create a load concentration of 110 pounds per square foot. It may seem to lack logic, and it does, but that is what the item proposes. We urge the S&T to step back and reconsider trying to define the infinite spectrum of what can or cannot be weighed on a scale and go back to classifying scales based on the worst-case design loads that are required. If this is not done the door is open to try and define what commodities can be weighed on a bench scale, floor scale, hopper scale etc."

The SMA Technical Committee also agrees with Mr. Quinn that "A vehicle scale is designed for the worst case conditions dictated by the dynamic loads of weighing over the highway trucks driving on or off a scale and a livestock scale is designed for a much lower level of dynamic loading. Weighing pallets, bins, vehicles, or livestock are within the design parameters of a vehicle scale as long as the minimum load requirements are met. It is not necessary to stipulate that the vehicle scale can be used for weighing pallets, bins, or livestock: it is simply logical that this is appropriate. On the other hand, although the livestock scale is not designed for the rigors of highway truck weighing, it is perfectly acceptable to weigh other items such as pallets, bins, and small vehicles like cars and pickup trucks as long as the minimum load requirements are met and nominal capacity not exceeded."

Therefore, the SMA TC joins Fairbanks' recommendation that the shift test pattern for livestock scales be simply defined as it was prior to 1988:

N.1.3.4. Vehicle Scales, Axle-Load Scales, and Livestock Scales With More Than Two Sections.

N.1.3.4.1. Vehicle Scales and Axle Load Scales. -

At least one shift test shall be conducted with a minimum test load of 12.5 % of scale capacity and may be performed anywhere on the load-receiving element using the prescribed test patterns and maximum test loads specified below. . . .

N.1.3.4.2. Livestock Scales With More Than Two Sections. - A shift test equal to one half the rated sectional capacity shall be conducted with test loads distributed over each section of the scale. (Two section livestock scales shall be tested consistent with N.1.3.8.)
(Amended 1991, 2000, and 200X)

We also concur that ". . .two section livestock scales should use the existing H-44 N.1.3.8. and that it is not necessary to define the physical dimensions of the livestock scale shift test pattern

The rationale for the above recommendations and comments is contained in the following pages.

Sincerely

Daryl Tonini
Chairman, SMA Technical Committee

Attach: Summary of Current and Proposed N.1.3.4 Requirements

Cs. Regional W&M S&T Committees
NTEP Weighing Sector

RATIONALE:

Subject: S&T Item 320-1B

This particular item is difficult to comment on. It has become very complex because of the sheer number of inputs that are based on conclusions that are neither technically correct nor factually supported and show some degree of a lack of understanding of both history and application. Some examples are:

1. A "Combination Vehicle/Livestock" scale requires a special design for the load-receiving elements and load receiver differing from that of a standard vehicle scale.

2. Vehicle scales used to weigh livestock must be tested side to side because cattle will gather in corners.

3. Livestock, especially cattle, are more abusive to a vehicle scale than truck traffic.

4. Stock racks and gates added to a vehicle scale increase the dead load on the scale beyond that tested in an NTEP evaluation and therefore additional testing is required.

5. A truck on a vehicle scale load-receiving element causes movement from end to end and not side-to -side as livestock would. Vehicle scales have checking only for this end-to-end movement and therefore require modification to deal with livestock movement.

6. A new mindset that a shift-test must have a specific weight pattern detailed in H-44.

The following is an attempt to clarify and present technical support refuting the above points:

1. A "Combination Vehicle/Livestock" scale requires a special design for the load-receiving elements and load receiver differing from that of a standard vehicle scale.

The term "Combination vehicle livestock" scale dates back to at least 1958 and was used by manufacturers to describe a standard vehicle scale and indicator package that was suitable for weighing livestock on a vehicle scale and priced as a single catalog item. The "special" features added to a standard vehicle scale were an indicator (usually a beam) with 5pound divisions as required by P&S, and mechanical restraints to stabilize the weight reading due to livestock movement. Nothing else was done to the vehicle scale. No modifications were made in the weighbridge enabling the scale to be used for this application. Today if such a package priced item were to exist for a "Combination vehicle livestock" scale, it would be simply a standard vehicle scale, no special additions, and an electronic instrument with filtering capable of stabilizing the weight reading due to livestock movement.

2. Vehicle scales used to weigh livestock must be tested side to side because cattle will gather in corners.

A vehicle scale is designed for the load concentration of a dual tandem axle applied to the load receiver of the scale. This load concentration is in an area of 4 feet x 8 feet and is defined in H-44 as Concentrated Load Capacity (CLC). A typical CLC would be 60,000 pounds for a dual tandem axle. Assume for this discussion that the vehicle scale platform is 10 feet wide. The load bearing points under the load receiver are, by design, normally about 6 inches inboard from each side, placing them 9 feet apart on a 10 foot-wide scale. Studies have shown that the drivers will tend to observe the left side of the scale from his position in the cab to place the vehicle 6 to 12 inches from the left side of the scale platform. This results in the load bearing points under the dual tandem nominally sharing the load approximately 50/50.

The H-44 Scale Code shift test pattern for a vehicle scale, N.1.3.4., describes a weight pattern of 4 feet x 10 feet, which, on the 10 foot-wide scale, loads the load bearing points exactly 50/50. The area of the shift test pattern is 40 square feet and the concentrated load of 60,000 pounds is distributed at 1,500 pounds per square foot. The shift test pattern correctly tests the scale "as used" simulating the weight distribution of a dual tandem axle over the load bearing points. It is not necessary to test a 10 foot-wide vehicle scale side to side because an "as used" weight distribution is nominally 50/50 side to side. Note: As a load receiver increases in width the vehicle position on the scale remains the same relative to the left side and the weight distribution begins to change with more of the vehicle weight on the left load-bearing points and less of the vehicle's load on the right load-bearing points. With scale widths over 12 feet, side-to-side differences may begin to show up. The new shift test pattern dimensions adopted by NCWM in 2001 should be used to test side to side on vehicle scales over 12 feet in width.

