National Type Evaluation Technical Committee (NTETC)
Grain Analyzer Sector
August 23-24, 2006 - Kansas City, Missouri
Meeting Agenda

Agenda Items

1. **Report on the 2006 NCWM Interim and Annual Meetings 1**
2. **Report on NTEP Type Evaluations and OCP (Phase II) Testing 2**
3. **Review of Ongoing Calibration Program (Phase II) Performance Data 2**
4. **Proposed Change to Publication 14 - Bias Tolerances for Test Weight per Bushel 2**
5. **Proposed Amendment to HB44 § 5.56.(a) to Address Minimum Acceptable Abbreviations for Multi-Class Grain Moisture Calibrations 6**
6. **Proposed Changes to Handbook 44 and Publication 14 to Address Multi-Class Calibrations (other than moisture) for Near Infrared Grain Analyzers 7**
   - **(a) Proposed Changes to § 5.57 of NIST Handbook 44: 8**
   - **(b) Proposed Changes to the NIR Grain Analyzer Chapter in the 2006 Edition of Publication 14: 9**
7. **Proposed Change to the GMM Chapter of Publication 14 to Avoid Reducing a Previously Evaluated Approved/Pending Moisture Range Due to Lack of Data 14**
8. **Proposed Changes to HB44 § 5.56.(a), Paragraph S.4. and to the GMM Checklist of Publication 14 to Modify Operating Instruction Requirements. 15**
   - **(a) Proposed Changes to Handbook 44 § 5.56.(a), Paragraph S.4.: 16**
   - **(b) Proposed Changes to the GMM Checklist in the 2006 Edition of NTEP Publication 14: 17**
9. **Report on "Basis of Determination" in Official Grading Standards 17**
10. **Report on OIML TC17/SC1 IR59 "Moisture Meters for Cereal Grains and Oilseeds" . 18**
11. **Report on OIML TC17/SC8 Protein Draft Recommendation 18**
12. **Report on OIML TC5/SC2 Document D-SW, "General Requirements for Software Controlled Measuring Devices" 19**
13. **Time and Place for Next Meeting 19**

---

1. Report on the 2006 NCWM Interim and Annual Meetings

The Interim Meeting of the 91st National Conference on Weights and Measures (NCWM) was held January 22 – 25, 2006, in Jacksonville, FL. The NTEP Committee accepted the Sector's recommended amendments and changes to the 2005 Edition of the Grain Moisture Meter (GMM) chapter of Publication 14. These changes appear in the 2006 Edition. For additional background refer to *Committee Reports for the 91st Annual Meeting*, NCWM Publication 16, April 2006.

Amendments and Changes to the 2005 Edition of the Grain Moisture Meter Chapter of Publication 14			
Section Number	**Amendment/Change**	**Page**	**Source**
Section IV. Tolerances for Calibration Performance	Correct language	GMM-7	08/05 GMM Sector Item 8
Section V. Criteria for NTEP Moisture Calibration Review	Add language for Multi-Class Calibration in Case VIII	GMM-9	08/05 GMM Sector Item 8
Appendix D. Sample Temperature Sensitivity	Correct table	GMM-44	08/05 GMM Sector Item 9

The 91st Annual Meeting of the NCWM was held July 9 – 13, 2006, in Chicago, IL. No Grain Moisture Meter (GMM) or Near Infrared (NIR) Grain Analyzer items appeared in the Specifications and Tolerances (S&T) Committee Interim Report for consideration by the NCWM at the 2006 Annual Meeting.

Steve Patoray, NTEP Director, will report on other issues from these meetings that might be of interest to the Sector.

2. Report on NTEP Type Evaluations and OCP (Phase II) Testing

Cathy Brenner of the Grain Inspection, Processors and Stockyards Administration (GIPSA), the NTEP Participating Laboratory for Grain Analyzers, will bring us up to date on the progress of NTEP Type Evaluations and the collection and analysis of Grain Moisture Meter OCP (Phase II) data on the 2005 crop. She will also identify, for the 2006 harvest, the models enrolled in Phase II.

3. Review of Ongoing Calibration Program (Phase II) Performance Data

At their August 2005 meeting, the Sector agreed that comparative OCP performance data identifying the Official Meter and listing the average bias for each NTEP meter type should be available for annual review by the Sector. Accordingly, Cathy Brenner, representing GIPSA, the NTEP Participating Laboratory for Grain Analyzers, will present data showing the performance of NTEP meters compared to the air oven. These data are based on the last three crop years (2003– 2005) using calibrations updated for use during the 2006 harvest season.

4. Proposed Change to Publication 14 - Bias Tolerances for Test Weight per Bushel

Background: This is a carry-over item from the Sector's August 2005 meeting see the Summary of that meeting for additional discussion.

