Appendix A

National Type Evaluation Technical Committee
Grain Analyzer Sector

August 20, 2008 – Kansas City, Missouri
Meeting Summary

Agenda Items

1. Report on NCWM Administrative Staff Changes

Effective October 1, 2008, NCWM, Inc. will have a new management structure. The first step in this transition has been completed with the hiring of Don Onwiler as the new NCWM Executive Director and Jim Truex as NTEP Administrator. Don will work out of the Lincoln, Nebraska, office and Jim will operate from a home office in Ohio. The transition of duties from Management Solutions in Rockville, Maryland, to the new NCWM Headquarters in Lincoln will occur gradually over the coming weeks and will be completed by October 1, 2008. Contact information for the new offices is shown below:

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2. Report on the 2008 NCWM Interim and Annual Meetings

The Interim Meeting of the 93rd National Conference on Weights and Measures (NCWM) was held January 27 - 30, 2008, in Albuquerque, New Mexico. At that meeting the NTEP Committee accepted the Sector's recommended amendments and changes to the 2007 Edition of NCWM Publication 14. These changes appear in the 2008 Edition (see also *ADDENDUM SHEET Pub 14, Grain Analyzers 2008 Edition ISSUED April 24, 2008* for changes not included in the original 2008 Edition.) For additional background refer to *Committee Reports for the* 93rd *Annual Meeting*, NCWM Publication 16 – April 2008.

Amendments/Changes to the Grain Moisture Meters Chapter in the 2007 Edition of NCWM Publication 14

Section Number	Amendment/Change	Page	Source
IV. Tolerances for Calibration Performance	Delete all text relating to "Approved" and "Pending" categories. Amend/modify to show the revised criteria for calibration approval.	GMM-5 thru GMM-7	08/07 Grain Moisture Meter Sector Agenda Item 4
V. Criteria for NTEP Moisture Calibration Review	Add table specifying "Basic 6-Percent Moisture Interval," "Standard Moisture Range," and "Maximum Upper Limit" for each grain type or class. Delete Cases I through VII dealing with inadequately represented moisture intervals. Modify "Special Considerations for 'Multi-Class' Calibrations."	GMM-7 thru GMM-10	08/07 Grain Moisture Meter Sector Agenda Item 4
VII.B. Accuracy, Precision, and Reproducibility	Change Oats moisture range from 10 - 16 % to 8 - 14 % in table.	GMM-13	08/07 Grain Moisture Meter Sector Agenda Item 4
Appendix D – Sample Temperature Sensitivity (For grains/oil seeds other than corn, soybeans, & hard red winter wheat)	Change Oats moisture range from 10 - 16 % to 8 - 14 % in table titled "Moisture Ranges and Tolerance for Sample Temperature Sensitivity."	GMM-44	08/07 Grain Moisture Meter Sector Agenda Item 4

The 93rd Annual Meeting of the NCWM was held July 13 - 17, 2008, in Burlington, Vermont. No Grain Moisture Meter (GMM) or Near Infrared (NIR) Grain Analyzer items were presented for consideration by the NCWM at the 2008 Annual Meeting.

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

Cathy Brenner of the Grain Inspection, Packers, and Stockyards Administration (GIPSA), the NTEP Participating Laboratory for Grain Analyzers, briefed the Sector on NTEP Type Evaluation activity. No new devices had been submitted for evaluation since the Sector's 2007 meeting. Annual GMM calibration reviews were completed on schedule and updated Certificates of Conformance (CCs) were issued for six device types. She reported that the following device types are enrolled in the OCP (Phase II) for the 2007 harvest:

[Note: Models listed on a single line are considered to be of the same "type."]

DICKEY-john Corporation	GAC2000 NTEP, GAC2100, GAC2100a, GAC2100b
Foss North America	Infratec 1241
Foss North America	Infratec 1227, Infratec 1229
Perten Instruments	AM5100
The Steinlite Corporation	SL95

Ms. Brenner explained that although the CC for DICKEY-john's OmegAnalyzer G does not expire until July 1, 2009, DICKEY-john has elected not to enroll in Phase II for the 2008 harvest. Because there are now only five devices in the program, the cost to manufacturers for Phase II drops from $7,730 to $5,300 per meter type.

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

At their August 2005 meeting, the Sector agreed that comparative OCP 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, presented data showing the performance of NTEP meters compared to the air oven based on the last three crop years (2005–2007) using calibrations updated for use during the 2008 harvest season.

Ms. Brenner pointed out that data on the DICKEY-john OmegAnalyzer G and Perten's AM5100 were not included in the comparisons because they have not been in the program for three full years. Comparisons of GMMs with less than three years of data against GMMs with the full three years of data are not meaningful as they may be unduly influenced by a single unusual crop year. Also, to preserve confidentiality sunflower results were not included because only two meters were approved for sunflowers and one of them was the Official Meter.

Dr. Richard Pierce, GIPSA, explained that GIPSA, to avoid making calibration changes that might be unduly influenced by unusual growing conditions in a single year, looks at both the most recent three years and the most recent five years of data before making decisions on changes. This year, as a matter of curiosity, results based on 13 years of Official Meter Phase II data were also reviewed and were found to be quite different from results based on data from the last three years. Some Sector members speculated that advancements in genetic engineering have led to accelerated introduction of new plant varieties resulting in a different overall genetic population for the most recent three years when compared to the previous 13 years. Grain moisture meters (GMMs) may respond differently to grains of different genotypes.

