National Type Evaluation Technical Committee
Grain Moisture Meter Sector
Meeting Summary
December 17 – 18 , 1991

Agenda Items

Sid Colbrook (Chairman, NCWM), Carroll Brickenkamp (NIST), and Dave Funk (FGIS) welcomed sector members to the organizational meeting. Selected comments are summarized below as part of the discussion on goals and scope of the Moisture Meter Sector. These remarks also apply for the NIR Wheat Protein Analyzer Sector.

Discussion of "Type Evaluation Considerations" did not proceed according to the agenda. Consideration of the first issue "Instrument Calibration" led to a more general discussion of type evaluation requirements. This discussion was summarized and reported under five general categories: (1) General Approval Approach, (2) Instrument Calibration, (3) Sample Set Selection, (4) Tolerances, and (5) Sealing Instruments.

RESULTS AND DISCUSSION

I. Goals and scope of the Committee

The primary responsibility of these National Type Evaluation Technical Committee sectors is to develop type approval requirements for moisture meters and NIR wheat protein analyzers. The sectors are also charged with making parallel changes to the Handbook 44 Grain Moisture Meter code and with developing new code for NIR protein analyzers.

NCWM is a standards writing body, and like most standards writing bodies, requires that you be a member in order to participate in the process. This includes technical sector activities. Membership applications were distributed at the meeting. Rather than resolving issues by bringing them to a vote, the sectors shall attempt to reach a consensus. Consensus was defined as "more than a majority but less than unanimity."

Sector activities will be consistent with the organizational structure and operational procedures of NCWM Sectors may make recommendations on policy issues that will then be forwarded to the Executive Committee of NCWM for consideration. Recommendations on technical issues will be forwarded to and voted upon by the Specifications and Tolerances Committee.

The NCWM Chairman and the Chief of the office of Weights and Measures worked to appoint members to the sectors. During this process, they responded to questions and provided information to sector members. Now that the sectors have been established, they should no longer be considered as primary contacts regarding sector activities. Inquiries should be directed to either the Technical Advisor or the Chairman of the Sector.

Type evaluation criteria need to be a reasonable interpretation of the appropriate code in Handbook 44. Type evaluation tests need to be developed for all features that will be listed on the Certificate of Conformance.

The sectors need to address "direct sale considerations." Both the customer and seller are entitled to equal information at the time of sale.'- Instruments should be designed in such a fashion that they do not "facilitate fraud."

2. Handbook 44 Code considerations

A. Moisture measurement technologies to be considered by the Committee

Results of the Meeting

1. The sector discussed whether moisture measurement technology should be limited by Handbook 44 code, to what extent instruments can be sealed, and whether current Handbook 44 tolerances should be maintained.

    1. Sector members agreed that technology should not be limited by Handbook 44 code, and that type evaluation test criteria should emphasize performance specifications rather than design features. Technical Advisor was assigned the task of reviewing the literature and providing information on minimum acceptable sample sizes for moisture meters.

    2. The Technical Advisor will also provide a technology update at the next meeting regarding means of sealing instruments or otherwise deterring fraud.

It was recommended that the present maintenance tolerances in Handbook 44 be maintained. This assumes that field test samples are screened to achieve good agreement between moisture meter and air oven results.

Discussion: The consensus of the group was that Handbook 44 code should be general enough that it does not limit the development and adoption of new moisture measurement technologies. This does not imply that all technologies will be suitable for commercial use. The intent is that the emphasis be placed upon performance, not design considerations. It was determined that the sector can and should define what data needs to accompany an application for type evaluation to show that the instrument potentially meets test criteria. Publication 14, not Handbook 44, is the appropriate place to specify application requirements.

It was suggested that it would be easier to develop performance specifications if we limited discussion to those types of technology that we understand i.e., capacitance meters, DC conductivity meters, and NIR analyzers. The concern was that different test procedures will be required for different measurement technologies, and that developing type evaluation criteria would be more difficult if no technologies were eliminated.

In the discussion on including or excluding specific technologies, it was proposed that any moisture measurement system accepting a whole grain sample and providing a moisture reading be considered a grain moisture meter. Thus, a "moisture meter" might consist of several pieces of equipment and require a number of different steps to make a moisture determination. For example, it would be acceptable to have a grinder included as part of the system if the performance of the overall moisture measurement system meets type evaluation test requirements. Auxiliary equipment and analysis procedures would be specified on the Certificate of Conformance. Devices intended for use in measuring the moisture of processed grain commodities (flour) should be excluded from consideration.

It was agreed that there should be no limit on the time required to make a moisture determination. Rather, the marketplace should be relied upon to discourage unrealistic analysis procedures. The priority placed upon analysis time depends upon the situation and the specific application.

Sample size was identified as one of the more critical design considerations. Discussion included the importance of obtaining a representative sample from the bulk lot, use of proper subsampling techniques, and the fact that air oven reference methods use only a small amount of sample. Questions posed by the group included: Should minimum sample size requirements be described on a weight or volumetric basis? Does sample size matter if we get the correct result? How large a sample is required in order to get repeatability? This issue was not resolved.

It was agreed that Handbook 44 code should continue to exclude testing of in-motion moisture measurement devices. Concern was expressed that grain moves through some instruments during analysis, and that this might be defined as in-motion moisture

measurement. It was suggested that a static moisture measurement be defined as one where the sample is retained by the instrument after the analysis is complete.

2. There was considerable discussion regarding direct sale considerations and the fact that some instruments, NIR analyzers in particular, may more readily facilitate fraud than other instrument types. Concern centered on the fact that operational procedures are different from those of dielectric meters. It is normal for NIR operators to make frequent bias checks and to adjust instrument results up or down as required. There was discussion regarding how frequently NIR's need to be biased for moisture. It was suggested that bias checks might not need to be as frequent for moisture as they are for protein, because the moisture bands are strong and may be inherently more stable The group discussed whether some type of audit trail would be required for NIR instruments.

   It was acknowledged that, though some dielectric meters can be largely sealed, there are no instruments currently in use that do not to some extent facilitate fraud. Meters requiring conversion charts were cited as an example. In addition to the opportunity for fraud, the possibility of operator error is greater with these instruments. It was stated that NCWM wanted to specify the use of fully automatic at the time the moisture meter code in Handbook 44 was developed. The question was asked whether now is the time to specify the use of fully automatic moisture meters.