The Grain Moisture Meter (GMM) Chapter of Publication 14 calls for testing the automatic test weight per bushel (TW) measuring feature of GMMs for accuracy, repeatability (precision), and reproducibility using 12 selected samples of each grain type (for which the meter has a pending or higher moisture calibration). The two tests for accuracy are bias (meter versus the standard reference method) and the Standard Deviation of the Differences (SDD) between the meter and the standard reference method. Publication 14 states that, "The manufacturer may adjust the calibration bias to compensate for differences from the type evaluation laboratory in reference methods or sample sets."

Recent NTEP tests revealed that the results of the bias test, which uses only 12 selected samples, are sample set dependent. Because of this, the NTEP Lab did not list specific bias terms on the Certificate of Conformance (CC) for instruments recently evaluated for TW. Instead, the CC simply indicated that the meter is approved for Test Weight per Bushel measurements.

NIST Handbook 44, Section 5.56.(a) Grain Moisture Meters Code, stipulates:

> **S.2.4.3. Calibration Transfer** - *The instrument hardware/software design and calibration procedures shall permit calibration development and the transfer of calibrations between instruments of like models without requiring user slope or bias adjustments.*

This requirement applies to both moisture and TW calibrations. In devices where grain-dependent TW calibration coefficients (including bias adjustment coefficients) are imbedded in the CC listing of grain moisture calibration coefficients, there is no problem. Any change in coefficients affecting TW will require a change in the moisture calibration and an amendment to the CC. The concern is with devices that do not treat a grain-dependent TW bias adjustment coefficient as part of the moisture calibration. In that case, unless grain-dependent bias adjustment coefficients are listed on the CC, there is no way for field inspectors to know if the most recent adjustment coefficients are being used for test weight. The Sector agreed that if the bias adjustment term is not part of the moisture calibration coefficients then it must be listed on the certificate.

The Sector was in general agreement that TW data from the On-going Calibration Program (OCP), (Phase II), was the best measure of how closely a meter is biased to the standard quart kettle method. In response to a question of whether Phase II TW data for corn for the entire moisture range should be used or only data for a restricted (and lower) moisture range, Dr. Pierce replied that TW data above 20 % moisture would not be used.

The Sector agreed that the Grain Moisture Meter chapter of Publication 14 should be amended using the following guidelines:

1. The Bias test for TW Accuracy will be retained.
2. Data from the Phase II On-going Calibration Review Program may be used at the manufacturer's discretion to support a grain-specific TW bias-adjustment change in a TW calibration. TW data for Corn will be limited to samples with oven moistures not exceeding 20%.
3. A new Phase I evaluation is NOT required for a grain-specific TW bias-adjustment change in a TW calibration supported by Phase II data.
4. Any change in a grain-specific TW calibration (including changes in grain-specific bias adjustments) must be reflected on the CC in a manner obvious to field inspectors.
5. The Bias results for TW accuracy for each of the two instruments of like-type submitted for evaluation must agree with each other by the same tolerance that they must agree with the reference method.

Proposed: Make the following changes in the 2006 Edition of the GMM chapter of *NCWM Publication 14*, §**. VII. Additional Type Evaluation Test Procedures and Tolerances for Grain Moisture Meters Incorporating an Automatic Test Weight per Bushel Measuring Feature:**

(1) In part **B. Accuracy, Precision, and Reproducibility** amend the **Accuracy** tests to include tolerance specifications for bias difference between two like instruments.
(2) Add part **C. Tolerances For Test Weight per Bushel Calibration Performance** to define calibration performance requirements on the basis of data collected as part of the on-going national moisture calibration program.

Proposed changes are shown below:

[Editor's note: Added equations and terms used in the equations are not underscored. Microsoft Word's "Track Changes" feature does not underscore objects created with "Microsoft Equation 3.0." Changed areas are, however, marked by a vertical line in the left margin.]

III. Accuracy, Precision, and Reproducibility Requirements

.
.
.

A. Basic Instrument Tests:

.
.
.

B. Accuracy, Precision, and Reproducibility

.
.
.

Accuracy. The two tests for accuracy are bias (meter versus the standard reference method) and the Standard Deviation of the Differences (SDD) between the meter and the standard reference method. Each instrument will be tested individually. Additionally, the bias results for accuracy for each of the two instruments of like-type submitted for evaluation must agree with each other by the same tolerance that they must agree with the reference method.