Dr. Charles Hurburgh, Iowa State University, remarked that with the increase in grain prices, moisture measurements have a greater economic impact (one percentage point difference in moisture is worth 25 cents for soybeans and 12 cents for corn). As a result, he has received phone calls concerning moisture meter alignments. He was of the opinion that the comparison data looked very good for corn and soybeans, and that it may not be possible to be any better. He cautioned that state weights and measures personnel may see an increasing number of complaints at harvest due to corn and soybeans sold earlier at very high prices for fall delivery.

5. Report on GIPSA/NIST Interagency Agreement Renewal

The present five-year Interagency Agreement that provides funding for the Grain Moisture Meter On-going Calibration Program (OCP) will expire at the conclusion of data collection for crop year 2009. Renewal of the Agreement is subject to an annual review to determine if changes should be made. Under the terms of the present

agreement NIST and GIPSA each contribute one third of the cost of the program subject to an annual maximum of $26,500 each. The balance of costs is borne by manufacturers and depends on the number of meter models in the NTEP "pool" according to a fee schedule (see table below). NIST and GIPSA are currently reviewing costs associated with the program to determine what changes should be made to the funding arrangements and fee schedule.

NTEP On-going Calibration Program Fee Schedule
For Fiscal Years 2005 - 2009

(1) Total Meters (including Official Meter)	(2) Meters in NTEP Pool	(3) Cost per NTEP Pool Meter	(4) Total Program Cost	Funding Contribution from Participants			
				(5) NIST	(6) GIPSA	(7) Manufacturers (total funding from manufacturers)	(8) Cost per Meter Type
2	1	19,875	19,875	6,625	6,625	6,625	3,315
3	2	19,875	39,750	13,250	13,250	13,250	4,415
4	3	19,875	59,625	19,875	19,875	19,875	4,970
5	4	19,875	79,500	26,500	26,500	26,500	5,300
6	5	19,875	99,375	26,500	26,500	46,375	7,730
7	6	19,875	119,250	26,500	26,500	66,250	9,465
8	7	19,875	139,125	26,500	26,500	86,125	10,765
9	8	19,875	159,000	26,500	26,500	106,000	11,775

Dr. Pierce, representing GIPSA, reported that there is no agreement yet on the funding arrangements or on the duration of the program. GIPSA may consider transferring a greater portion of the program cost to the manufacturers. If the program is approved for a 5-year period, it is possible there will be an inflationary factor built in for each year of the program. The program currently appears to be carrying its weight, but it did better at the beginning of the period. There have been questions as to whether all the time of NTEP laboratory staff has been considered in reporting program costs.

Dr. Pierce believes that USDA will participate in the program, but questions how long it will remain feasible to continue the program. If the present Official Meter is replaced by a meter utilizing a very high frequency (VHF) universal moisture algorithm there would be no need for the OCP. Meters could be aligned by other less expensive means and calibrations could be transferrable between different models designed to use that algorithm. Dr. Pierce cited GIPSA's goal to ultimately approve multiple models for use in the Grain Inspection System and suggested that the Sector may need to look ahead if GIPSA drops their existing calibration maintenance program.

Diane Lee, representing NIST, stated that NIST recognizes the value of keeping meters aligned with the standard reference method and would continue to contribute to the support of appropriate means to do so.

5.5. Air-Oven Collaborative Study

Submitted by: Karl Cunningham, Illinois Department of Agriculture. [Note: This item was received after the Sector agenda had been published. Because of the importance of this issue the Sector agreed to include this issue on the agenda at its August 2008 meeting.]

Background: Under the NTEP program for grain moisture meters, calibrations are based on USDA/GIPSA air ovens while field inspection is based on state air ovens. For the program to be effective, procedures must be in place to assure that state oven results (and manufacturers' oven results) agree with the USDA/GIPSA air oven, which is considered the standard. NIST-WMD's laboratory measurement traceability program requires that laboratories participate in interlaboratory and other collaborative experiments. This requirement has been met by one of two methods: 1) individual laboratories independently send samples to GIPSA for air oven analysis, and subsequently compare their results to those obtained by GIPSA; or 2) a structured collaborative study where every lab, including GIPSA, measure the same sample. A structured collaborative air oven study was last conducted following the 2000 harvest. Results of that study were reported at the Sector's August 2001 meeting.

Discussion/Recommendation: A structured collaborative study has at least two advantages over independent submission of samples to GIPSA by individual laboratories: 1) in addition to a check against the "standard," it provides information on how individual labs compare with each other; 2) it allows GIPSA to plan for a known work load. The Sector agreed that a collaborative study was long overdue. It was also noted that such a study addresses the measurement traceability requirements of ISO 17025. Two manufacturers, Dr. Hurburgh of Iowa State University, and the two state weights and measures representatives present expressed a desire to participate in the study. Although Karl Cunningham was not present, it was suggested that Illinois serve as the "pivot" laboratory. Diane Lee, NIST, will write up the procedures to be followed and will send out a memo soliciting additional participants to all states with a grain moisture program. GIPSA will be the reference laboratory.