Some years ago P&S conducted a study to determine the concentrated load of cattle on a scale platform. The purpose of this study was to determine the amount of weight necessary to check a livestock scale to its used capacity. Numerous sized load receivers were used and cattle were pressed onto the loading surface to fill the area completely. The result was that when no more cattle could be squeezed onto the weighing surface the total weight averaged 110 pounds per square foot. (This fact was confirmed with a retired P&S employee involved in the study.) The load concentration of cattle on a load receiver is only 7 % of the load concentration of the shift test pattern above (1,500 pounds per square foot). A 34,000 pound legal over the highway dual tandem axle in the same design spacing of 4 feet x 8 feet would distribute the axle load over 1063 pounds per square foot. Based on the 50/50 weight distribution to the transverse load points, the shift test pattern would load each side of the scale to 30,000 pounds (area 4 foot x 5 foot) and the legal dual tandem axle would load each side to 17,000 pounds (area 4 foot x 5 foot). Based on the P&S study, the worst-case condition created by cattle gathering in this 4 foot x 5-foot area would be a load concentration of 2,200 pounds as opposed to the 17,000 pounds legal dual tandem axle or the 30,000 pounds shift test pattern. Cattle do tend to gather together on a load receiver and do so in the two corners at the end of a vehicle scale. Assuming this "gathering" weighs a total of 17,000 pounds, the weight would be spread over 155 square feet an area 5 times that occupied by the 32 square feet of the dual tandem axle weighing 34,000 pounds.

The minimum load of livestock on a vehicle scale is 500 divisions or 10,000 pounds with a division size of 20 pounds. This minimum load would occupy 91square feet, an area greater than twice the load distribution of the 40 square feet in the vehicle scale shift test pattern. Testing side to side on a normal width (10 feet to 12 feet) vehicle scale is not necessary due to normal distribution of livestock weight. Testing the same scale side to side if it is to be used in livestock weighing

follows no logic. For that reason P&S did no special testing of vehicle scales used to weigh livestock, if they had been tested and certified as a vehicle scale by local jurisdictions. If P&S did test a vehicle scale they conducted only the normal test over sections. (This fact was also confirmed with a retired P&S employee.)

3. Livestock, especially cattle, are more abusive to a vehicle scale than truck traffic.

A legal highway truck can have a gross weight of 80,000 pounds. For the sake of this discussion, assume a maximum gross weight of 60,000 pounds. Also assume an average vehicle scale size of 70 feet x 10 feet (700 square feet). The average speed for a vehicle entering onto a vehicle scale load receiver is between 3 and 5 mph. The load receiver is at rest when the front axle of the vehicle first touches the load receiver causing the load receiver to move in the direction of the truck movement. The average 70 foot x 10-foot concrete deck load receiver weighs about 35,000 pounds so the dynamic forces of the load receiver moving from rest is severe. When the truck stops on the load receiver, the inertial force created by stopping of a the moving 60,000-pound load causes an equal force on the load receiver. The same dynamics take place when the vehicle begins to accelerate to leave the scale.

By loading the same 700 square feet of load receiver with cattle the average maximum load would be 77,000 pounds. The cattle enter the load receiver not as a single 77,000-pound mass like a vehicle but rather randomly until the load receiver has no space for more. Loaded to 110 pounds per square foot, the cattle cannot move at all. To reduce the load of cattle to 60,000 pounds (same as vehicle) the square footage they would occupy gathered together would be 545 square feet allowing 155 square feet of open area in which to move freely. For these cattle to even simulate the dynamics of the vehicle the entire herd would have to move as one single mass coming onto the scale in unison and leaving the scale in like manner. Experience dictates this is not likely. What if an individual animal ran from side-to-side or attempted to get off the scale by climbing the stock racks? An average head of commercial beef cattle weighs less than 1300 pounds and certainly cannot create dynamic forces that come close to the vehicle scale design limits.

4. Stock racks and gates added to a vehicle scale increase the dead load on the scale beyond that tested in an NTEP evaluation and therefore should require additional testing.

The load capacity of an average vehicle scale section is 100,000 pounds (50,000 pound capacity load cells). Assuming a 4-section concrete deck scale, the dead load on each section will be in the area of 9,000 pounds and the live load on each section at maximum rated capacity will be less than 50,000 pounds. Total load on the section is 59,000 pounds or only 59 % of section capacity.

The addition of racks and gates to the scale adds an additional 4500 to 5000 pounds at most and is well within scale design limits. These modifications are subject to Handbook 44 UR.2.7, UR.4.1., and UR.4.3., and are usually approved by the manufacturers of the scale. In addition, because the live load uses such a small portion of the total output of each load cell, an increase in dead load will not change the linearity of the device.

5. A truck on a vehicle scale load receiver causes movement of the load receiver from end to end and not side-to-side as livestock would. Vehicle scales have checking only for this end-to-end movement and require modification to deal with livestock movement.

The movement of a vehicle on the scale deck causes the deck to move in an elliptical pattern which is why all vehicle scales limit transverse as well as longitudinal movement. The recent use of "rocker" type load cells drives this point home. These cells will rotate because of the elliptical deck movement and if rotation is not controlled by design, the cell cable will wind around the cell and break. To conclude that vehicle scales are not checked for transverse movement is simply not factual and to conclude that scale movement created by moving livestock is more abusive to a vehicle scale than the movement of a vehicle is technically incorrect.

6. A new mindset that shift tests must have a specific weight pattern detailed in H-44.

The S&T item 320-1B attempts to place dimensions on a shift test pattern for livestock scales with no apparent technical basis for the dimensions used. Specific dimensions are essential in the shift test pattern for a vehicle scale to simulate the manufacturer's concentrated design load on the load receiver as applied by a dual tandem axle with 4-foot centers and a width of 8 feet. To provide for better use of available test equipment, NCWM and vehicle scale manufacturers agreed to a shift test pattern of 4 feet x 10 feet.