   The Technical Advisor was tasked with providing a technology update regarding methods, other than sealing the instrument, of preventing fraud. One suggestion was that NIR manufacturers design safeguards into the instrument. It was commented that several years would be required to develop software to lock out the operator from some features. Another suggestion was that the bias setting be printed with the moisture result.

3. The sector did not feel that any changes were required to current Handbook 44 acceptance and *maintenance tolerances*. Representatives from state Weights and Measures offices reported few problems with the tolerances when using preselected field test samples. Meter rejection rates from 0.5 to 5.0% were reported by the various state representatives.

B. Mass, temperature, and test weight measurements

Results of the Meeting

The sector recommended that existing tolerances for auxiliary equipment, that is separate and external from the moisture meter, be maintained. Internal devices providing intermediate temperature, test weight, or mass measurements used to adjust moisture values do not need to be tested unless the intermediate result will be reported and used for purposes of trade.

Discussion: Most of the discussion was to clarify existing Handbook 44 code to make it clear that internal devices will not be tested as part of type evaluation, and that the primary performance requirement is that the instrument provide accurate moisture results. If intermediate results are printed or displayed, the display should indicate that these results are "not legal for trade." A question was asked regarding how this requirement affects an NIR that is approved for making moisture determinations but not protein determinations. The response was that the same restrictions apply as far as displaying information.

There was some discussion that the tolerances for external devices may be unrealistic. For example, it was suggested that requirements for moisture scales might not be practical because weighing error does not necessarily translate into a moisture determination error of the same magnitude. The question was then asked whether temperature requirements in sections T4 and N1.3 were excessive. Most Weights and Measures representatives felt that there was no problem with the tolerances for temperature and that there was no need to recommend changes to this section of Handbook 44.

Concern was expressed as to whether the 0.15 tolerance for test weight was meaningful without having the test procedure defined. It was agreed that FGIS procedures for determining test weight per bushel should be referenced in Handbook 44. It was suggested that the sector recommend that test weight tolerances be removed from the Grain Moisture Meter chapter. There were objections to removing test weight tolerances on the basis that they are needed for enforcement purposes and for addressing complaints.

C. Reference method

Results of the Meeting

The committee agreed that NCWM should continue to recognize the most current FGIS air oven procedures as the reference method. It is understood that calibrations will need to be updated if FGIS changes air oven procedures. It was recommended

that the definition for the air oven reference method be moved from the "Definitions" section of Handbook 44 to section N.1.1 "Transfer Standards" in the Grain Moisture Meter chapter.

3. Type Evaluation Considerations

Results of the Meeting

The discussion of type evaluation procedures did not closely follow the meeting agenda. Rather, broad type evaluation considerations were discussed. During the discussion, it became obvious that a number of issues must be resolved before type evaluation test criteria can be developed for moisture meters. A sub-committee was appointed to address these issues and draft type evaluation test procedures before the next meeting. Members of the sub-committee are: Rich Pierce, Dave Funk, Jim Rampton, Cliff Watson, Jack Barber, and Bob Wittenberger. Topics were then identified that needed to be discussed to provide direction for the sub-committee. Discussion of these topics is summarized below.

General Approval Approach

Two basic approaches to type evaluation testing of moisture meters were discussed. The first is to evaluate and approve basic instrument capabilities using a calibration that is suitable for type evaluation purposes, but might not be adequate for field use in commercial transactions. The second approach is to test both the instrument and the calibration as part of type evaluation, and then approve the instrument and the calibration for immediate use in commercial transactions. There was disagreement about which approach was most appropriate.

Those favoring the first approach felt that "full testing" should not be required as the instrument is approved for additional grain types. They preferred that tests of basic instrument performance, such as susceptibility to radio frequency interference, be conducted only once to approve the instrument and that a reduced set of tests be conducted to approve calibrations. It was felt that calibrations used for type evaluation purposes could be developed using more limited sample sets than would be required for a commercially acceptable calibration. It was suggested that the instrument be "approved" and that calibrations be endorsed" as they are developed and tested for additional grains. By separating the two testing processes, it was felt that it would be easier to define what must be done to maintain adequate calibrations. A suggestion that an instrument be "provisionally" approved until suitable calibrations are developed received little support.

Those favoring the first approach also felt that it was unrealistic to expect a new instrument to come in for type evaluation testing equipped with a calibration suitable for commercial use. It was commented that if devices must be calibrated by the manufacturer prior to being submitted for type evaluation testing that test tolerances would have to be increased. An associated concern with evaluating both the instrument and the calibration is how to handle biases between predicted and reference values. It was suggested that it may be necessary to adjust type evaluation data to address bias problems. It was further noted that bias adjustment would not be a problem with NIR analyzers because a validation set could be used to slope and bias individual instruments. A final concern with approving the instrument and calibration was that sometimes the calibration might mask problems with the instrument.

A potential benefit of using a limited sample set to develop a calibration for type evaluation purposes is that the time required to test an instrument may be reduced. However, because of the problems associated with storing high moisture samples, it may not be possible to develop a calibration and conduct type evaluation testing in a single harvest season. Suggestions for addressing this concern were to use a material other than grain for testing, or to use "dry" samples of one type of grain to predict performance with other grains. Neither approach was felt to be feasible.

Those favoring the second approach were concerned about approving an instrument without considering long-term calibration needs. FGIS representatives commented that they have tried approving just the instrument, and that there are problems when type evaluation and calibration are not carefully coordinated. The users or customers do not view the instrument and calibration separately. They do not understand how an instrument can be approved, yet cannot be used because an approved calibration is not available. A related problem is that of determining criteria for testing or identifying approved calibrations.

The question was raised whether a Certificate of Conformance should be issued if approved calibrations are not available and the instrument cannot be used in the field. One consideration is the importance of documenting approval activities. The approved instrument and calibration should be clearly specified on the Certificate of Conformance, along with any auxiliary equipment. The Certificate of Conformance can then be used to document changes in a calibration. Issuance of a Certificate of

Conformance does not assure permanence or long term approval. It may be desirable for each Certificate of Conformance to have an expiration date.