6. Proposed Change to Handbook 44, Section 5.57, Paragraph N.1.2. To Modify Tolerances on Standard Reference Samples

Background: This is a carryover item from the Sector's August 2007 meeting. During that meeting a question was raised regarding how the standard reference samples needed for field testing would be provided to the states. It was pointed out that, at present, states must provide the samples. Paragraph N.1.2. of the NIR Grain Analyzer Code of NIST Handbook 44 stipulates:

> **N.1.2. Standard Reference Samples.** – Reference samples used for field inspection purposes shall be clean and selected to reasonably represent the constituent range. These samples shall be selected such that the difference between constituent values obtained using the GIPSA standard reference method and an official GIPSA NIR grain analyzer does not exceed one-half of the acceptance tolerance shown in Table T.2. for individual test samples or 0.375 times the acceptance tolerance shown for the average of five samples.
> (Amended 2001and 2003)

At that time Dr. Richard Pierce, GIPSA, did not immediately recall the origin of the traceability numbers, but suspected they came from the original Tentative Code that covered only wheat protein. He noted that they would not apply to soybeans.

A table showing the acceptance tolerance from Table T.2. and the resulting tolerances for standard reference samples, calculated using the current multipliers (0.50 and 0.375) from paragraph N.1.2., has been reproduced below for convenience.

Tolerances for Standard Reference Samples (GIPSA Reference Method Minus GIPSA Official NIR Grain Analyzer)					
Type of Grain	**Constituent**	**Acceptance Tolerance Individual Samples (percent)**	**Tolerance for Standard Reference Samples (percent)**	**Acceptance Tolerance Average for Five Samples (percent)**	**Tolerance for Standard Reference Samples Average for Five Samples (percent)**
All Wheats (including Durum)	protein	0.60	0.30	0.40	0.15
Soybeans	protein	0.80	0.40	0.60	0.23
	oil	0.70	0.35	0.50	0.19
All Barleys	protein	0.70	0.35	0.50	0.19
Corn	protein	0.80	0.40	0.60	0.23
	oil	0.70	0.35	0.50	0.19
	starch	1.00	0.50	0.80	0.30

Discussion/Recommendation: The Sector was asked to consider making this issue an item for further study. Additional data and actual field experience are needed before an intelligent recommendation can be made on tolerances for standard reference samples.

Commenting on the tolerances shown in the above table, Dr. Pierce, GIPSA, noted that with current technology the reference standard tolerances shown for wheat may be too wide. On the other hand, for corn and soybeans he was concerned that the standard reference method may use up most of the tolerance making sample selection very difficult if not impossible. Dr. Hurburgh noted that the reproducibility error standard deviation for the standard reference method for oil testing was 0.25.

Several questions were raised regarding the possible use of grain samples as "transfer standards."

1. Can we establish traceability using GIPSA field office instrument results?
2. How important is sample selection if we use meter-assigned values?
3. Do meter-assigned values have to be device-type specific?

In partial answer to questions 2 and 3, above, Dr. Hurburgh replied, "If all [instruments] are transmittance using 18 mm path length, sample selection is not important, but if reflectance instruments are involved results are often diametrically opposed."

It was suggested that this issue might best be handled by a subcommittee charged with determining:

1. How should samples be selected for field testing?
2. Who will assign the official value of the sample used?

One Sector member pointed out that a method for selecting samples and assigning official values had already been specified. Members were generally reluctant to commit to expending extra effort because of lack of interest from the states. Significant effort had been expended in developing the original Handbook 44 specifications and the corresponding tests/check lists in Publication 14. As far as the Sector has been able to determine not a single state has a program for inspecting NIR Grain Analyzers for anything other than moisture. Developing revised procedures for selecting field samples will require active participation not only by manufacturers and GIPSA but also by interested state weights and measures personnel to provide feedback during method development and to provide field test results and additional feedback using proposed methods.

Diane Lee, NIST, has agreed to send a memo to states to determine if there is a true need for revising the existing method and if so, to see if they are willing to actively participate.

7. Proposed Changes to the GMM Chapter of Publication 14 to Address Multi-Class Test Weight per Bushel Type Evaluations

Background/Discussion: The GMM Chapter of NCWM Publication 14 was amended in 2006 to allow multi-class moisture calibrations. Since that time devices have become available with the potential for using multi-class calibrations for both moisture and Test Weight per Bushel (TW). The current edition of the GMM Chapter of Publication 14 provides procedures and tolerances for addressing multi-class calibrations for moisture but not for TW.

The Sector agreed by consensus to recommend changes to the 2008 Edition of Publication 14 to address devices with multi-class calibrations for TW and to forward the recommendation below to the NTEP Committee for consideration.

Recommendation: Amend **§ VII. Additional Type Evaluation Test Procedures and Tolerances for Grain Moisture Meters Incorporating an Automatic Test Weight per Bushel Measuring Feature,** Subsection **B. Accuracy, Precision, and Reproducibility** of the GMM Chapter of Publication 14 to address multi-class type evaluations for TW.

VII. Additional Type Evaluation Test Procedures and Tolerances for Grain Moisture Meters Incorporating an Automatic Test Weight per Bushel Measuring Feature

B. Accuracy, Precision, and Reproducibility:

The automatic test weight per bushel measuring feature of grain moisture meters will be tested for accuracy, repeatability (precision), and reproducibility with 12 samples of each grain type for which the meter has an approved moisture calibration. Samples will be chosen to represent the moistures and test weights per bushel shown in the following table. The reference method for test weight per bushel is the quart kettle test weight per bushel apparatus as specified by the USDA GIPSA. The reference value will be the average of 3 replicates. Samples will be dropped three times through each of two meters. The reference value will be re-checked after the meters have been tested. The average of the initial and final reference values shall be used as the reference value in calculations of meter performance.