One must ask: What is the rationale proposed by the S&T Committee for a 4 foot x 5 foot pattern concentrated over a load bearing point equal to ½ "sectional" capacity? Vehicle scales do not have a sectional capacity rating they have a CLC rating (dual tandem axle rating) which one would reasonably assume is the capacity of a section. Assume the 60,000-pound CLC vehicle scale from the above discussion. The S&T Committee is proposing to do a shift test on a vehicle scale used in a livestock weighing application with a load of 30,000 pounds concentrated in a 4 foot x 5 foot pattern. This load equates 1,500 pounds per square foot as opposed to the as used 110 pounds per square foot concentrated load of cattle. The proposal lacks technical basis and logic. A load of 30,000 pounds of cattle would occupy 273 square feet, not 20 square feet as proposed by the S&T agenda. Spread over this 273 square feet the load is distributed side to side across the scale. P&S did section testing of livestock scales with more than two sections, not corner testing, and with no specific dimensions on a test pattern. In fact, other than the vehicle shift test pattern which must have specific dimensions to simulate the dual tandem axle for which the scale is designed, no other shift test, regardless of scale type, is defined by dimensions in H-44.

Conclusions: It is important to understand that "floor scale", "bench scale", "hopper scale", "livestock scale" and "vehicle scale" are terminology used to describe the design criteria that a manufacturer must use to provide a product suitable for a type of application. However, the design is not limited to that specific application. A bench scale is designed to take full capacity loads anywhere on the load receiver and should be tested to insure that the scale can, in fact, perform to that specification. During an NTEP evaluation of a bench scale, the initial verification procedure is tested with weights and a permanence test is conducted after a specified number of cycles of test load are applied to the scale. In the market place it is understood that the bench scale can weigh produce, meat, hardware, etc.. The scale is not NTEP evaluated for each application. From a manufacturing standpoint, there is no difference in the load receiver of a grain hopper scale or the same hopper scale used to weigh sand or cement. The difference is in tolerances allowed in H44~~,~~. If the NTEP test of a hopper is based on the tightest H-44 requirements then it should be understood that less stringent applications are an acceptable use of the hopper scale. Likewise, a vehicle scale designed for the dynamic loads created by large masses that stop and go quickly on the load receiver. No one would question that a pallet of metal castings could properly be weighed on a vehicle scale as long as the load met the minimum weight requirements for a vehicle scale. Yet the S&T item suggests that if livestock are to be weighed on a vehicle scale, the scale must be tested as a "livestock" scale. We are letting long-standing "classifications" of scales get in the way of valid requirements. A scale classified as a "livestock" scale is specifically designed for livestock weighing by a manufacturer and the design criteria is based on dynamics that are well below the dynamics that must be considered for a scale classified as a "vehicle" scale. Understanding the design of a vehicle scale, logic dictates that livestock weighing dynamics are well within the dynamic design limits of a vehicle scale. Given an appreciation of the dynamics of a livestock scale design, logic would dictate that most vehicles would exceed the dynamic design limits of a scale classified as a "livestock". However, that being said, this does not preclude the weighing of vehicles that are obviously within the specified design limits of a scale classified as a "livestock" scale. Example a 20 ton, 10 ton per section "livestock" scale could weigh a pick up truck of baled hay and be well within the design limits of the livestock scale.

NTEP is not nor was it ever intended to define all the applications acceptable for a specific "class" of scale. It has always been and continues to be the responsibility of the local W&M authority to determine the suitability of a scale for the application. This judgment has to be based on logic and understanding of both the device design and the application in question and must be applied nationally in a uniform basis.

Attachment to Agenda Item 16

The first proposal breaks up the long paragraphs in Publication 14, 2002 Edition vehicle scale test procedures in (hopefully) easier to follow steps.

The second proposal is included in a letter from Ross Anderson, NY, describing the vehicle test procedures that includes the steps in a table format and describes test weights and weight cart positions and usage. Ross Anderson will present additional proposed language, at the Sector meeting.

The Sector also reviewed information provided by the Ohio participating laboratory for possible Checklist Items and Test Report Forms.

Proposal 1:

65a.3.2. Shift Tests. Conduct at least two complete sets of shift tests over each section to at least 90 % of the rated CLC. A single complete shift test is defined in steps a through d.

a. The shift test will be conducted by loading one end section to the first of at least five test loads, moving the load to each section, increasing the load to the next increment (at the opposite end of the scale) and repeating up to at least 90 % of the CLC using loads that are as evenly incremented as possible with the available equipment.

b. Record the error moving the load to each section until the opposite end of the scale is reached, recording the error at each section and at each load.

c. Conduct a decreasing load lest on the section at the end of the scale where the weights can be reloaded.

(Note from NIST Technical Advisor: Is step c. necessary since a decreasing load is done with 90 % CLC (worst case) during the shift test (step e.) and during the strain-load tests? Discuss at next sector meeting?)

d. Repeat the shift test procedure above in steps a, b, and c for each weight increment until at least 90 % of the CLC is reached ~~and on this test where the maximum applied test weights are loaded on the scale~~. While at the maximum test load, locate the test weights and record the errors at each section, mid-span between sections, and on modular scales, each on the right and left side of the module connection line located at each section.

e. Conduct a decreasing load test on one end section of the scale.

(**Note:** If possible, the first increment of test weights should equal 500e. If weights cannot be conveniently applied that equal 500e, the first load should equal just below 500e as nearly as possible. The other tolerance breakpoints should be tested if possible.)