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

where,

$\bar{x}_i =$ average predicted test weight per bushel for sample *i* (3 replicates)

$r_i =$ reference test weight per bushel for sample *i*

$n =$ number of samples (n=12)

$\Delta Bias = |Bias_1 - Bias_2|$

where,

$|\Delta Bias| =$ absolute value of difference between the bias of instrument 1 and instrument 2

$Bias_1 =$ bias of instrument 1 (meter versus the standard reference method)

$Bias_2 =$ bias of instrument 2 (meter versus the standard reference method)

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

where,

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

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

$n =$ number of samples (n=12)

Tolerances for bias, bias difference, and SDD tests are one-half the absolute value of the NIST Handbook 44 acceptance tolerance. Specific tolerances are:

Grain Type	Tolerance
Corn, oats	0.4 pounds per bushel
All wheat classes	0.25 pounds per bushel
Soybeans, barley, rice, sunflower, sorghum	0.35 pounds per bushel

The manufacturer may adjust the calibration bias to compensate for differences from the type evaluation laboratory in reference methods or sample sets. Note: Any such adjustments for calibration bias must be identical for each of the two instruments of like-type submitted for evaluation.

.

.

C. Tolerances For Test Weight per Bushel Calibration Performance:

In addition to the Basic Instrument Tests and the Accuracy, Precision, and Reproducibility Tests cited previously, test weight per bushel calibration performance will be monitored using test weight per bushel data collected as part of the on-going national moisture calibration program (Phase II). Evaluation of test weight per bushel performance for corn will be limited to data collected on samples with moisture content not exceeding 20 percent as determined by the USDA air-oven reference method.

For up to three years of available test weight per bushel data:

a. The difference between the average bias to quart kettle for all samples in a given year and the average bias to quart kettle for any other year shall not exceed: 0.80 for corn and oats; 0.50 for wheat; and 0.70 for all other grains.

b. The average calibration bias with respect to quart kettle shall not exceed: 0.80 for corn and oats; 0.50 for wheat; and 0.70 for all other grains calculated using the most recent calibration and all available raw data collected within the last 3 years for the entire moisture range (data for corn samples above 20 percent moisture will be excluded.)

Failure to meet the requirements in either item a. or b. above will cause removal of test weight per bushel approval status for the affected grain type(s) on the NTEP Certificate of Conformance (CC) for that instrument.

Test weight per bushel data from Phase II may be used at the manufacturer's discretion to support a grain-specific bias adjustment change in a test weight per bushel calibration. A repeat of the Basic Instrument Tests and the Accuracy, Precision, and Reproducibility Tests cited previously is not required for a grain-specific bias-adjustment change in a test weight per bushel calibration supported by Phase II data.

Any change in a grain-specific Test Weight per Bushel calibration (including changes in grain-specific bias adjustments) must be reflected on the CC in a manner obvious to field inspection personnel.

5. Proposed Amendment to HB44 § 5.56.(a) to Address Minimum Acceptable Abbreviations for Multi-Class Grain Moisture Calibrations

Discussion: ***NIST Handbook 44*, §5.56.(a)** Paragraph **S.1.2. Grain of Seed Kind and Class Selection and Recording** requires that, "The means to select the kind and class of grain or seed shall be readily visible and the kind and class of grain or seed selected shall be clearly and definitely identified." The GMM Chapter of NIST Publication 14 was recently amended to allow multi-class moisture calibrations. A multi-class grain calibration that includes all the NTEP classes of that grain type (e.g., two-rowed barley and six-rowed barley) can be clearly and definitely identified by a single type name (e.g., barley). Similarly, both long grain and medium grain rough rice could be identified unambiguously as "rough rice". However, a multi-class grain calibration that does not include all of the NTEP classes of a grain type may not be clearly and definitely identified using a single grain type name (e.g., wheat). For example, a calibration for "all wheat except durum" cannot be labeled "wheat" because the grain type "wheat" includes "durum wheat". The acceptable abbreviations (and grain names) in Table S.1.2. of Handbook 44 don't address the groupings and the names that might be used for selecting and recording multi-class calibrations.

Proposed: Add Paragraph **S.1.2.1. Multi-Class Grain or Seed Selection and Recording** and **Table S.1.2.1. Acceptable Names and Minimum Acceptable Abbreviations for Multi-Class Groups** to **§5.56.(a)** of NIST Handbook 44 to specify allowed groupings for Multi-class calibrations that are selected by the group name (or an acceptable abbreviation of the name). Proposed additions are shown below:

S.1.2.1. Multi-Class Grain or Seed Selection and Recording

Unless multi-class grain calibrations can be selected (and recorded) by the kind or class of each individual grain to be measured using the multi-class calibration, the use of multi-class calibrations shall be limited to the groupings shown in Table S.1.2.1. Provision shall be made for selecting and recording the multi-class group of grain or seed to be measured. The means to select the multi-class group shall be readily visible and the group selected shall be clearly and definitely identified. Abbreviations for multi-class groups indicated on the meter must meet the minimum acceptable abbreviations listed in Table S.1.2.1., Meters shall have the capability (i.e., display capacity) of indicating the group name using a minimum of eight characters in order to accommodate the eight-character abbreviations listed in Table S.1.2.1. (Added January 1, 2008)