Supporters of both approaches seemed to agree that a hierarchical approval process would be required. Specifically, the most feasible approach appears to approve an instrument for use with a few grains and add calibrations and approval for other grains at a later time. One concern with this approach is that not all calibrations stored on an instrument may be approved. This could lead to a problem with sealing instruments if some calibrations on an instrument are approved and others are not.

The committee discussed basic philosophy of experimental design as it relates to type evaluation testing. The comment was made that the test procedures outlined in the FGIS Moisture Handbook approach a full factorial design. An alternative approach is to perform sensitivity analyses, and develop test criteria for only those factors affecting moisture results. This approach requires basic knowledge of the instrument technology being tested. It was recommended that the sector ask manufacturers for information on the types of technology most likely to be submitted for testing, and then develop general type evaluation tests for these technologies.

Instrument Calibration

It was generally agreed that the sector needs to consider calibration requirements for both type evaluation (whether or not this is the calibration to be used in the field) and the long-term. An on-going, long-term calibration effort was viewed as essential if we are to achieve national uniformity in moisture measurement.

There was less agreement regarding how an on-going calibration effort would be maintained. It was acknowledged that FGIS has the facilities and access to national samples needed to develop these calibrations, and that FGIS would need to recover the cost of providing calibration data to instrument manufacturers. There was little agreement regarding who should pay for an on-going calibration effort.

The sector felt it would be reasonable to expect a manufacturer to support calibration efforts for the first few years after a new instrument is introduced, because calibration costs could be recovered from the sale of new instruments. Concern was expressed on whether calibration costs could be recovered for instruments already being used in the field. It was pointed out that the manufacturer has little leverage to force users to pay for calibration updates. It was estimated that it might cost $100 to $500--dollars per user to support calibration development for some older instruments with low sales numbers. This issue was not resolved.

Sample Set Selection

There was discussion of assembling a national sample set that could be used for both type evaluation and enforcement by the states. This would ensure that the states are using appropriate field test samples. It was pointed out that it would be difficult, if not impossible, to assemble and maintain standard sample sets because high moisture samples will survive for only a couple of months. It was further noted that the availability of high moisture samples may require that all type evaluation testing be conducted during and immediately after harvest.

Concern was expressed that type evaluation testing might not be possible in the off-season or in drought years. It was suggested that it might be possible to characterize a set of stable grains that would give the same instrument response as the set we are interested in testing. A similar suggestion was to use substitute grain types that would be more stable. It was felt that these approaches would not work because electrical and surface characteristics would be different. There does not appear to be substitute for using grain with the proper characteristics.

A type evaluation test set should represent a range of varieties, geographic areas, and moisture contents. It was suggested that the sub-committee look at the moisture ranges for samples included in the annual FGIS moisture survey and the moisture ranges specified in Chapter 2 of the FGIS Moisture Handbook to determine realistic moisture ranges for type evaluation and calibration needs. It was noted that obtaining high moisture samples at harvest is critical. If type evaluation and on-going calibration efforts are coordinated with the FGIS moisture survey, it will be necessary to obtain larger survey samples.

Tolerances

The initial question considered by the sector was whether tolerances similar to the acceptance and maintenance tolerances in Handbook 44 would be appropriate for type evaluation purposes. Performance results compiled using data from the annual FGIS moisture survey were distributed. This data indicates that existing moisture meters would be unlikely to meet Handbook

44 tolerances when tested using a randomly selected test set. It was cautioned that Handbook 44 reflected trade expectations and that such expectations often exceed the capability of available technology. It was proposed that statistical tolerances, such as the Normal Root Mean Square of the Difference (NRMSD) as outlined in Chapter 2 of the FGIS Moisture Handbook, be used in type evaluation testing.

Concern was expressed that an instrument might fail simply because of the sample set assembled for type evaluation testing, and that the same instrument might pass with a different test set. It was suggested that this problem be minimized by eliminating outliers from type evaluation test sets. It was proposed that the Motomco 919 be used as a screening device to preselect samples for use in type evaluation testing. A similar screening process is currently used by state Weights and Measures officials when they select test samples for field verification of moisture meter performance.

Another point of discussion was whether type evaluation approval could be based on instrument performance using a test set consisting of lower moisture samples that would be easier to maintain in good condition. The sector was asked what priority should be placed on high moisture samples. It was estimated that as much as 80% of the corn crop is dried to a moisture content of 18% or less before marketing.

The sector discussed type evaluation testing over a range of operating temperatures. Handbook 44 currently specifies that a moisture meter will operate over a temperature range of 35-104 F, or the temperature range specified by manufacturer if that temperature range is not applicable. Interest was expressed in establishing a standard temperature range for type evaluation testing. This would facilitate testing of more than one instrument at a time during the environmental phase of type evaluation testing. A standard test range of 50-104 F was suggested. There was no discussion of testing instruments over a range of relative humidities.

A final point of discussion was whether it was desirable to test the effect of Radio Frequency Interference (RFI) on instrument performance. Henry Oppermann cautioned that, if we are going to require RFI testing, it would be necessary to test over the entire spectrum of frequencies. It was suggested that the sector needed to determine how much of a problem RFI presented, and weigh the costs and benefits of conducting testing for susceptibility to RFI. It was reported that instruments are currently being tested to determine if they generate RFI that interferes with other applications. There is currently no testing to see if instruments are susceptible to RFI. One suggestion was to require that instruments be tested by an independent laboratory that would certify that they are not susceptible to RFI.

Sealing Instruments Adjustments

Some sector members were troubled that NIR instruments are unique, and require individual slope and bias adjustment. They were concerned that the operator needs to make frequent bias adjustments, and it was suggested that the sector may need to consider that NIR analyzers might not be suitable for commercial use as a moisture meter. It was noted that there are already devices available that do not require a daily bias check. As an alternative, the sector may need to investigate other means of establishing checks and balances. For example, it may be necessary to require certification and licensing of NIR operators. It was noted that there are more safeguards available in other areas regulated by Weights and Measures.