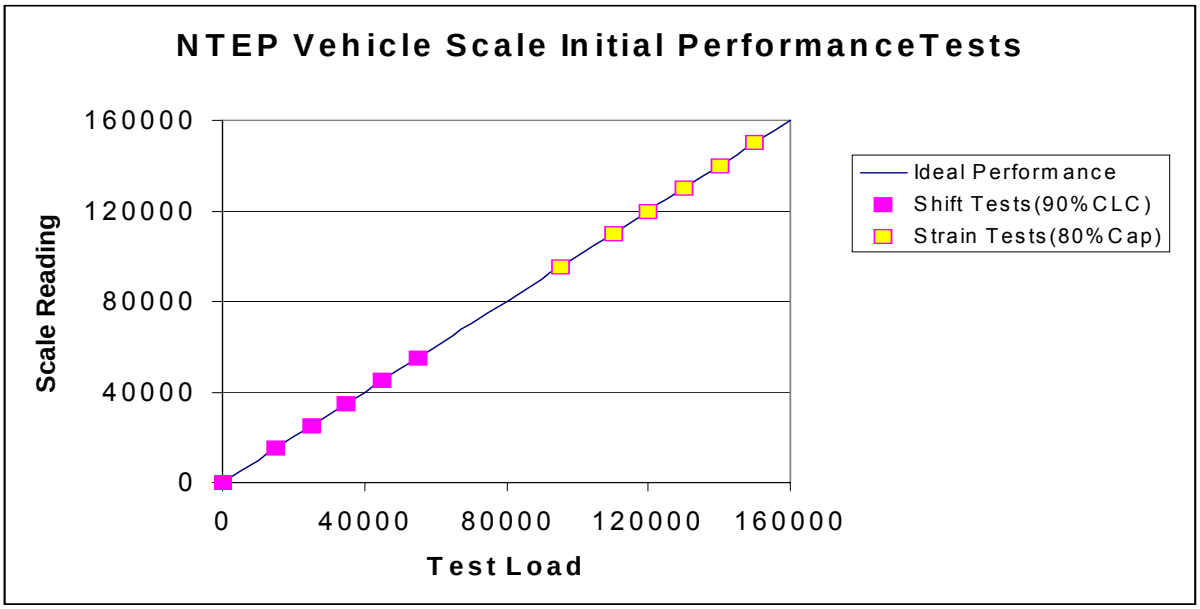
Delete 65a.3.2. and 65a.3.3.

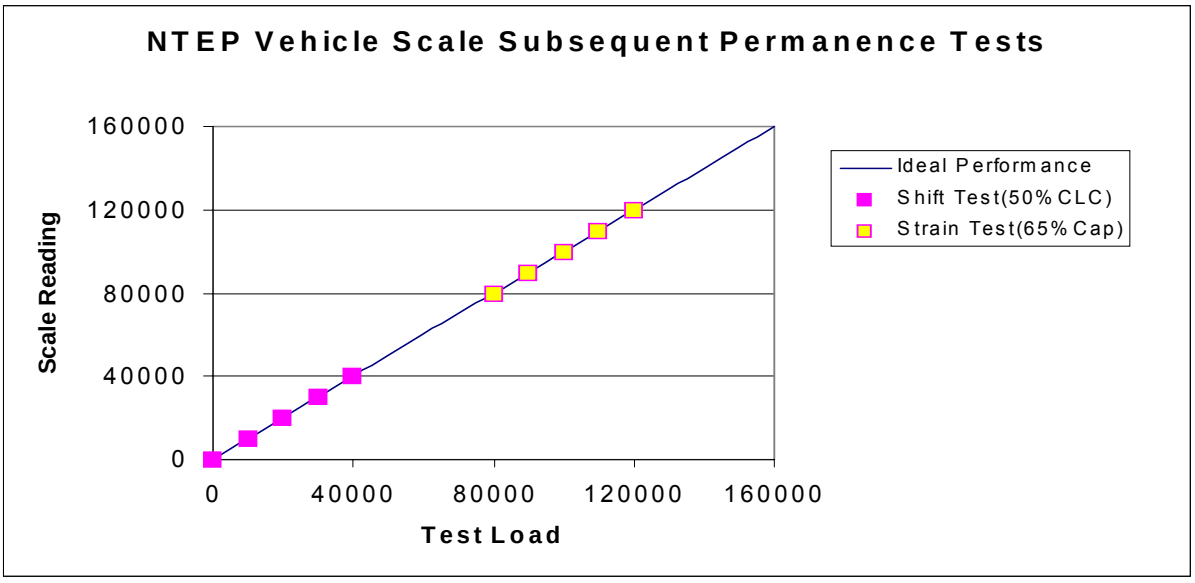
The weighing labs reviewed the remaining procedures for strain load testing and testing of side-by-side and extra wide vehicle scales and felt that, other that the shift test procedures being made clearer consistent with the above recommendation, the procedures, test patterns, and test load positions were representative of these scales potential usage.

Proposal 2:

Outline of Typical NTEP Vehicle Scale Evaluation from Pub 14
By Ross Andersen, New York State
August 29, 2002

This outline is my interpretation of the current Pub 14 Checklist items for testing vehicle scales. It is also based on my participation in the Weighing Sector meetings during their development and training from Henry Oppermann. The diagrams below illustrate that these tests as written will evaluate performance over a fairly wide range of the scale's capacity.





Note: For each X in the tables below, the evaluator shall determine actual errors at each test load and application point. Loading shall be within limits specified by the manufacturer as per scale capacity and CLC. All examples are based on the three-section scale pictured in Pub 14. Test points would be added for additional sections as necessary following the same patterns.

65.3.1. Two complete Sets - Loads 1-5 should be approximately evenly spaced over the test range to reach 90 % of CLC. This does leave some leeway to use test loads close to the tolerance break points and that are convenient to using the weight carts available to maximum advantage. The objective is to provide data that demonstrates increasing load performance over each section of the scale and at each mid-span.

Load \ Location	Sect 1	Mid Span 1-2	Sect 2	Mid Span 2-3	Sect 3
1st Test Load 1	X		X		X
1st Test Load 2	X		X		X
1st Test Load 3	X		X		X

Load \ Location	Sect 1	Mid Span 1-2	Sect 2	Mid Span 2-3	Sect 3
1st Test Load 4	X		X		X
1st Test Load 5	X		X		X
2nd Test Load 1	X		X		X
2nd Test Load 2	X		X		X
2nd Test Load 3	X		X		X
2nd Test Load 4	X		X		X
2nd Test Load 5	X		X		X

65.3.2. One set of shift tests at mid span (May be done in conjunction with one of the sets of shift tests in 65.3.1.)

Load \ Location	Sect 1	Mid Span 1-2	Sect 2	Mid Span 2-3	Sect 3
Mid-span Load 1		X		X	
Mid-span Load 2		X		X	
Mid-span Load 3		X		X	
Mid-span Load 4		X		X	
Mid-span Load 5		X		X	

65.3.3. Test of Module Connections for Modular Scales – Assumes tests in 65.3.1 were done with test load straddling the joint between module 1 and 2. (May be done in conjunction with one of the sets of shift tests in 65.3.1.)