Three replicates will be run on each instrument for each sample, resulting in a total of 72 observations of test weight per bushel per grain type (2 instruments x 12 samples x 3 replicates).

Type of Grain	Moisture Range	Minimum Test Weight per Bushel Range	Criteria for Sample Selection
Corn	12 - 18 %	54 - 58	a) No less than 8 samples should come from the lowest two-thirds of the 6 % moisture range. b) No less than 2 samples should come from the highest one-third of the 6 % moisture range. c) Samples should represent a distribution of Test Weights per Bushel (TW) that minimizes the correlation between TW and moisture.
Soybeans	10 - 16 %	55 - 59	
Hard Red Winter Wheat	10 - 16 %	59 - 63	
Durum Wheat	10 - 16 %	59 - 63	
Soft White Wheat (except White Club)	10 - 16 %	58 - 62	
Hard Red Spring Wheat (and White Club)	10 - 16 %	58 - 61	
Soft Red Winter Wheat	10 - 16 %	56 - 60	
Hard White Wheat	8 - 14 %	60 - 64	
All-class wheat*	10 - 16 %	56 - 63	
Wheat Excluding Durum*	10 - 16 %	56 - 63	
Two-Row Barley	10 - 16 %	47 - 51	
Six-Row Barley	10 - 16 %	43 - 47	
All-class Barley*	10 - 16 %	43 - 51	
Oats	8 - 14 %	33 - 39	
Sunflower Seed (Oil Type)	6 - 12 %	28 - 31	
Long Grain Rough Rice	10 - 16 %	43 - 47	
Medium Grain Rough Rice	10 - 16 %	44 - 48	
All-class Rough Rice*	10 - 16 %	43 - 48	
Grain Sorghum or Milo	10 - 16 %	58 - 62	

Note: Calibrations marked with an asterisk (*) are "multi-class" calibrations

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.

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

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, see Note 1 below regarding "multi-class" calibrations.)

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

where,

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

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

n = number of samples (n=12, see Note 1 below regarding "multi-class" calibrations.)

Tolerances for bias 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 1: "Multi-class" calibrations will be tested using full test sets for all included classes (12 x number of classes). In addition to meeting accuracy requirements (bias and SDD) for the tests sets of each individual class, "multi-class" calibrations must meet the accuracy requirements (bias and SDD) when the data from all included classes is pooled.

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

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

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

where,

P_{ij} = predicted test weight per bushel for sample *i* and replicate *j*

$\overline{P}_i$ = average of the three predicted test weight per bushel values for sample *i*

n = number of samples (n=12, *see note below regarding "multi-class" calibrations.*)

Tolerances for repeatability for all grain types except corn and oats are 0.4 x the absolute value of the Handbook 44 acceptance tolerance. The tolerance for repeatability for corn and oats is 0.5 x the absolute value of the NIST Handbook 44 acceptance tolerance. Specific tolerances are:

Grain Type	Tolerance
Corn, oats	0.40 pounds per bushel
All wheat classes	0.20 pounds per bushel
Soybeans, barley, rice, sunflower, sorghum	0.28 pounds per bushel

Note: "Multi-class" calibrations will be tested using full test sets for all included classes. "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 test weight per bushel replicates will be averaged for each instrument, and the Standard Deviation of the Differences (SDD) between instruments will be calculated using the following equation:

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

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 (n=12, *see note below regarding "multi-class" calibrations.*)

Tolerances for reproducibility are 0.5 x the absolute value of the Handbook 44 acceptance tolerance. Specific tolerances are:

Grain Type	Tolerance
Corn, oats	0.40 pounds per bushel
All wheat classes	0.25 pounds per bushel
Soybeans, barley, rice, sunflower, sorghum	0.35 pounds per bushel

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

8. Proposed Changes to the GMM Chapter of Publication 14 to Limit the Moisture Content of Samples Used To Evaluate Test Weight per Bushel Performance and to Add Special Considerations for Multi-Class Calibrations

Background/Discussion: During the August 2006 Sector meeting, a consensus was reached to require monitoring test weight per bushel (TW) calibration performance using data collected as part of the on-going moisture calibration program (Phase II).

Cathy Brenner, representing GIPSA, the NTEP participating laboratory for Grain Analyzers, has compiled a table showing the composition of TW samples for the three most recent years of Phase II data (see Table 1, below). Table 1 data indicate that several grains besides corn can have samples with moistures greater than 20 %. Also of interest is the fact that a surprising number of Phase II samples have not been of sufficient size to obtain a reference TW measurement using the quart kettle method.