The performance of NIR analyzers was defended, and it was pointed out that they are working very well in Canada for determining moisture. The response was that there are only 6 to 8, well centralized companies measuring grain moisture in Canada. These companies have strong quality control programs, and their operation is similar to that in a regulated environment. Some sector members felt that it was inappropriate to exclude NIR analyzers, and that the solution was to put a quality control system in place that would ensure reliable results. A final comment was that it made no sense to say that NIR analyzers were not suitable for use as moisture meters, then say that it is okay to use these same instruments for determining wheat protein.

Participants
December 17-18, 1991

Name	Organization
John Antoniszyn	Canadian Grain Commission
John Barber	Dickey-john Corp.
Cathy Brenner	USDA/FGIS
Carroll Brickenkamp	NIST
Bill Burden	USDA/FGIS
Randy Burns	Arkansas Bureau of Standards
Tina Butcher	NIST
Sid Colbrook	Illinois Weights and Measures
Dieter Curlis	Perstorp Analytical, Inc.
Dave Funk	USDA/FGIS
Lowell Hill	University of Illinois
Terri McLain	Sartorius Instruments
Allen Nelson	Connecticut Weights and Measures
Tom O'Connor	National Grain & Feed Association
Henry Oppermann	NIST
Allison Pflug	CSC Scientific
Rich Pierce	USDA/FGIS
Robert Rachlis	Bran+Luebbe Inc.
Jim Rampton	USDA/FGIS
Joseph Rothleder	California Div of Measurement Standards
Tom Runyon	Seedburo Equipment Company
Cheryl Tew	NC Dept of Agriculture
Cliff Watson	Consultant
Phil Williams	Canadian Grain Commission
Robert Wittenberger	Missouri Weights and Measures
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Hiroshi Yamahira	Kett Electric Laboratory

National Type Evaluation Technical Committee
Near Infrared Grain Analyzer Sector
Meeting Summary
December 19 – 20, 1991

Agenda Items

RESULTS AND DISCUSSION

1. Goals and scope of the Committee

Because all members of the NIR Wheat Protein Sector are also members of the Moisture Meter Sector, there was no additional discussion of the goals and scope of the sector. Refer to the summary of the Moisture Meter Sector meeting for comments relating to the goals and scope of the two sectors.

2. Overview of NIR technology and FGIS programs

Results of the Meeting

Committee members were provided with background information on (1) basic operating principles for NIR protein analyzers, (2) reference methods for determining wheat protein, (3) FGIS monitoring procedures for official wheat protein determination, and (4) FGIS type evaluation test procedures. The overviews effectively provided background information to committee members, and provided an opportunity for those individuals familiar with NIR instruments to share observations on basic operating principles.

Discussion:

NIR Overview. Dave Funk, FGIS, presented operating characteristics for two basic types of NIR technology: Reflectance-type instruments that usually are fixed filter instruments operating at wavelengths between 1068 to 2575 nm, and transmittance-type instruments that utilize wavelengths in the very near-infrared region from 800 to 1100 nm. Reflectance-type instruments typically obtain readings from the light reflected from the surface of a ground grain sample. Multilinear regression is the most common calibration technique used with these instruments. Transmittance-type instruments typically measure the amount of light transmitted through a whole grain sample.

One concern expressed following this presentation was the need to standardize acronyms used to describe these instrument types i.e., NI, NIR, NIRS, NIRR, NIRT, or NIT.

Reference Method. Bill Burden, FGIS, discussed kjeldahl and other procedures used to determine protein content. FGIS plans to adopt a combustion-type nitrogen analyzer for use as an approved protein reference method were discussed. Use of a combustion-type nitrogen analyzer should allow more samples to be analyzed in a shorter period. This is important because

NTEP type evaluation and calibration activities would represent added load on an operation that is already a bottleneck in FGIS protein operations. It was commented that individual states may want to use kjeldahl facilities currently available in their states to establish protein values for standard field check samples.

FGIS Wheat Protein Program. Dave Funk, FGIS, outlined FGIS procedures for maintaining a wheat protein program within the official inspection system. This effort includes instrument calibration, maintaining slope and standard reference sample sets, and monitoring the performance of instruments in the field. FGIS receives nation-wide monitoring samples and can assemble a pool of samples to be used for type evaluation or calibration purposes. FGIS NIR calibrations are developed using protein values adjusted to a constant moisture basis of 12% w.b.. Slope adjustment is a procedure used to transfer universal calibrations to different instruments of a given model. Slope adjustments are infrequent, typically not required more than once or twice a year. Bias adjustments with standard reference samples are more frequent, with bias checks required daily. Thus, NIR instruments typically require frequent checks; checking only once a year probably is not realistic since there can be significant changes in bias over that period.

FGIS Type Evaluation. Rich Pierce, FGIS, presented an overview of FGIS design criteria, performance specifications, and test protocol for NIR wheat protein. Discussion focussed on test procedures outlined in the document "Design Criteria and Operational Performance Specifications for Grain Constituent Measuring Instruments Using Near Infrared Spectroscopy.

The question of having to submit NIR instruments for both wheat protein grain moisture type evaluation testing was discussed. Reasons given conducting these tests separately included: (1) test sample sets may not be the same for both type evaluation tests, (2) high moisture samples need to be handled differently than the lower moisture, more stable samples suitable for use in testing wheat protein determination, and (3) characteristics for use with reflectance-type as minimizing moisture loss and the fineness of grind, moisture and protein analyses. A uniform, fine particle required for protein analyses while a coarser grind may be e when making moisture determinations.

FGIS uses the Udy cyclone grinder to prepare samples for protein analyses, and uses the Wiley Mill when a whole grain moisture determination is required and moisture loss during grinding needs to be minimized. The Wiley Mill typically provides a coarser ground product than the Udy grinder.

3. Handbook 44 Code

A. Handbook 44 code needs to be developed for NIR wheat protein analyzers.

Results of the Meeting

The committee agreed that the Grain Moisture Meter code should serve as a guide for developing NIR wheat protein analyzer code. The committee recognized that the use of metric units is required for Handbook 44 code. It was recommended that the code specify that protein values be corrected to a constant moisture basis of 12% w.b.. Rich Pierce and OWM personnel will draft NIR Wheat Protein code for Handbook 44.