Table S.1.2.1. Acceptable Names and Minimum Acceptable Abbreviations for Multi-Class Groups		
Multi-Class Group Name	***Minimum Acceptable Abbreviation***	***Classes Included in Group***
All-class wheat	*ALLWHEAT*	*Durum Wheat* *Soft White Wheat* *Hard Red Spring Wheat* *Hard Red Winter Wheat* *Soft Red Winter Wheat* *Hard White Wheat*
Soft wheat	*SFTWHEAT*	*Soft White Wheat* *Soft Red Winter Wheat*
Hard wheat	*HDWHEAT*	*Hard Red Spring Wheat* *Hard Red Winter Wheat* *Hard White Wheat*
Red wheat	*REDWHEAT*	*Hard Red Spring Wheat* *Hard Red Winter Wheat*
White wheat	*WHITEWHT*	*Soft White Wheat* *Hard White Wheat*
Wheat excluding Durum	*WHTEXDUR*	*Soft White Wheat* *Hard Red Spring Wheat* *Hard Red Winter Wheat* *Soft Red Winter Wheat* *Hard White Wheat*
All-class barley	*BARLEY*	*Two-rowed Barley* *Six-rowed Barley*
All-class rough rice	*RGHRICE*	*Long Grain Rough Rice* *Medium Grain Rough Rice*

(Table Added January 1, 2008)

6. Proposed Changes to Handbook 44 and Publication 14 to Address Multi-Class Calibrations (other than moisture) for Near Infrared Grain Analyzers

Background/ Discussion: The GMM Chapter of NIST Publication 14 was recently amended to allow multi-class moisture calibrations. An addition has been proposed to the GMM Code of Handbook 44 to specify allowed multi-class groupings when user selection of a multi-class group is performed using the group name or an abbreviation of the name. The NIR Grain Analyzer program allows for either individual-class calibrations or "all-class" calibrations for constituents other than moisture, but doesn't have any provisions for multi-class calibrations for those constituents. The Sector has been asked to consider modifying NIR Grain Analyzer Code of Handbook 44 and the corresponding sections of Publication 14 to more closely resemble the recent and proposed changes made to handle multi-class moisture calibrations. For additional discussion on the proposed change to Handbook44, see Agenda item 5.

Proposed: (a) Add Paragraph **S.1.2.1. Multi-Class Grain or Seed Selection and Recording** and **Table S.1.2.1. Acceptable Names and Minimum Acceptable Abbreviations for Multi-Class Groups** to **§5.57** of NIST Handbook 44, and (b) Amend § **III. Accuracy, Precision, and Reproducibility Requirements** in the 2005 Edition of the GMM Chapter of *NCWM Publication 14* to add criteria applicable to "multi-class" calibrations. Proposed additions and changes are shown below.

(a) Proposed Changes to § 5.57 **of NIST Handbook 44:**

S.1.2.1. Multi-Class Grain or Seed Selection and Recording

Unless multi-class grain calibrations can be selected (and recorded) by the kind or class of each individual grain to be measured using the multi-class calibration, the use of multi-class calibrations shall be limited to the groupings shown in Table S.1.2.1. Provision shall be made for selecting and recording the multi-class group of grain or seed to be measured. The means to select the multi-class group shall be readily visible and the group selected shall be clearly and definitely identified. Abbreviations for multi-class groups indicated on the meter must meet the minimum acceptable abbreviations listed in Table S.1.2.1., Meters shall have the capability (i.e., display capacity) of indicating the group name using a minimum of eight characters in order to accommodate the eight-character abbreviations listed in Table S.1.2.1. (Added January 1, 2008)

Table S.1.2.1. Acceptable Names and Minimum Acceptable Abbreviations for Multi-Class Groups		
Multi-Class Group Name	***Minimum Acceptable Abbreviation***	***Classes Included in Group***
All-class wheat	*ALLWHEAT*	*Durum Wheat* *Soft White Wheat* *Hard Red Spring Wheat* *Hard Red Winter Wheat* *Soft Red Winter Wheat* *Hard White Wheat*
Soft wheat	*SFTWHEAT*	*Soft White Wheat* *Soft Red Winter Wheat*
Hard wheat	*HDWHEAT*	*Hard Red Spring Wheat* *Hard Red Winter Wheat* *Hard White Wheat*
Red wheat	*REDWHEAT*	*Hard Red Spring Wheat* *Hard Red Winter Wheat*
White wheat	*WHITEWHT*	*Soft White Wheat* *Hard White Wheat*
Wheat excluding Durum	*WHTEXDUR*	*Soft White Wheat* *Hard Red Spring Wheat* *Hard Red Winter Wheat* *Soft Red Winter Wheat* *Hard White Wheat*
All-class barley	*BARLEY*	*Two-rowed Barley* *Six-rowed Barley*
All-class rough rice	*RGHRICE*	*Long Grain Rough Rice* *Medium Grain Rough Rice*

(Table Added January 1, 2008)

(b) Proposed Changes to the NIR Grain Analyzer Chapter in the 2006 Edition of Publication 14:

III. Accuracy, Precision, and Reproducibility Requirements

Grain analyzers will be tested for accuracy, repeatability (precision), and reproducibility over the applicable constituent concentration ranges shown in Table 1. Instrument and calibration performance will be individually tested for each grain type and constituent.