Table 1. Yearly TW Sample Set Composition

Grain	Year	N - Moisture	N - TW	% N - TW	Moisture Range	TW Range
Corn	2005	141	140	99.3	9.1 - 19.9	53.5 - 61.8
	2006	189	174	92.1	9.5 - 20.0	50.1 - 62.7
	2007	151	139	92.1	11.8 - 19.9	54.5 - 61.1
Durum	2005	30	10	33.3	7.9 - 20.3	47.8 - 62.9
	2006	24	9	37.5	7.4 - 13.7	56.9 - 63.6
	2007	70	44	62.9	8.0 - 16.3	56.7 - 63.7
Grain Sorghum	2005	38	31	81.6	11.8 - 17.7	57.8 - 61.6
	2006	45	18	40.0	12.5 - 18.3	54.5 - 61.6
	2007	18	18	100.0	10.8 - 19.5	54.3 - 62.1
Hard White Wheat	2005	31	23	74.2	7.2 - 15.4	54.9 - 65.7
	2006	39	9	23.1	8.6 - 14.9	57.4 - 64.1
	2007	27	20	74.1	7.7 - 15.0	57.8 - 64.8
Hard Red Spring Wheat	2005	51	31	60.8	7.5 - 26.9	36.6 - 62.9
	2006	67	45	67.2	7.1 - 17.3	51.0 - 64.1
	2007	55	37	67.3	6.9 - 22.2	57.5 - 64.7
Hard Red Winter Wheat	2005	89	76	85.4	7.7 - 23.1	45.6 - 65.1
	2006	79	70	88.6	7.3 - 19.7	51.8 - 64.0
	2007	98	77	78.6	8.1 - 20.0	50.9 - 64.5
Long Grain Rough Rice	2005	36	36	100.0	8.0 - 22.5	42.6 - 47.5
	2006	55	55	100.0	10.0 - 27.1	41.7 - 48.2
	2007	71	71	100.0	10.8 - 26.1	41.6 - 48.3
Medium Grain Rough Rice	2005	57	57	100.0	8.1 - 29.7	43.8 - 49.6
	2006	53	53	100.0	11.6 - 25.6	42.1 - 50.3
	2007	61	61	100.0	11.0 - 28.0	41.3 - 50.1
Oats	2005	17	11	64.7	9.8 - 12.1	36.8 - 41.4
	2006	22	20	90.9	8.3 - 15.3	30.0 - 44.6
	2007	26	17	65.4	10.0 - 14.7	35.0 - 43.6
Six-Row Barley	2005	28	23	82.1	7.8 - 16.8	41.7 - 51.8
	2006	42	34	81.0	7.6 - 14.4	40.8 - 51.8
	2007	36	28	77.8	7.9 - 20.6	43.5 - 51.9
Soft Red Winter Wheat	2005	34	34	100.0	7.2 - 20.2	54.8 - 64.6
	2006	65	63	96.9	10.2 - 20.2	55.4 - 63.4
	2007	88	87	98.9	9.0 - 28.0	52.4 - 64.1
Soft White Wheat	2005	24	24	100.0	7.8 - 15.4	57.6 - 63.6
	2006	35	33	94.3	7.1 - 15.3	57.7 - 63.0
	2007	51	42	82.4	7.5 - 18.3	57.5 - 62.7
Soybeans	2005	161	141	87.6	7.7 - 19.8	51.7 - 58.5
	2006	221	214	96.8	7.9 - 24.5	48.7 - 59.3
	2007	246	225	91.5	7.1 - 20.5	52.3 - 59.3
Sunflower Seeds	2005	66	62	93.9	4.8 - 18.2	24.5 - 35.7
	2006	56	55	98.2	5.7 - 20.7	22.7 - 36.2
	2007	48	38	79.2	6.3 - 18.5	24.7 - 34.1
Two-Row Barley	2005	17	17	100.0	7.1 - 19.3	45.5 - 55.6
	2006	41	31	75.6	8.0 - 14.2	43.6 - 53.7
	2007	27	26	96.3	8.3 - 15.0	42.8 - 53.8

The NTEP Laboratory has suggested that the moisture content of samples used to evaluate Phase II TW performance be limited to 20 % for all grains. Also suggested was adding criteria for evaluating Phase II multi-class TW calibration results that was similar to the criteria used for reviewing the performance of multi-class moisture calibrations.

The Sector agreed by consensus to accept the recommendation below incorporating changes suggested by the NTEP laboratory and to forward it to the NTEP Committee for consideration.

Recommendation: Amend **§ VII. Additional Type Evaluation Test Procedures and Tolerances for Grain Moisture Meters Incorporating an Automatic Test Weight per Bushel Measuring Feature,** Subsection **C. Tolerances for Test Weight per Bushel Calibration Performance** of the GMM Chapter of Publication 14 to limit the moisture content of samples used to evaluate test weight per bushel performance and to add special considerations for multi-class calibrations for TW as shown below:

VII. Additional Type Evaluation Test Procedures and Tolerances for Grain Moisture Meters Incorporating an Automatic Test Weight per Bushel Measuring Feature

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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 all grains 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: 0.40 for corn and oats; 0.25 for wheat; and 0.35 for all other grains calculated using the most recent calibration and all available raw data collected within the last three years for samples with moisture content not exceeding 20 percent.

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.

Special Considerations for "Multi-Class" Calibrations.

For Phase II, data for each individual grain class included in a "multi-class" calibration will be reviewed to determine what adjustments, if any, are needed.

Data for each individual grain class and the combined data for all grain classes included in the "multi-class" calibration will be reviewed to verify calibration performance for each individual grain class and the combined data.

9. Proposed Changes to Appendix C of the GMM Chapter of Publication 14 to Add Data Fields for Test Weight per Bushel and to Modify Instructions for Submitting to Reflect Current Technology

Background/Discussion: Several changes are required to **Appendix C, Standard Data Format**, of the GMM Chapter of Publication 14 to bring Appendix C up to date with current practice:

1. Recent changes to the GMM Chapter of Publication 14 stipulating the monitoring of Phase II TW data will require manufacturers to submit re-predicted TW data for review in the event that changes are made in TW calibrations. Data fields for TW are not defined in the current issue of Publication 14.
2. The instructions for submitting re-predicted data for calibration review require updating to reflect current technology.
3. The table of File Names to be used in submitting re-predicted data requires amending to specify file names for multi-class calibrations.