Load \ Location	Left Side Sect 2	Right Side Sect 2
Maximum feasible load e.g. 5	X	X

65.4. Strain Load Tests (65.4.2. - 65.4.5.)

Load \ Location	End A	End B
1st Test - Strain Load distributed on End A	Strain Load	Ref Val
1st Test - Inc Test Load 1 (applied to End B)	Strain Load	X
1st Test - Inc Test Load 2	Strain Load	X
1st Test - Inc Test Load 3	Strain Load	X
1st Test - Inc Test Load 4	Strain Load	X
1st Test - Inc Test Load 5	Strain Load	X
1st Test - Remove Test Load 5	Strain Load	Ref Val
1st Test con't - Inc Load 1	Strain Load	X
1st Test con't - Inc Load 2	Strain Load	X
1st Test con't - Inc Load 3	Strain Load	X
1st Test con't - Inc Load 4	Strain Load	X
1st Test con't - Inc Load 5	Strain Load	X
1st Test con't - Dec Load 4	Strain Load	X
1st Test con't - Dec Load 3	Strain Load	X
1st Test con't - Dec Load 2	Strain Load	X
1st Test con't - Dec Load 1	Strain Load	X
1st Test con't - Dec Load @ Strain load)	Strain Load	X
Remove strain load and rezero scale		
2nd Test - Strain Load distributed on End B	X	Ref Val
2nd Test - Inc Test Load 1 (applied to End A)	X	Strain Load
2nd Test - Inc Test Load 2	X	Strain Load
2nd Test - Inc Test Load 3	X	Strain Load
2nd Test - Inc Test Load 4	X	Strain Load
2nd Test - Inc Test Load 5	X	Strain Load
2nd Test - Remove Strain Load leaving Dec Test Load 5 on End A	X	
2nd Test - Dec Test Load 4	X	

Load \ Location	End A	End B
2nd Test - Dec Test Load 3	X	
2nd Test - Dec Test Load 2	X	
2nd Test - Dec Test Load 1	X	
2nd Test - Dec Test Load at zero	X	

Notes on Initial Performance Tests: I expect that the two sets of shift tests will probably be combined as follows to be as efficient as possible. Note: The two tables below include all the required tests in Pub 14 Section 65.3.

Shift Tests (Set One)

Load \ Location	Sect 1	Mid Span 1-2	Sect 2	Mid Span 2-3	Sect 3
Test Load 1	•	•	•	•	•
Test Load 2	•	•	•	•	•
Test Load 3	•	•	•	•	•
Test Load 4	•	•	•	•	•
Test Load 5	•	•	•	•	•

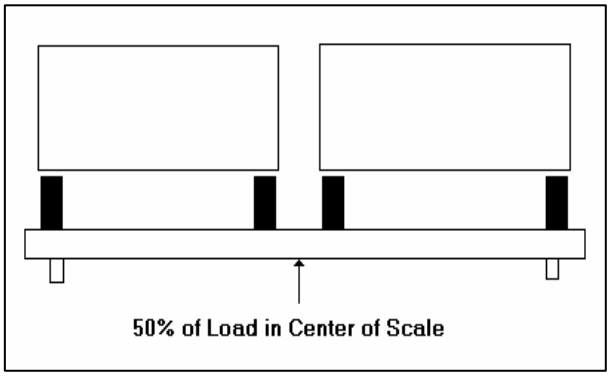
It has been suggested that the strain tests should be done between the two sets of shift tests to ensure that loading the scale near capacity does not change performance.

Shift Tests (Set Two)

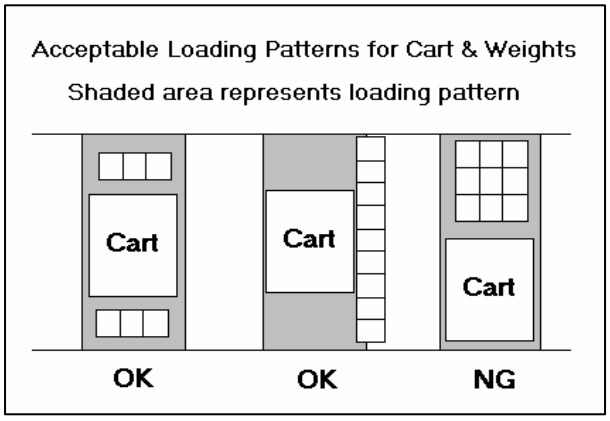
Load \ Location	Sect 1	Left Joint-2	Sect 2	Right Joint 2	Sect 3
Test Load 1	•		•		•
Test Load 2	•		•		•
Test Load 3	•		•		•
Test Load 4	•		•		•
Test Load 5	•	•	•	•	•

Remaining Questions:

? How do you use more than one weight cart? The two carts must be loaded end-to-end to avoid loading the center of the platform. Most carts can't be loaded side by side since they have wheelbases in the 5-6 foot range. Even if they could be loaded side-by-side, the loading pattern would not be acceptable since this would result in 50 % of the test load being loaded on the centerline of the deck where no truck tire can ever reach. Loading the center-line of the platform was industry's big beef on this subject.



? How should weights be loaded in conjunction with a weight cart? To keep loading approximately symmetrical in a pattern, I believe that the weights should either be loaded equally on both sides of the cart or lined up completely across the test pattern immediately in front of or behind the cart.



? What additional tests should be done to cover livestock weighing? We'll cover this subject another day!

65.5. Permanence Tests 20-30 days later after period of use with test loads of at least 40,000 lb or 50 % CLC, whichever is greater. Typically this will only result in four test loads (4 tolerance bands).