Table 1. Constituent Ranges for Type Evaluation				
Grain Type	**Constituent**	**Constituent Range (%) at Moisture Basis (M.B.) Shown**	**Low Moisture Range**	**High Moisture Range**
Durum Wheat	Protein	10 - 18 at 12% M.B.	10% - 12%	13% - 15%
Hard Red Spring Wheat	Protein	10 - 19 at 12% M.B.		
Hard Red Winter Wheat	Protein	8 - 18 at 12% M.B.		
Hard White Wheat	Protein	9 - 16 at 12% M.B.		
Soft Red Winter Wheat	Protein	9 - 12 at 12% M.B.		
Soft White Wheat	Protein	8 - 15 at 12% M.B.		
"All Class" Wheat Calibration*	Protein	8 - 19 at 12% M.B.		
Soft Wheat Calibration*	Protein	8 - 15 at 12% M.B.		
Hard Wheat Calibration*	Protein	8 -19 at 12% M.B.		
Red Wheat Calibration*	Protein	8 - 19 at 12% M.B.		
White Wheat Calibration*	Protein	8 - 16 at 12% M.B.		
Wheat Excluding Durum*	Protein	8 - 19 at 12% M.B.		
Two-rowed Barley	Protein	8 - 17 at 0% M.B.	10% - 12%	13% - 15%
Six-rowed Barley	Protein	8 - 17 at 0% M.B.		
"All Class" Barley Calibration*	Protein	8 - 17 at 0% M.B.		
Corn	Protein	8 - 12 at 0% M.B.	11% - 13%	14% - 16%
	Oil	3 - 9 at 0% M.B.		
	Starch	67 - 73 at 0% M.B		
Soybeans	Protein	30 - 40 at 13% M.B.	10% - 12%	13% - 15%
	Oil	16 - 21 at 13% M.B.		

[Note: Calibrations marked with an asterisk (*) are "Multi-class calibrations.]

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				
Soft Wheat Calibration*	Protein				
Hard Wheat Calibration*	Protein				
Red Wheat Calibration*	Protein				
White Wheat Calibration*	Protein				
Wheat Excluding Durum*	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

[Note: Calibrations marked with an asterisk (*) are "Multi-class calibrations.]

Two instruments will be tested using test sets consisting of no less than 50 samples for each grain type to be used on the instrument submitted for type approval. (Note: In cases where grain types have multiple constituent calibrations, more than 50 samples may be required to satisfy the range requirements for each constituent associated with that grain type.) The sample set will be screened using the GIPSA official instrument model and reference method. Samples where the official instrument model disagrees from the reference method by more than the Handbook 44 acceptance tolerance will be deleted and another sample selected to replace it. No sample set will be used where the standard deviation of the differences between the GIPSA official instrument model and the reference method exceeds one-half the Handbook 44 acceptance tolerance applied to individual samples. Finally, any sample result not within three standard deviations of the mean for the test instrument will be dropped before analysis of the data.

Three replicates will be run on each instrument for each sample, resulting in a minimum of 300 observations per constituent calibration (2 instruments x 50 samples-minimum x 3 replicates).

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.

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

x_i = predicted constituent concentration for the first replicate of sample i

r_i = reference constituent concentration for sample i

$y_i = x_i - r_i$

$\bar{y}$ = 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.)

The tolerance for SEP is shown in Table 2.

If requested by the applicant, data from a 20-sample slope set will be provided for adjusting calibration slope and bias prior to the start of type evaluation testing. No further standardization adjustments will be made during type evaluation testing.

Note 1: ~~"All-class"~~ "Multi-class" calibrations will be tested using full test sets for all included classes (50 x number of classes). In addition to meeting accuracy requirements (SEP) for the tests sets of each individual class, ~~"all-class"~~ "Multi-class" calibrations must meet the accuracy requirements (SEP) when the data from all included classes is pooled.

Note 2: A single slope and bias will be used for ~~all-class~~ "multi-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:

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

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

$\overline{P}_i$ = 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.)

The tolerance for repeatability is shown in Table 2.

Note: ~~"All-class"~~ "Multi-class" calibrations will be tested using full test sets for all included classes. ~~"All-class"~~ "Multi-class" calibrations must meet the repeatability requirements (SD) for the test sets of each individual class.

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:

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

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 d_i

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

The tolerance for reproducibility is shown in Table 2.

Note: ~~"All-class"~~ "Multi-class" calibrations will be tested using full test sets for all included classes. ~~"All-class"~~ "Multi-class" calibrations must meet the reproducibility requirements (SDD) for the test sets of each individual class.