Because multi-class calibrations are evaluated using full test sets for all included classes and must meet the requirements for the test sets of each individual class, the Sector decided that the table **File Names for Submitting NTEP Meter Data for Calibration Review** should not be modified to specify file names for multi-class calibrations. The Sector agreed by consensus to recommend amending/modifying Appendix C in the 2008 Edition of the GMM Chapter of Publication 14 to add additional data fields for TW data and to update instructions for submitting data to reflect current practice. The Sector's recommendation, below, will be forwarded to the NTEP Committee for consideration.

Recommendation: Amend/modify Appendix C of the GMM Chapter of Publication 14 as shown below to address these issues:

Appendix C

Standard Data Format

(For Submitting NTEP Meter Data for Calibration Review)

1. Data Fields:

Sample I.D.	Meter Moist	A.O. Moist	Meter Model	Meter S.N.	Calibration I.D.	Grain Type	Crop Year	Reference T.W.	Meter T.W.

2. Description of Data Fields:

- Sample I.D. — The unique sample number assigned by FGIS.
- Meter Moist — The meter-predicted moisture.
- A.O. Moist — The FGIS air oven moisture result.
- Meter Model — The name of the model submitted by the manufacturer.
- Meter S.N. — The instrument serial number assigned by the manufacturer.
- Calibration I.D. — The unique name or number of the calibration used to predict the moisture value.
- Grain Type — The abbreviated name of the grain type (see accompanying table).
- Crop Year — The crop year in which the sample was received.

- Reference T.W. The FGIS test weight apparatus result.

- Meter T.W. The meter-predicted test weight per bushel.

3. Instructions for submitting:

E-mail as a Microsoft Excel® file or as a comma-separated text file with each grain in a separate file. Name the files using the abbreviations in the accompanying table and report each observation as a single record on a single line.

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10. Editorial Correction to the GMM Chapter of Publication 14 § IV. Tolerances for Calibration Performance

Background: At its August 23, 2007 meeting the Sector recommended that the portion of § IV specifying the categories of calibrations that will be listed on a Certificate of Conformance would be removed from Publication 14. This recommendation was subsequently approved by the NTEP Committee in January 2008. When the 2008 Edition of the Grain Analyzer Book of Publication 14 was issued, the paragraphs regarding Approved, Pending, and Not Available had not been removed from the GMM Chapter. When this oversight was discovered, an addendum sheet dated April 24, 2008, was included with the Grain Analyzer Book of Publication 14 instructing readers to strike through the portions of what should have been deleted.

The Sector agreed to re-submit the changes to ensure that they won't be over looked when the 2009 Edition of Publication 14 is published.

Recommendation: In the 2008 Edition of the Grain Analyzer Book of Publication 14, pages GMM-6 and GMM-7, delete the portion of § IV specifying the categories of calibrations to be listed on a Certificate of Conformance. Details are shown below:

IV. Tolerances for Calibration Performance
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Until calibrations for NTEP grains have been evaluated successfully they shall not be used on NTEP instruments. Calibrations for any of the NTEP grain types that have not been evaluated (or that a manufacturer chooses not to provide) will be listed on the CC as "Not Available."

11. Report on OIML TC 17/SC 1 IR 59 "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 TC 17/SC 1. The Secretariat (China) is working closely with the United States and a small 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 Sector. A 4 CD was circulated to the IWG in August 2006. U.S. comments on the 4 CD were returned to the Secretariat in November 2006. A TC 17/SC 1 meeting was hosted by NIST in September 2007 to address comments received on 4 CD.

Discussion: Diane Lee, NIST/WMD, reported that the U.S. delegation to the September 2007 meeting included the following Sector members: Diane Lee, NIST; Rich Pierce, GIPSA; Cathy Brenner, GIPSA; and Cassie Eigenmann, DICKEY-john. The subcommittee reached decisions on several issues of interest to the Sector.

The reference method for determining grain moisture content will be defined by the national responsible bodies. In re-affirming this decision (originally agreed to at the June 2001 meeting of TC 17/SC 1) the subcommittee noted that because different reference methods may be used in each country, accuracy may have to be tested in each country. It was also likely that the grain samples used for testing would have to be country specific unless a globally acceptable sample set could be agreed upon.

During a discussion of how maximum permissible errors (MPEs) would be presented in R 59, the U.S. delegation had the opportunity to explain in detail how grain moisture meters are evaluated in the U.S. NTEP program. The subcommittee subsequently agreed that while acceptable results of some evaluation tests would best be specified by MPEs, the acceptability of other test results would more suitably be specified by error shifts and error limits. A table will be added to R 59 that includes MPEs, error shifts, and error limits for accuracy and repeatability.

The subcommittee also agreed that a test for reproducibility was necessary for grain moisture meters. Consequently the type evaluation laboratory must receive two instruments for testing.