The committee agreed to adopt ten design requirements (with appropriate revision) used by FGIS in previous type evaluation testing. The specific items adopted by the committee are listed below with discussion of recommended changes. The committee recommended against adopting requirements that FGIS personnel be able to develop calibrations on approved instruments, that minimum calibration capacity be four products and three constituents each, that the instrument be equipped with FGIS specified optical filters, and that the minimum analysis time be five minutes.

Discussion: The committee discussed reporting wheat protein on either the 12% moisture basis used by FGIS, the 13.5% moisture basis used in Canada, on a dry basis moisture content, or on an "as is" moisture basis. To promote uniformity, it was decided that protein values should be reported on the 12% moisture basis used by FGIS. Handbook 44 code should include a user requirement that wheat protein be displayed only on a 12% moisture basis. The moisture basis used to report protein level should be listed on the printed statement, if available, or on the hand written ticket.

Concern was expressed whether the consumer (farmer) would believe the corrected protein value unless the moisture content also is displayed. This issue was not resolved.

The committee discussed design criteria previously used by FGIS. The committee agreed that the following items should be included in either Handbook 44 or Publication 14.

1. The manufacturer shall provide the model(s) identification, applicable drawings, and data indicating the equipment potentially meets performance specifications. This does not require that detailed schematics of electronic circuits be submitted unless required to definitively define the model. Requirements regarding the materials to accompany the request for type evaluation will be addressed in Publication 14.

2. Handbook 44 code should state that calibrations must be transferable between different instruments of a given model type.

   Comments: Allowable techniques for transferring calibrations must be specified. Slope and bias adjustments are considered normal calibration transfer procedures.

3. Handbook 44 code shall include a requirement that the operator be able load and verify calibration constants and standardize the instrument on location without use of an auxiliary computer. An external computer used for normal constituent analysis is not considered auxiliary.

   Comments: The operator's ability to change calibration constants may contribute to the facilitation of fraud. It was correctly noted that calibration constants cannot be verified on some instrument types.

4. Handbook 44 code should specify that instruments have a built-in standard serial port, such as an RS 232 port, capable of providing output of constituent contents and data required for calibration development.

   Comments: This feature is needed to collect calibration data and is also a desirable feature for day-to-day data collection. Handbook 44 code should specify use of a "standard serial port" instead of requiring an RS 232. It was pointed out that RS 442 or RS 449 ports are better suited for some uses, i.e., a high noise environment, than an RS 232 port. It should be required that the output be compatible with that of an RS 2329 and stated that BCD or HPlB output is not acceptable.

   Serial ports are used in instrument development and production and most instrument models are equipped with serial ports, so this requirement should not be difficult to meet. It is anticipated that as inspection systems become more sophisticated, information will be routinely downloaded to remote computers.

5. Handbook 44 code should require that instruments be capable of programming to display constituent contents of products in percent on a constant moisture basis. The display shall permit constituent value determination to 0.01 and 0.1 percent resolution.

   Comments: It was discussed that the 0.01 percent resolution is required for use in type evaluation testing, and that the 0.1 resolution is typically used in the field. The consensus was to keep this specification, but to clarify the reason for requiring two different display resolution values. This requirement is consistent with General Code requirements on rounding.

   It was suggested that requirements for size and visibility of displayed values should be defined. This concern appears to be adequately covered in the General Code. It was suggested that we might want to require a printout of pertinent information such as date, product, and protein level.

6. Handbook 44 shall require that an instrument operate on AC power and that performance requirements shall be met with line voltage variations from 100 to 130 volts at 59.5 to 60.5 cycles per second.

   Comments: It was suggested that the cycles per second range not be specified in Handbook 44. There is a similar requirement in the Scales Code, but the effect of varying cycles per second is typically not tested. The response was that this requirement should be in Handbook 44, even if it would typically not be tested during type evaluation, so that a device can be rejected if a problem exists. It was felt that this approach could be explained to the Specifications and Tolerances Committee.

7. FGIS requirements state that the instrument shall attain hardware accuracy within 24 hours of power turn-on from a cold start.

Comments: It was felt that the 24 hour warm-up time was excessive, and noted that the precedent in the Scales Code is that a device should not indicate a result until it can perform within specified requirements. Typically, this requires a sensor to detect when the instrument is ready to make an analysis. It was suggested that this is not a trivial thing to design into an instrument. Concern was expressed over the possibility of an instrument locking-up due to a power glitch or after being unplugged and moved across the room. A suggestion that manufacturers could incorporate an UPS system met with concerns about expense. A similar problem is addressed in Sections T.5 and TN.814 of the Scales Code. The consensus was that requirements for warm-up time should be written using language already developed in other Handbook 44 chapters.

8. Handbook 44 should include a requirement that instrument optics and electronics be protected from exposure to dust by either sealing both areas or by protecting them with a dust filtration system suitable for the removal of air-borne grain dust. Instruments with dust filter systems should not overheat at 50% blockage of the filter within the operating temperature range. Dust filters shall be easily replaced.

9. FGIS requirements state "If an instrument has an upper internal operating temperature limit that could be exceeded within an ambient temperature range of 50' to 90* F, then a means of sensing and indicating an over-temperature condition must be provided."

   Comments: This requirement needs to be reworded and included with requirements for warm-up time. Again, a similar requirement is addressed in Section T.5 of the Scales Code.

10. Handbook 44 should specify that if an instrument must be positioned to less than 3 degrees from an upright normal position to a level plane in order to meet performance specifications, then the instrument shall have a level indicator and leveling adjustments.

    Comments: This requirement should be included because some monochromater devices might be sensitive to operation in out of level conditions.

The committee decided not to include requirements for permanence or life testing in the NIR chapters feeling that this area is adequately covered in Section G-S.3 in the General Code. Procedures for testing permanence should be included in Publication 14. FGIS test criteria include a requirement of 8000 continuous measurements without failure, that was intended to reflect 1 year of operation in their system. FGIS has waived permanence testing in the past, and required justification from the manufacturer that their instrument meets permanence requirements. It was commented that 8000 measurements is not a very challenging test.