7. Proposed Change to the GMM Chapter of Publication 14 to Avoid Reducing a Previously Evaluated Approved/Pending Moisture Range Due to Lack of Data

Background: At the Sector's August 2005 meeting Dr. Richard Pierce, GIPSA (the NTEP Laboratory) mentioned that the NTEP Laboratory is having problems increasing and decreasing "approved" or "pending" ranges of grain moisture meters depending on the data available in the most recent 3-year period. Most Sector members agreed that it didn't seem logical to reduce a range solely because data previously used to justify the range classification had to be dropped from the most recent 3-year period. Further discussion of the issue at that time was dropped because of time restraints.

The present system for determining the range of 2 percent moisture intervals eligible for "approved" status uses only the most recent three years of NTEP data. An "approved" range cannot be extended by including manufacturer data. When the "approved" and "pending" moisture ranges were originally proposed, it was believed that after a meter had been in the Phase II on-going calibration program for 3 years the "pending" classification would go away, because there would always be sufficient data in the 2 percent intervals at the end of the calibration data range. Experience has shown that this is not the case. In fact, to maintain even a "pending" classification at the ends of the calibration data range, manufacturers often have to supply archived Phase II data to supplement the most recent 3 years used for the initial NTEP Calibration Report. With that data, moisture intervals listed as "not approved" on the initial calibration report can be upgraded to "pending" if the bias to air oven is within the approval tolerance for that moisture interval. Confidence intervals are not applied to approval tolerances for use in determining "pending" ranges when manufacturer data is used.

Discussion: For calibration performance comparison purposes, it seems logical to continue using data from the most recent 3-year period. As new models are added to the Ongoing Calibration Program (Phase II), comparisons between meters become meaningful sooner than they would have if a longer period had been chosen.

At first glance, it also appears logical to recommend, provided a calibration has not changed, that moisture ranges previously evaluated as "pending" or "approved" not be reduced due to lack of data in subsequent 3-year periods, but hard to find samples are only one issue. The NTEP Laboratory has reported instances where there were quite a few samples in a moisture interval with the samples coming from only one or two growing locations. This resulted in meter to oven biases that varied from year to year depending on the source of the samples. In one meter and one moisture interval, the meter was out of NTEP tolerance using the last 3 years of data but biased within 0.08 of air oven when using the last 5 years of data.

When it comes to determining how to set operating limits for an individual meter, one would think that using five years of available Phase II data would increase the number of samples across the entire moisture range and reduce the number of inadequately represented moisture intervals. However, for some grains no samples have been received in some moisture ranges within the last three years or even the last five years. There are cases where only one sample is available in a 2 percent interval.

Eliminating or even reducing the problems encountered in determining "approved" or "pending" calibration ranges may require not only using more than the most recent three years or even five years of Phase II data but also limiting the moisture range over which an "approved" or "pending" rating can be granted. In practice, the present distinction between "approved" and "pending" classifications is lost to the user. The upper and lower moisture limits for a device are set using the "pending" range, so any "out of limits" warning printed or displayed appears only when the "pending" range is

exceeded. Limiting the use of "pending" to a new device that has not been evaluated in Phase II could simplify the administration of Phase II and the annual re-issuing of CCs.

The Sector is asked to consider recommending major revisions to the GMM Chapter of Publication 14 that would be based on the following points:

1. Redefine "Pending" to be simply: A new calibration that has not been validated by ongoing calibration data collected as part of the national calibration program.

2. The upper and lower moisture limits for a new device are to be set using the standard 6 percent moisture ranges used in device evaluation.

3. Retain the present GMM comparison report based on the most recent 3-years of Phase II data. This report will be used for comparison purposes and for review by the Sector.

4. Limit the use of manufacturer data to the initial type evaluation and first complete season while enrolled in Phase II.

5. Prepare a second calibration report using all available Phase II data on file at GIPSA. This report is to be used to determine "approved" ranges. "Approved" ranges are to be used to set the upper and lower moisture limits for a GMM.

6. The maximum upper moisture interval and the minimum lower moisture interval that can be given "approved" status will be defined for each grain. These upper and lower limits are to be fixed values that do not change from year to year.

Development of specific wording for the changes will depend on decisions reached by the Sector on the above points.

8. Proposed Changes to HB44 § 5.56.(a), Paragraph S.4. and to the GMM Checklist of Publication 14 to Modify Operating Instruction Requirements.