Ms. Lee noted that the format of 5 CD has been revised to meet the guidelines of the document *Format for OIML Recommendations* that was provided to participants in the April 2008 OIML Secretariat Training Session in Paris. The 5 CD of R 59 is expected to be distributed for review sometime in September 2008. A final date for USNWG comments will be specified when 5 CD has been distributed. The Secretariat expects to submit the final version of 5 CD to CIML for consideration at their meeting scheduled for early 2009.

12. Report on OIML TC 17/SC 8 Draft IR "Protein Measuring Instruments for Cereal Grain"

Background: This item was included on the Sector's agenda to provide a summary of the activities of OIML TC 17/SC 8. A new subcommittee has been formed to study the issues and write a working draft document "Measuring instruments for protein determination in grains." Australia is the Secretariat for this new subcommittee. A work group meeting was held in September 2006 in Ottawa, Canada, to discuss comments on the 1 CD. A TC 17/SC 8 meeting was hosted by NIST in September 2007 to discuss 2 CD.

Discussion: Diane Lee, NIST/WMD, reported that discussions on 2 CD dealt mostly with maximum permissible errors (MPEs) and harmonization of the TC 17/SC 8 Recommendation for protein with the TC 17/SC 1 Recommendation for moisture. It is unlikely that 3 CD will be ready for submission to CIML in time for their January 2009 meeting.

13. Marking Requirements for Type P Devices

Background: This item was included on the Sector's agenda to provide information on the activities of the NTEPTC Software Sector that may have an impact on Grain Moisture Meters (GMMs) and Near Infrared (NIR) Grain Analyzers.

Two NTEPTC Software Sector items were accepted as developing items by the Specifications and Tolerances (S&T) Committee for inclusion in the Committee Reports for the NCWM 93rd Annual Meeting. A developing item has merit, but has been returned to the submitter for further development before any action can be taken at the national level. The Software Sector is interested in receiving input from the weights and measures community about these items. Working with input from the weights and measures community, the Software Sector plans to introduce proposed modifications to current requirements through the regional weights and measures associations and other technical committees. In the meantime, the Software Sector welcomes opportunities to discuss these items at regional weights and measures associations to ensure the items are adequately addressed.

The two developing items are shown below:

1) **Item 360-2: Developing Items, Part 1, Item 2 –** Add a new definition and cross-reference term to Appendix D in HB 44 for "Electronic devices, software-based" as follows:

Electronic devices, software-based. Weighing and measuring devices or systems that use metrological software to facilitate compliance with Handbook 44. This includes:

(a) Embedded software devices (Type P), aka built-for-purpose. A device or element with software used in a fixed hardware and software environment that cannot be modified or uploaded via any interface without breaking a security seal or other approved means for providing security, and will be called a "P," or

(b) Programmable or loadable metrological software devices (Type U), aka not-built-for-purpose. A personal computer or other device and/or element with PC components with programmable or loadable metrological software, and will be called "U." A "U" is assumed if the conditions for embedded software devices are not met.

Software-based devices – See Electronic devices, software-based.

2) **Item 360-2: Developing Items, Part 1, Item 1 –** Amend HB 44 General Code G-S.1. and/or G-S.1.1. to include the following:

Method	**NTEP CC No.**	**Make/Model/Serial No.**	**Software Version/Revision[1]**
TYPE P electronic devices shall meet at least one of the methods in each column:			
Hard-Marked	X	X	Not Acceptable
Continuously Displayed	X	X	X
By command or operator action	Not Acceptable	Not Acceptable	X[2]
TYPE U electronic devices shall meet at least one of the methods in each column:			
Hard-Marked	X[3]	X	Not Acceptable
Continuously Displayed	X	X	X
Via Menu (display) or Print Option	Not Acceptable	X[4]	X[4]

[1] If the manufacturer declares that the primary sensing element "software" is integral, has no end user interface and no print capability, the element may be considered exempt from the marking requirement for version/revision. Example: Primary sensing element may be Positive Displacement (P.D.) meter with integral correction, digital load cell (only for reference, not limiting).
[2] Information on how to obtain the Version/Revision shall be included on the NTEP CC.
[3] Only if no means of displaying this information is available.
[4] Information on how to obtain Make/Model, Version/Revision shall be included on the NTEP CC.

Metrologically significant software shall be clearly identified with the software version. The identification may consist of more than one part but one part shall be only dedicated for the metrologically significant portion.

At their May 2008 meeting, the Software Sector reviewed the above table and made both corrections and further clarifications. The table was split into two separate tables, one for Type P devices and one for Type U devices, to make it clear that although there are similarities between the two types, they are unique and must be treated separately.

*[**Editor's Note:** At the 93rd NCWM Annual Meeting held July 13 - 17, 2008, the Software Sector Chairman advised the Specifications and Tolerances Committee (S&T) that the sector had gone as far as they could go in developing the criteria listed under S&T Item 360-2: Developing Items, Part 1, Items 1 & 2. He asked that these be moved up to Informational items on the S&T agenda. Grain Analyzer Sector members should review the Informational items*

in the S&T Committee 2008 Final Report in the Report of the 93rd Conference on Weights and Measures when it is published.]

The table for Type P devices proposed by the Software Sector at their May 2008 meeting is shown below:

Method	NTEP CC No.	Make/Model/Serial No.	Software Version/Revision[1]
TYPE P electronic devices shall meet at least one of the methods in each column:			
Hard-Marked	X	X	Not Acceptable[1]
Continuously Displayed	X	X	X
By command or operator action	Not Acceptable	Not Acceptable	X[2]

[1] If the manufacturer declares that the primary sensing element "software" is integral, has no end user interface and no print capability, ~~the element may be considered exempt from the marking requirement for version/revision.~~ **the version/revision shall be hard marked on the device**. Example: Primary sensing element may be Positive Displacement (P.D.) meter with integral correction, digital load cell (only for reference, not limiting).