65.5.2. Shift Test - One set minimum

Load \ Location	Sect 1	Mid Span 1-2	Sect 2	Mid Span 2-3	Sect 3
1st Test Inc Load 1	X	X	X	X	X
1st Test Inc Load 2	X	X	X	X	X
1st Test Inc Load 3	X	X	X	X	X
1st Test Inc Load 4	X	X	X	X	X

65.5.3. Strain Load Tests - One set minimum

Load \ Location	End A	End B
1st Test - Strain Load distributed on End A	Ref Val X	
1st Test - Inc Test Load 1 (applied to end B)	Strain Load	X
1st Test - Inc Test Load 2	Strain Load	X
1st Test - Inc Test Load 3	Strain Load	X
1st Test - Inc Test Load 4	Strain Load	X
1st Test - Dec Load 3	Strain Load	X
1st Test - Dec Load 2	Strain Load	X
1st Test - Dec Load 1	Strain Load	X
1st Test - Dec Load (Strain)	Ref Val X	
1st Test - Remove strain load - Dec Load @ zero		X
Reestablish zero Reference		
2nd Test - Strain Load distributed on End B		Ref Val X
2nd Test - Inc Test Load 1 (applied to end A)	X	Strain Load
2nd Test - Inc Test Load 2	X	Strain Load
2nd Test - Inc Test Load 3	X	Strain Load
2nd Test - Inc Test Load 4	X	Strain Load
2nd Test - Remove Strain Load leaving Dec Test Load 4 on end A	X	
2nd Test - Dec Test Load 3	X	
2nd Test - Dec Test Load 2	X	
2nd Test - Dec Test Load 1	X	
2nd Test - Dec Test Load at zero	X	

Note: The use of four test loads is based on standard procedure of taking one reading in each tolerance band over the range of weight used in the test.

OHIO NTEP Lab Vehicle Scale Test Procedures and Report Forms

Large Capacity Platform And Vehicle Scales Checklist

Table Of Contents

Table of Contents **Page**

Section 1. Information

Date of Test _____ Control Number _____ CC Number _____
Scale Owner _____
Address _____
City _____ State _____ Zip Code _____
Manufacturer _____
Address _____
City _____ State _____ Zip Code _____
Telephone _____ Fax _____

Section 2. Device

Scale Model Number _____ Scale Capacity _____
Division Size _____ Number of sections _____ Size of Platform(s) _____
Serial Number _____ CC Number _____
CLC _____ Accuracy Class _____

Section 3. Markings

Section 4. Load Cells

Load cells for which Certificates of Conformance have been issued under the National Type Evaluation Program shall be marked with the following:

1. the accuracy class of III, III L corresponding to the scale accuracy class for which its use is intended

2. the maximum number of scale divisions (stated in units of 1 000) for which the accuracy class requirements are met

3. a “S” or “M” for single or multiple cell applications, respectively, in conjunction with the maximum number of scale divisions for each class and application in which the load cell may be used

4. the direction of loading, if not obvious

5. special limits of working temperature if other than 14 °F to 104 °F (-10 °C to 40 °C); and

6. the name and address of the manufacturer or the manufacturer's trademark, model designation, minimum dead load, maximum capacity safe load limit, and load cell verification interval (v_{min}).

The required information may be given on a plate attached to the load cell or, alternatively, in an accompanying document. If the document is the source of the information, the serial number of the load cell shall be marked on the load cell plate and also given in the document. Yes ☐ No ☐

Load Cell Manufacturer _____ Model Number _____
Is/Are load cell(s) NTEP approved Yes ☐ No ☐
CC Number _____ Number of load cells _____
Load Cell Capacity _____ Number of divisions _____ V_{min} _____

Load Cell Serial Numbers:

1.	2.
3.	4.
5.	6.
7.	8.
9.	10.
11.	12.
13.	14.
15.	16.
17.	18.
19.	20.

Load Cell Formulas:

For scales without lever system and N is the number of load cells in the scale: $\mathbf{v_{min}\#d\ )\ /N}$
v_{min} of the load cell must be less than or equal to the scale division divided by the square root of the number of load cells.

For scales with a lever system: $\mathbf{v_{min}\#\ d\ )\ (/N\ x\ scale\ multiple)}$
v_{min} of the load cell must be less than or equal to the scale division divided by the square root of the number of load cells multiplied by the scale multiple.

WORKSHEET
FOR NEW VEHICLE & LIVESTOCK SCALE INSTALLATIONS
HANDBOOK 44 MARKING REQUIREMENTS & SUITABILITY CRITERIA

MARKINGS	INDICATING ELEMENT	WEIGHING ELEMENT	LOAD CELL(s)
Manufacturer			
Model			
CC Number			
Serial Number			
Class III, III L, III/III L			
Capacity			***NA***
"d" Scale Division Value		**NA**	**NA**

MARKINGS	INDICATING ELEMENT	WEIGHING ELEMENT	LOAD CELL(s)
"e_{min}" Minimum Scale Division	NA		NA
"n_{max}" Maximum Number of "d"			
"V_{min}" Verification Scale Div.	NA	NA	
Single Cell (S) or Multiple Cells (M)	NA	NA	
"CLC" Concentrated Load Cap.			NA

Suitability Criteria	Meets Requirements yes no NA
Is e_{min} ≤ d ? _____ ≤	
Is "n"(for system) ≤ n_{max} (smallest of any one) ? _____ ≤	
Is capacity ≤ [(no. sections - 0.5) x CLC]? _____ ≤	
Is V_{min} # d)/N ? (scales without levers) _____ ≤	
Is V_{min} # d)(/N x scale multiple)?(Lever Systems) _____ ≤	

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WORKSHEET
FOR NEW CLASS III SCALE INSTALLATIONS (CAPACITY > 2000 lb)
HANDBOOK 44 MARKING REQUIREMENTS & SUITABILITY CRITERIA