Source: Cassie Eigenmann, DICKEY-john

Discussion: Item (d) of paragraph S.4. in Handbook 44, **§ 5.56.(a) Grain Moisture Meters** requires that operating instructions for the device specify "the kinds or classes of grain or seed for which the device is designed to measure moisture content and test weight per bushel." Item (e), which requires declaring a device's "limitations of use" in the operating instructions, includes "kind or class of grain or seed" in the list of limitations to be declared and also requires that the "moisture measurement range" be shown, presumably for each grain or seed. These requirements are redundant, considering that paragraph **S.1.3. Operating Range** specifies that "A meter shall automatically and clearly indicate when the operating range of the meter has been exceeded," with item (c) of that paragraph further stating, " "Moisture and test weight per bushel values may be displayed when the moisture range is exceeded if accompanied by a clear indication that the moisture range has been exceeded." The requirements of S.4 are also unnecessarily burdensome to manufacturers selling their GMMs in markets outside the U.S. In those markets, the kinds and classes of grain or seed for which the GMM is to be used may not be the same as in the U.S. and may include non-NTEP grain or seed. In the U.S., information pertaining to the kinds and classes of grain or seed for which the device is designed to measure moisture and TW are included in the NTEP CC along with the moisture measurement range of each NTEP grain or seed. Furthermore, the kinds and classes of grain are listed on the device's "menu" of included calibrations.

Proposed: (a) Modify paragraph S.4 for clarity and to address the above issues, and (b) modify the 2006 issue of the Grain Moisture Meter checklist of NTEP Publication 14 to reflect the changes in paragraph S.4. Proposed changes are shown below:

(a) Proposed Changes to Handbook 44 § 5.56.(a), Paragraph S.4.:

S.4. Operating Instructions and Use Limitations. - The manufacturer shall furnish operating instructions for the device. Complete information concerning the accuracy, sensitivity, and use of accessory equipment necessary in obtaining a moisture content shall be included.~~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:

(a) name ~~and address (~~or trademark) and address of the manufacturer;

~~(b) the type or design of the device with which it is intended to be used;~~

(~~c~~b) date of issue;

(~~d~~c) the kinds or classes of grain or seed for which the device is designed to measure moisture content and test weight per bushel;
(Amended 2003)

(d) the moisture measurement range for each grain or seed;

(e) the limitations of use, including but not confined to ~~the moisture measurement range,~~ grain or seed temperature, maximum allowable temperature difference between grain sample and meter, ~~kind or class of grain or seed~~, moisture meter temperature, voltage and frequency ranges, electromagnetic interferences, and necessary accessory equipment.

(Added 1984)(Amended 2007)

The requirements of items (c) and (d) do not apply to devices which have received an NTEP Certificate of Conformance. Manufacturers submitting a device for NTEP evaluation may satisfy the requirements of (c) and (d) by submitting the required information with their application for evaluation.

(b) Proposed Changes to the GMM Checklist in the 2006 Edition of NTEP Publication 14:

Code Reference: S.4. Operating Instructions and Use Limitations

4.12.	Operating instructions shall be furnished by the manufacturer with each device. Complete information concerning the accuracy, sensitivity, and use of accessory equipment necessary in obtaining a moisture content shall be included. In addition, operating instructions shall include the following information:		**Yes ☐ No ☐ N/A ☐**
	4.12.1.	Name ~~and address (~~or trademark) and address of the manufacturer.	**Yes ☐ No ☐ N/A ☐**
	~~4.12.2.~~	~~The type or design of the device with which it is intended to be used.~~	**Yes ☐ No ☐ N/A ☐**
	4.12.~~3~~2.	Date of issue.	**Yes ☐ No ☐ N/A ☐**
	4.12.~~4~~3.	The kinds or classes of grain or seed for which the device is designed to measure moisture content.	**Yes ☐ No ☐ N/A ☐**
	4.12.4	The moisture measurement range for each grain or seed.	
	4.12.5.	The limitations of use (e.g., ~~moisture measurement range,~~ grain or seed temperature, maximum allowable temperature difference between grain sample and meter, ~~kind or class of grain or seed,~~ instrument temperature, voltage and frequency ranges, electromagnetic interferences, and necessary accessory equipment).	**Yes ☐ No ☐ N/A ☐**

9. Report on "Basis of Determination" in Official Grading Standards

Source: Richard Pierce, GIPSA

Discussion: The principles governing application of official grain grading standards include definitions of the “basis of determination” to be used for each of the individual official tests. The "basis of determination" identifies whether a measurement will be made on the whole grain sample, also referred to as the entire or original grain sample, or on a grain sample after dockage has been removed and/or after the sample has been cleaned.

The various "basis of determination" requirements are part of the U.S. grain grading standards and most have not been changed since USDA began implementing official standards in 1916. Current standards require that:

- official moisture measurements be made on the whole (un-cleaned) grain sample.
- test weight measurements be made on the whole grain sample for some grain types while for other grain types that test weight measurements be made on grain samples with dockage removed.
- protein and oil determinations be made using clean grain samples.