B. Measurement Technologies to be Considered by the Committee

Results of the Meeting

It was agreed that the code for protein analyzers should be limited to near-infrared reflectance- and transmittance-type instruments. These instruments may utilize either whole grain or ground grain samples.

Discussion: We are limiting technology to near-infrared analyzers since by definition we are developing test criteria for NIR wheat protein analyzers. It was recommended that the code be general enough to accommodate future type evaluation of NIR instruments used to test other commodities and constituents such as soybean protein and oil.

C. Reference Method for Determining Wheat Protein

Results of the Meeting

The code will 'require use of a reference method recognized by FGIS. FGIS will develop the wording to be used in the code.

Discussion: The committee discussed the fact that FGIS is moving toward recognition and use of a combustion-type nitrogen analyzer as a primary reference method. Some states may want to use kjeldahl to establish field standards for enforcement, and

that this may require a round-robin sample exchange program to assure agreement between kjeldahl and combustion-type nitrogen analyzer results.

4. Type Evaluation Considerations

A. Calibrations

1. Calibrations used for type evaluation testing
2. Wheat classes
3. Grinder specifications

Results of the Meeting

The committee agreed that calibrations used for type evaluation testing way be either supplied by the manufacturer or developed as part of type evaluation. The calibration used during type evaluation testing shall be specified on the Certificate of Conformance and its use will be required for instruments used in commercial inspection. It was agreed that a on-going calibration effort is required for NIR wheat protein analyzers, and that a national calibration set is needed.

The committee agreed that instruments (and calibrations) must be evaluated for each individual class of wheat for which approval is requested. This does not mandate the use of separate calibrations for each wheat class. Instruments may be submitted for evaluation using an all-class calibration that will be tested for each class individually using a single slope and bias adjustment. Instruments using all-class calibrations must conform to the same test requirements as those using calibrations for individual classes of wheat. The classes of wheat for which an instrument is approved will be specified on the Certificate of Conformance.

The make and model of grinder used when developing calibrations for ground-grain NIR protein analyzers must be specified by the manufacturer and listed on the Certificate of Conformance as required auxiliary equipment.

Discussion: The committee discussed two means of obtaining calibrations suitable for use in type evaluation testing. One option is to use a calibration provided by the manufacturer. If calibrations are provided by the manufacturer, a standard set of slope samples may be required so that appropriate slope and bias adjustments can be made to accommodate type evaluation testing with a national test sample set. Having the manufacturer provide calibrations may not be a reasonable requirement for new instruments with no calibration history.

The second option is to develop calibrations as part of type evaluation testing. FGIS has tested NIR analyzers using calibrations developed specifically for type evaluation testing and based upon 50 samples selected from the same population as the test set. This approach is not recommended for NTEP evaluations because calibrations based upon only 50 samples are probably not adequate for field use. It was suggested that a national calibration set is needed to promote uniformity in wheat protein measurements.

The committee agreed that a national calibration set could be used to develop calibrations suitable for both type evaluation and commercial protein determinations. This would require that a set of 150-200 calibration samples be assembled for each class of wheat. The NTEP laboratory would supply the manufacturer/applicant with log and chemical data for these calibration samples and for an additional 50 samples included in a validation set. It would then be the manufacturer's responsibility to use this data to develop a calibration that meets all type evaluation test requirements. With this approach, there would be no need to specify minimum requirements for the Standard Error of Calibration (SEC). This approach should promote uniformity since field results would be based upon calibrations developed using a standard calibration set.

The committee discussed how to handle situations where instruments are resubmitted for testing after having previously failed to meet type evaluation test criteria. Normally, it is required that the manufacturer shall have addressed problems identified during type evaluation before resubmitting the instrument for another evaluation. It was suggested that we allow an instrument to be resubmitted for type evaluation if the calibration is modified and improved. There was some concern that an instrument might fail due to the test set used for evaluation. Testing should clearly demonstrate that an instrument has a tendency to fail.

The grinder and the characteristics of the ground sample, has a significant effect on calibration performance. Changing the grinder invalidates the calibration and would require that the instrument be reevaluated. It was recognized that this presents a dilemma for NIR manufacturers in that the approval of their instrument is dependent upon continued availability of the specified

grinder. It was agreed that the NTEP laboratory should have the option of requiring the manufacturer to provide a grinder to be used in type evaluation testing. The question of durability and permitted wear on the grinder was also discussed.

B. Test Procedures and Tolerances

1. Accuracy, repeatability, and reproducibility
2. Environmental tests

Results of Meeting

The committee agreed that type evaluation criteria previously used by FGIS should be revised to form the initial draft of NTEP test criteria. Test criteria and tolerances developed by FGIS for instrument accuracy, repeatability, reproducibility, and susceptibility to environmental conditions are described in the document "Design Criteria and Operational Performance Specifications for Grain Constituent Measuring Instruments Using Near Infrared Spectroscopy."

Discussion: It was suggested that the order of testing be such that it is possible to check fatal errors first. Type evaluation testing would stop at the first failure. It was recommended that instrument precision be tested first as this is a good check on the suitability of the calibration.

The tolerances established by FGIS were intended to define state-of-the-art equipment. The committee was asked if it was reasonable to expect this kind of performance from commercial grain inspection equipment. The committee felt it was acceptable for type evaluation tolerances to be tighter than what can be maintained in the field. It was noted that several instruments have already met these requirements, and that it would be a move backward to widen tolerances.

Requirements for some environmental tests are severe, and different tolerances might be needed for instruments operated outside the "normal" range of parameters. The committee felt that all environmental tests should be retained, but that tolerances should be reexamined. The tolerances are a particular concern for instruments that cannot accommodate the use of sealed samples.

Tolerances for field enforcement were discussed briefly. Handbook 44 tolerances should be related to the statistical tests used for type evaluation. It is important that the grain industry understand the variability and limitations associated with wheat protein determinations.

The need for an on-going quality assurance program to maintain field performance was discussed. The availability of field test samples and standard reference samples (for regular bias checks) are a concern. It was suggested that states could assemble test samples and submit a portion of each to FGIS for analysis. In this way, FGIS laboratories can be used to standardize the protein values of samples used for regulation. The states may in turn provide reference samples to elevators. Such efforts will complement an on-going calibration program.