MARKINGS	INDICATING ELEMENT	WEIGHING ELEMENT	LOAD CELL(s)
Manufacturer			
Model			
CC Number			
Serial Number			
Class III, III/III L			
Capacity			NA
"d" Scale Division Value		NA	NA
"e_{min}" Minimum Scale Division	NA		NA
"n_{max}" Maximum Number of "d"			
"V_{min}" Verification Scale Div.	NA	NA	
Single Cell (S) or Multiple Cells (M)	NA	NA	

Suitability Criteria	Meets Requirements yes no NA
Is e_{min} ≤ d ? _____ ≤	
Is "n"(for system) ≤ n_{max} (smallest of any one) ? _____ ≤	
Is V_{min} ≤ d) /N ? (scales without levers) _____ ≤	
Is V_{min} ≤ d) (/N x scale multiple)? (lever systems) _____ ≤	

Section 5. Weight Information

Vehicle scales:

1. The minimum amount of test weights needed for the test is 90 % of the concentrated load capacity.

2. The minimum load for the strain load test in the initial test is at least 80 % of the scale capacity.

3. The minimum load for the strain test in the subsequent test is at least 65 % of the scale capacity.

4. The maximum number of scale divisions for a scale cannot exceed the lesser of the number of divisions for which the load cells and indicator were evaluated separately, i.e., if the load cells have an NTEP Certificate for a maximum of 10 000 divisions and indicator has an NTEP Certificate of 8 000 divisions, then the scale is limited to a maximum of 8 000 divisions.

Section 6. Evaluation Criteria

These evaluation criteria are to be used in conjunction with the applicable NTEP requirements for Digital Electronic Scales (Section 1 of NCWM Publication 14). Also see HB 44 General Code Requirements.

Provisions for Sealing Adjustable Components on Electronic Devices
Code Reference: G-S.8., S.1.11

Due to the ease of adjusting the accuracy of electronic scales, there must be a provision for applying a security seal so that the security seal must be broken before any adjustment that affects the performance of the electronic device can be made. Performance adjustments generally refer to accuracy and sensitivity adjustments. Yes ☐ No ☐

Antifriction Means

Frictional effects shall be reduced to a minimum, by means of suitable antifriction, at all points where system parts may come into contact with each other.

1. System components are properly designed to prevent binds or interfere with the weighing operation.
   Yes ☐ No ☐

2. Frictional effects have been reduced to a minimum. Yes ☐ No ☐

Adjustable Components
Code Reference: S.4.2

An adjustable component, such as a nose iron or potentiometer, shall be held securely in adjustment and shall not be adjustable from the outside of the device except for a component for adjusting level or a no-load reference value.
Yes ☐ No ☐

Repeatability of the Device
Code Reference: G-S.5.4, T.5

A device shall be capable of repeating its indications and recorded representations. The results obtained by several weights of the same load under reasonable static test conditions shall agree within the absolute value of the maintenance tolerance for that load, and shall be within applicable tolerances. This requirement shall be met irrespective of repeated manipulation of any element of the device in a manner approximating normal usage and of the repeated performance of steps or operations that are embraced in the testing procedure.

Repeatability - Indications. Yes ☐ No ☐

Installation Requirements - Protection from Environmental Factors
Code Reference: UR.2.1

The indicating elements, the lever system or load cells, the load-receiving element, and any permanently installed test weights shall be adequately protected from environmental factors such as wind, weather, and RFI that may adversely affect system operation or performance. Yes ☐ No ☐

Installation Requirements - Foundation, Supports, and Clearance
Code Reference: UR.2.2

The foundation and supports of any system shall be such as to provide strength, rigidity, and permanence of all components. Clearance shall be provided around all live parts so that no contact can result before or during operation of the system.

1. Adequate system foundation and supports are provided. Yes ☐ No ☐

2. Sufficient clearance around all live parts is provided. Yes ☐ No ☐

Section 7. Performance and Permanence Tests for Vehicle Scales

Performance tests are conducted to ensure compliance with the tolerances and, in the case of nonautomatic indicating scales, the sensitivity requirements specified in NIST Handbook 44.

The test described here, apply primarily, to the weighing element. It is assumed that the indicating element used during the test has already been examined and found to comply with applicable requirements. If the design and performance of the indicating element is to be determined during the same test, the applicable requirements for weigh beams, poses, dials, electronic digital indications, etc., must also be referenced.

Weighbeams

The sensitivity test is conducted at zero load and at maximum load. The sensitivity test is conducted by determining the actual test weight value necessary to bring the beam from a rest point at the center of the trig loop to rest points at the top and bottom of the trig loop. The maximum load at which the sensitivity test is conducted need not be comprised of known test weight.

Increasing Load and Shift Tests

At least two complete sets of shift tests shall be conducted over each section to at least 90 % of the concentrated load capacity (CLC) of the scale. This is to determine the repeatability of the scale. The scale error should be determined at a minimum of five equally spaced test loads. Scale errors may be determined at more points if desired. If two weight carts are used, they should travel along the paths the wheels of a vehicle would take when moving across the scale. Decreasing load tests are to be avoided when testing a section. A truck many not be backed onto the scale in order to place weights on the inner sections. Decreasing load test shall be conducted after the sections have been tested to their maximum load and the weights are being removed from the scale. Do not exceed the CLC capacity. The load is to be distributed across the section.

At least one complete set of shift tests to at least 90 % of the CLC shall be conducted at midspan between sections.

If a scale consists of modules that are connected together to comprise the weighbridge, shift tests shall be conducted by placing the load so that it straddles the connection between the modules. At least one shift test is to be conducted on the scale where the test load is placed first on one side of the connection line of the module, then on the other side of the connection line.

The results of the shift tests are required to agree within the absolute value of the applicable maintenance tolerances and must be within acceptance tolerances.

NTEP Vehicle Scale Test Report									
Company:					Wind Conditions:			Test No:	
Model:					SN :			Temp:	
Device Type:					Capacity x Division			Tech:	
No. of Sections:			Platform Size:			CLC:		Date:	
Type of Test: Shift ☐ Position ☐ Strain ☐ Weight of Strain Load:_____ Test Weight Amt:_____									
Test Load		/		/		/		/	Tolerance

Comments: _____

_____

_____

Strain Load Test

At least one strain load test shall be conducted at each end of the scale. The maximum load applied during the strain load shall be in the range of 80 to 100 % of scale capacity. The load is to be distributed over the load-receiving element.