Largely because conflicting "basis of determination" requirements are a barrier to adoption of multi-use instruments in official inspection, GIPSA is investigating the potential for establishing a common "basis of determination" for determining moisture, test weight, protein, and oil. Also, there is concern that moisture and test weight measurements on un-cleaned grain samples may yield results that are not accurate for either the grain portion of the sample or the dockage in the sample.

A GIPSA representative will present an historical overview of inspection practices; a review of the levels of foreign material (FM), dockage, etc. measured in samples that have been officially inspected in recent years; and preliminary data indicating how moisture and test weight measurements are affected as different levels of dockage are added to a clean sample.

Because NTEP evaluations are conducted using clean grain samples; because GIPSA and NTEP calibrations are developed using data collected on clean grain samples; and because state field testing is conducted using clean grain samples, this presentation is intended at this time only to share information. As additional data becomes available on the effects of testing un-cleaned grain samples, and as GIPSA considers possible changes in "basis of determination" requirements, the Sector may want to discuss the possible implications for state regulated commercial transactions.

10. Report on OIML TC17/SC1 IR59 "Moisture Meters for Cereal Grains and Oilseeds"

Background: This item was included on the Sector's agenda to provide a summary of the activities of OIML TC17/SC1. The Secretariat (China) is working closely with the United States and a small international work group (IWG) to revise OIML R 59 "Moisture Meters for Cereal Grains and Oilseeds." All drafts have been distributed to the USNWG, which for the most part is a subset of the NTEP Grain Analyzer Sector. In October 2003 China hosted a meeting of the TC 17/SC 1 subcommittee in Beijing to review and discuss this revised document. A 2nd Committee Draft (CD) that incorporated U.S. comments was circulated in May 2004 by the Secretariat. A meeting of the IWG was held in Paris in September 2004 to resolve conflicts on the document. U.S. comments on the 3rd CD (dated April 2005) of R 59 were returned to the Secretariat in August 2005 for incorporation into the next draft.

Discussion: Diane Lee, NIST/WMD, will report on the status of next committee draft and will bring the Sector up-to-date on the schedule for the next meeting of TC17/SC1.

11. Report on OIML TC17/SC8 Protein Draft Recommendation

Background: This item was included on the Sector's agenda to provide a summary of the activities of OIML TC17/SC8. Australia, secretariat of TC17/SC8, developed an outline of the "Recommendation on Protein Measuring Instruments for Cereal Grain" (March 2004) that was circulated to participating nations (Australia, Brazil, Canada, Czech Republic, Germany, Japan, Poland, Republic of Korea, Russia, and the United States) for comments. In the U.S. the document was circulated to the U.S. National Work Group (USNWG) for comments. OIML TC17/SC8, charged with developing an International Recommendation (IR) for "Protein Measuring Instruments for Cereal Grain," met May 31 – June 1, 2004, in Sydney, Australia. At that meeting the scope of the recommendation was expanded to include wheat, barley, corn, soybeans, and rice, and changes were made to allow the national measurement authority to determine moisture basis, reference method, instrument monitoring process, and whether or not to test non-indirect measuring devices.

The U.S. received a 2nd WD of this document in August 2004, and a 3rd WD was received in May 2005. The USNWG members provided comments to this draft relating mostly to parts of the document that appeared to be in conflict with U.S. metrological practice and procedures. An International Work Group meeting was held in June 2005 in Berlin to discuss the latest round of comments on the 3rd WD.

Discussion: The Secretariat for OIML TC 17/SC 8, has recently submitted a 1st Committee Draft on "Protein Measuring Instruments for Cereal Grain and Oil Seeds" dated May 1, 2006. The closing date for U.S. comments on the draft recommendation was July 1, 2006. Diane Lee, NIST/WMD, will report on U.S. comments received.

12. Report on OIML TC5/SC2 Document D-SW, "General Requirements for Software Controlled Measuring Devices"

Background: In 2004 all OIML TCs and SCs that were revising an OIML Recommendation were contacted to ensure that software aspects are considered in revised Recommendations. All OIML Documents and Recommendations published since 1990 were reviewed for terms and requirements related to software. A pre-draft of the document "Software in Legal Metrology" was circulated in October 2004 by the Secretariat (Germany and France). When complete, this document will serve as guidance for OIML technical committees addressing software requirements in Recommendations for software-controlled instruments. The NIST/International Legal Metrology Group (ILMG) submitted U.S. comments on an early draft in February 2005. The 1st working draft of this document, titled: "General Requirements for Software Controlled Measuring Instruments" was received in February 2006. U.S. comments on this draft were sent to the Secretariat May 30, 2006. The 1st working draft and the U.S. comments can be viewed on the NIST/WMD website at http://ts.nist.gov/ts/htdocs/230/235/TC5-SC2.htm.

Discussion: Diane Lee, NIST/WMD, will report on the current status of the document and on U.S. comments.

13. Time and Place for Next Meeting

A tentative date and location will be selected for the next meeting. A late August meeting in St. Louis or Kansas City is suggested.