C. Sample Selection and Preparation

Results of Meeting

The committee agreed that type evaluation test sets should be selected to cover appropriate ranges of growing conditions (geographic location) moisture content, protein, and hardness level for each wheat class. The rules for selecting test samples need to be consistent. This is important because it will not be possible to use the same test set for an extended period. It also will be desirable to use a different test set in the event an instrument is reevaluated.

5. Next Meeting

Issues identified for discussion at the next meeting are:

1. How will on-going calibration efforts be funded? This is a concern for both moisture meters and NIR wheat protein analyzers.

2. Will NTEP testing be waived for instruments currently approved by FGIS?

The meeting adjourned at noon Friday, December 20. Several committee members toured the FGIS Technical Center in the afternoon.

Participants
December 19 – 20 , 1991

Name	Organization
John Antoniszyn	Canadian Grain Commission
Cathy Brenner	USDA/FGIS
Bill Burden	USDA/FGIS
Randy Burns	Arkansas Bureau of Standards
Tina Butcher	NIST
Dave Funk	USDA/FGIS
Lowell Hill	University of Illinois
Allen Nelson	Connecticut Weights and Measures
Tom O'Connor	National Grain & Feed Association
Henry Oppermann	NIST
Rich Pierce	USDA/FGIS
Robert Racblis	Bran+Luebbe Inc.
Joseph Rothleder	California Div of Measurement Standards
Cheryl Tew	NC Dept of Agriculture
Cliff Watson	Consultant
Phil Williams	Canadian Grain Commission
Robert Wittenberger	Missouri Weights and Measures
Richard Wotthlie	Maryland Weights and Measures

National Type Evaluation Technical Committee
Grain Moisture Meter Sector
Meeting Summary
March 18 – 19, 1992

Agenda Items

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1. Goals of the Meeting

The purpose of this meeting was to outline type evaluation tests tolerances for use in developing a moisture meter section in Publication 14.

Results of the Meeting

A. The subcommittee reviewed moisture meter test requirements specified in the FGIS Moisture Handbook, OIML International Recommendation No. 59 "Moisture Meters for Cereal Grains and Oilseeds," and the NCWM Handbook 44 to determine which tests should be included as part of an NTEP type evaluation.

B. The subcommittee discussed the overall evaluation process and general approval requirements.

C. The subcommittee outlined specific procedures for several tests, and suggested approaches for defining procedures for the remaining tests.

D. The subcommittee identified issues that need to be addressed by the Moisture Meter Sector.

Discussion: Subcommittee members were provided copies of Attachments 1, 2 and 3 at the meeting. Attachment 1 outlines the topics to be included in Publication 14, and illustrates how development of type evaluation test procedures fit into the overall development process. Attachments 2 and 3 list tests that need to be considered in developing type evaluation test criteria. Discussion is summarized into the four general categories listed above.

Concern was again expressed that it is difficult to develop test criteria if there are no limits placed on the types of measurement technologies that may evaluated. The subcommittee listed dielectric (capacitance), conductance (resistance), near-infrared spectroscopy, microwave transmission, thermogravimetric (moisture balance), and nuclear magnetic resonance (NMR) as possible measurement technologies. it was agreed that both line and battery power sources might be used. The subcommittee was reminded that the technologies to be evaluated will not be limited by design criteria in Handbook 44, but may be eliminated if they can not meet performance specifications.

A. Type Evaluation Tests

The subcommittee recommended that type evaluation testing verify the effects of fluctuations in power supply, power interruptions, storage temperature, temperature cycling, leveling, endurance (life test), warm-up time, operating temperature, differences between instrument and sample temperature, humidity, and instrument accuracy, precision, and reproducibility. Tests for vibration, radio frequency interference, stabilized readout, impurity (dockage) levels, external magnetic fields, electro-magnetic radiation, and failure of the power supply were not recommended for type evaluation. Comments on these tests are summarized below.

1. Power Supply (include) - It was agreed that this test should be included because power supply requirements are addressed in Handbook 44. The subcommittee recommends that performance be tested over a range of voltages (100 - 130 volts) while operating at a nominal frequency of 60 Hz. This nominal frequency should be used throughout type evaluation testing.

2. Vibration (do not include) - Henry Oppermann commented that NTEP evaluations for other types of equipment do not include vibration tests. It was noted that vibration problems during shipping are normally a reliability problem. Before on-site vibrations become a problem it is generally necessary that they be at a resonance frequency. This makes it difficult to design a test to demonstrate that a vibration problem exists.

3. Storage Temperature and Temperature Cycling (include) - This test is associated with conditions that might be encountered while an instrument is being shipped. Storage temperature tests should expose problems associated with adjoining parts having different coefficients of thermal expansion. It was suggested that these problems would be more readily apparent if the temperature was cycled. Storage temperature/temperature cycling tests will be conducted while the instrument power is off. It was noted that storage temperature is not referenced in Handbook 44 and that it will be necessary to either revise Handbook 44 to include storage temperature or to interpret some other section of Handbook 44 (permanence?) to cover storage temperature/temperature cycling tests.

4. Radio Frequency Interference (do not include) - Henry Oppermann indicated that this test is not required for other types of equipment tested by NTEP, and that the metal walls in their lab were not suitable for RFI testing. It was noted that RFI testing requires a lot of work and that testing might not address or identify actual problems.

5. Leveling (include) - This test should be required because grain might flow differently through instruments that are not level.

6. Life Test (include) - It was noted that stability might be a more important long-term test than permanence. It was unclear whether life testing should reflect the volume of samples run, a specific time period, or both.

7. Warm-up Time (include) - Warm-up time tests should be included because they are addressed in Handbook 44 specifications.

8. Stabilized readout (do not include)

9. Display Resolution - Display resolution is addressed in Handbook 44 and must be verified, but is more appropriately included as part of the checklist.

10. Moisture Ranges - Moisture ranges are related to the calibration and should be reported accordingly. The moisture range needs to be specified on the Certificate of Conformance. The problem is in verifying the moisture range over which instrument and calibration performance should be approved.