Load the scale with a vehicle or vehicles so the addition of test weights will provide a gross load of 80 to 100 % of the scale capacity. Determine the "reference point" for the start of the strain load test. Add the test weights to one of the ends of the scale without exceeding the CLC.

Do not conduct a decreasing load test or a return to the strain load referenced weights as part of this particular strain load test. After removing the test weights from the end of the scale, reestablish the strain load reference value and reapply the test weights to verify that the strain load values repeat the initial values. Conduct a decreasing load test and return to the strain load reference value as the weights are removed as part of this test cycle. The return to the strain load reference value shall be within one-half of a scale division with consideration given for the creep and for an temperature changes that may have occurred during this last cycle.

Remove the known test weights and strain load. Zero the scale, place the strain load on the other end of the scale, and establish the strain load reference value. **Do not** use the zero setting mechanism to set the strain load to zero; the tare mechanism may be used to tare out the strain load. The gross load zero value is needed to conduct a decreasing load test as the strain load is removed in the test.

Repeat the strain load test on the other end of the scale. After reaching the maximum test load for the strain load test, remove the strain load but leave the known test weights on the scale. The weight indication for the decreasing load test must be within tolerance for the known test load. Continue the decreasing load test by removing the known test weights. Take several readings as the weights are being removed. When all the weights are removed, record the return zero. The scale must return to zero within one-half of a scale division. When analyzing the return to zero, consideration must be given for the length of time the load was on the scale and for possible temperature changes that may have occurred during the test.

Acceptance tolerances are applied only to the known test load in the strain load test.

Section 8. Strain Test

Test Load	Known Weight	Indication	Error	Tolerance

Permanence Test

The permanence test shall be conducted at least 20 days after successful completion of the initial performance test. Performance during both tests must be within acceptance tolerances. A minimum of 40 000 lb of known test weights or 50 % of the CLC, whichever is greater is needed. At least one complete set of section tests shall be conducted over each section and at midspan between each section using the known test weights. At least one strain load test shall be conducted at each end of the scale. The maximum applied load shall be in the range of 65 to 100 % of the scale capacity. If a device fails a subsequent permanence test, the entire permanence test must be repeated.

Permanence Test Use Requirements for Vehicle Scales

A minimum of 300 weighing operations are required during the test period (20-30 days). The manufacture is to log the date, time and weight. Each entry is to be initialed by the person conducting the weighing. Only loads which have been applied using a method representative of the scales intended use can be counted.

For vehicle scales with a nominal capacity over 75 000 lb:

50 % of the loads must be above 50 000 lb or 80 % of the CLC, whichever is greater and
100 % of the loads must be above 20 000 lb or 50 % of the CLC, whichever is greater.

For all other scales:

50 % of the loads must be above 50 % of the scale capacity; and
100 % of the load must be above 20 % of the scale capacity.

The minimum number of days that a device is required to be in use is 20 days. The committee did not specify that a certain number of weighing operations needed to be conducted each day for the test period, but recommended that use of the scale be representative of normal in service use.

The device will be tested to the CLC on the subsequent type evaluation (field) performance test.

Section 9. General Considerations

The technician shall ensure that the scale systems main elements and components are NTEP approved, have each been issued an NTEP Certificate of Conformance (CC), and is a replica of that which is described in the CC. Only those features and options evaluated and described in the CC are allowed.

1. Suitability of Equipment

Weighing equipment shall be suitable for the application for which it is to be used, and shall conform to the appropriate sections of HB-44 as correct with respect to its elements of design, including but not limited to its weighing capacity, its computing capability, the character, number, size, and location of its indicating or recording elements, and the value of its smallest division.

2. Environment

Equipment shall be suitable for the environment in which it is used including, but not limited to, the effects of wind, weather and radio frequency interference.

3. Interchange or Reversal of Parts

Parts of a device that may readily be interchanged or reversed in the course of field assembly, or of normal usage, shall be so constructed that their interchange or reversal will not materially affect the performance of the device. Parts that may be interchanged or reversed in normal field assembly shall be:

a. constructed to ensure any interchange or reversal does not affect the performance of the device, or

b. marked to show their proper position.

Section 10. Status: Scale Meets NTEP Requirements? Yes ☐ No ☐

Test Performed By: NTEP: _____
And Witnessed _____ State: _____
By: _____ Manufacturer _____
(The following chart contains the applicable acceptance tolerances)

Section 11: Applied Class III L Acceptance Tolerances for 10, 20, and 50 pound scale divisions

Weight applied	**10 lb "d"**		**20 lb "d"**		**50 lb "d"**	
	d	lb	d	lb	d	lb
Zero	0	0	0	0	0	
10 000	1	10	0.5	20	0.5	25
20 000	2	20	1	20	0.5	25
30 000	3	30	1.5	30	1.0	50
40 000	4	40	2.0	40	1.0	50
50 000	5	50	2.5	50	1.0	50
60 000	6	60	3.0	60	1.5	75
70 000	7	70	3.5	70	1.5	75
80 000	8	80	4.0	80	2.0	100
90 000	9	90	4.5	90	2.0	100

Weight applied	10 lb "d"		20 lb "d"		50 lb "d"	
100 000	10	100	5.0	100	2.0	100
110 000	N/A	N/A	5.5	110	2.5	125
120 000	N/A	N/A	6	120	2.5	125
130 000	N/A	N/A	6.5	130	3	150
140 000	N/A	N/A	7	140	3	150
150 000	N/A	N/A	7.5	150	3	150
160 000	N/A	N/A	8	160	3.5	175
170 000	N/A	N/A	8.5	170	4	200
180 000	N/A	N/A	9	180	4	200
190 000	N/A	N/A	9.5	190	4	200
200 000	N/A	N/A	10	200	4	200