[2] Information on how to obtain the Version/Revision shall be included on the NTEP CC.

Metrologically significant software shall be clearly identified with the software version. The identification may consist of more than one part but one part shall be only dedicated for the metrologically significant portion.

*[**Editor's Note:** The Software Sector has considered alternate versions of the "Marking" tables. For the latest version of these tables, Grain Analyzer Sector members should review the Informational items in the S&T Committee 2008 Final Report in the Report of the 93rd Conference on Weights and Measures when it is published.]*

Discussion: All GMMs and NIR Grain Analyzers currently holding active CCs are of Type P. For these devices it would appear that the requirement for marking the Software Version/Revision of the metrologically significant portion might be the only change required to comply with the proposed marking for Type P devices.

Concern was expressed that the "**NTEP CC No.**" marking requirement might require marking with the base CC number plus the addendum number. GMM manufacturers have strong objections to requiring the addendum number to be marked or displayed on the device. GMM CCs automatically expire on June 30 of each year. To maintain a current GMM CC, the manufacturer must participate in the NTEP on-going calibration program (OCP). Data collected in the OCP are used to determine if existing (or revised) calibrations meet specified tolerances. If tolerances are met, the CC is re-issued with a new effective and expiration date and a new addendum number.

The Sector also had questions regarding interpretation of the second sentence of the note:

> *Metrologically significant software shall be clearly identified with the software version. The identification may consist of more than one part but one part shall be only dedicated for the metrologically significant portion.*

What was not clear to the Sector was whether there could be several metrologically significant portions, each having a separate (and unique) identification. This is of particular concern to the Grain Analyzer Sector because of the way grain calibrations (very significant metrologically significant portions) are currently handled. For both GMMs and NIR Grain Analyzers, grain calibrations are individually identified and are required to be "self-checking" against data corruption or alteration (see paragraphs **S.2.4.1. Calibration Version** and **S.2.4.2. Calibration Corruption** in **HB 44, § 5.56.(a)** and paragraphs **S.2.5.2. Calibration Version** and **S.2.5.3. Calibration Corruption** in **HB 44, § 5.56.**). Considering that procedures are already in place to control (and verify) changes in individual grain calibrations, and that changes in grain calibrations are likely to be more frequent than changes in other metrologically significant software modules, Sector members doubted that assigning a single identification to all metrologically significant software (including grain calibrations) is practical for GMMs and NIR Grain Analyzers.

For additional information on Software Sector activities that may affect GMMs and NIR Grain Analyzers, manufacturers are encouraged to review Appendix A, Item **360-2: Developing Items, Part 1, Items 1 and 2** of the S&T Committee Interim Reports in NCWM Publication 16 dated April 2008 and the Summary of the Software Sector's May 2008 meeting. These documents are available online at:

http://ts.nist.gov/WeightsAndMeasures/Publications/upload/11-ST-08-Pub16-Final.pdf
http://www.ncwm.net/ntep/pdf/software_sector_summary_05_08.pdf.

The WELMEC software document referenced in the Software Sector's Meeting Summary is available online at http://www.welmec.org/publications/7-2en.pdf. The second committee draft of ***General Requirements for Software Controlled Measuring Instruments*** (TC 5/SC 2 CD2-N12, dated 2008-01-24), referred to in the Sector's Meeting Summary as "OIML DSW-2 CD" can be found at http://www.oiml.org/download/cds.html.

14. Time and Place for Next Meeting

The next meeting is tentatively planned for Wednesday, August 19 and Thursday, August 20, 2009, at the Chase Suites Hotel in Kansas City, Missouri. Sector members are asked to hold these days open pending determination of agenda items, exact meeting times, and meeting duration. Final meeting details will be announced by early June 2009.

If you would like to submit an agenda item for the 2009 meeting, please contact any of the following persons by May 1, 2009:

Jim Truex, NTEP Administrator at jim.truex@ncwm.net
G. Diane Lee, NIST Technical Advisor, at diane.lee@nist.gov
Jack Barber, Technical Advisor, at barber.jw@comcast.net

Change Summary

Recommended Amendments/Changes to the Grain Moisture Meters Chapter in the 2008 Edition of NCWM Publication 14			
Section Number	Amendment/Change	Page	Source
VII.B. Accuracy, Precision, and Reproducibility	Amend to address multi-class type evaluations for TW.	GMM-11 through GMM-15	08/08 GMM Sector Agenda Item 7
VII.C. Tolerances for Test Weight per Bushel Calibration Performance	Amend to limit the moisture content of samples used in evaluating TW performance and to add special considerations for multi-class calibrations.	GMM-15	08/08 GMM Sector Agenda Item 8
Appendix C	Amend to add additional data fields for TW data and to update instructions for submitting data to reflect current practice.	GMM-41	08/08 GMM Sector Agenda Item 9
IV. Tolerances for Calibration Performance	Delete the portion of § IV specifying the categories of calibrations to be listed on a Certificate of Conformance.	GMM-6 and GMM-7	08/08 Grain Moisture Meter Sector Agenda Item 10