11. Accuracy, precision (repeatability) and reproducibility all describe instrument performance and should be included as part of type evaluation testing. These terms need to be defined, both in descriptive and mathematical terms. Jack Barber commented that the Normalized Root Mean Square of the Difference (NRMSD) described in Chapter 2 of the FGIS Moisture Handbook does not provide information on how well moisture is predicted over specific moisture ranges, and that a better measure than NRMSD is needed to describe instrument and calibration accuracy. There also is a need for a meaningful measure that can be used to determine when calibrations need to be updated. Tolerances used in type evaluation testing need to be tight enough to ensure that meters meeting type evaluation criteria also meet Handbook 44 requirements. Tests for instrument reproducibility are not covered by Handbook 44 requirements.

12. Auxiliary Equipment (do not include) - There was considerable discussion regarding test criteria and tolerances for test weight apparatuses. It is obvious that state Weights and Measures officials need approval criteria for test weight kettles. However, development of such criteria is not the responsibility of the sector.

13. Impurities (do not include) - The effect of impurities (broken grain and fine material) in the grain sample is difficult to define in a meaningful way. It is included in OIML requirements primarily because of concerns with measurements on high moisture grain. A statement indicating that tests will be conducted with clean grain needs to be added to Publication 14. User requirements may need to address the effect of impurities on instrument performance. It was felt that dockage levels of 5 percent or less probably will not affect moisture results.

14. Humidity (include) - Humidity tests should be included because humidity level might have a considerable affect upon the performance' of thermogravimetric devices, and may have some affect upon resistance meters. Henry had reservations about including humidity tests, and noted that scales are not tested over a range of humidities. It was suggested that humidity tests could be adapted from A.3.2 Damp Heat, Steady State.

15. External magnetic fields and electro-magnetic radiation (do not include) - The reason for not including these tests is similar to that given for electromagnetic susceptibility. These problems are difficult to detect and there is no guarantee that a test can be developed that would reliably identify instrument weaknesses.

16. Electrostatic discharges (do not include) - These effects are random. We are not sure what the effect will be.

17. Failure of the electrical power supply (do not include) - The general feeling was that problems associated with a power failure or brownout are obvious to the user through error codes or instrument failure. There is no need to type evaluate features that are obvious in the field.

    The subcommittee discussed the associated problem of automatically detecting a corruption in the calibration. This is a concern where calibration data is stored as bits of data. Most subcommittee members agreed that detection of calibration corruption needs to be designed into the instrument as an automatic check instead of having to manually check calibration codes. Cliff Watson felt that printing out the calibration constants is an acceptable alternative. It was recommended that Handbook 44 code be developed specifying automatic checks for calibration corruption.

B. Overall Evaluation Process

A concern voiced at the December sector meeting was that "full-blown" type evaluation testing should not be required to extend approval to additional grain types or update calibrations. It was clarified that there is no need to perform redundant tests, and that only new features or performance ranges need to be tested. Type evaluation should not be required for calibration updates performed as part of the on-going calibration effort.

The subcommittee recommended that type evaluation testing be conducted in two phases. The first phase would emphasize tests more directly related to instrument performance, and would be conducted using grain samples

representing a limited moisture range. Limiting moisture ranges will allow these tests to be conducted nearly year-round. The second phase of testing will be designed to extend approved moisture ranges for the calibration and will be conducted during harvest when higher moisture samples are available.

The manufacturer will be responsible for supplying instruments equipped with calibrations capable of meeting phase one test requirements. They also must provide data showing that the calibration is based on real grain samples representing their reported operating range.

C. Specific Test Procedures

Basic phase one testing will be conducted by running all tests on each of two instruments. Most tests will be conducted at room temperature (room temperature conditions need to be defined). The subcommittee agreed that many of the tests can be conducted using Hard Red Winter (HRW) wheat or the most uniform applicable grain. The following test procedures were outlined for power supply, storage temperature and leveling tests.

Test	Grain Type	Moisture Range	No. of Samples	Tolerance	Test Range
Power - Line	HRW	12-14	1 sample, 10 drops	0.2 x accept tol. (also precision)	100-130 v 200-250 v
-Battery	HRW	12-14	1 sample,	0.2 x accept tol.	Max Volt.

			10 drops	(also precision)	No result
Storage Temp	HRW	12-14	1 sample 10 drops	0.4 x accept tol.	-20 to 55C
Leveling	HRW	12-14	1 sample	0.2 x accept tol.	H-44 spec

Notes:

Power supply - A total of 30 drops will be required, 10 at the nominal voltage of 117 v, and 10 drops each at the voltage extremes. The lower voltage limit for a battery powered instrument will be the point at which a result is no longer provided.

Storage Temperature - Drop the sample 10 times at room temperature and relative humidity prior to temperature cycling. Turn the instrument off. Increase the temperature to 55 C over a 1 hour period. Maintain the temperature at 55 C for 3 hours. Decrease the temperature to -20 C over a 1 hour period. Maintain the temperature at -20 C for 3 hours. Repeat the cycle. Turn the instrument on for the specified warm-up period and drop the test sample 10 times.

Leveling - The leveling test will be conducted for a minimum of 2 orientations; front-to-back and left-to-right. Additional orientations will be tested as deemed appropriate.

Because of time constraints, the subcommittee moved to discussion of accuracy, precision and reproducibility tests instead of continuing to outline procedures for the more basic tests. The discussion dealt primarily with identifying an approach for developing test criteria. General recommendations include:

1. In addition to testing for accuracy over the moisture range, instrument accuracy should be evaluated for each 2% moisture intervals.

2. FGIS data for the Motomco 919 will be used to determine the number of samples per 2% interval, the number of drops per sample (probably 3), and the tolerance limits that will be applied.

3. Tolerances will reflect a confidence interval, determined using FGIS data, applied to the maximum allowable instrument bias. Confidence intervals will be developed for individual grain types and classes.

4. Accuracy tolerances should be established for both the average moisture for samples in a 2% interval and for the Standard Deviation of the Differences (SDD) for all samples in an interval.

Jack Barber asked whether it was necessary to evaluate instrument precision for every grain type, or whether testing could be done using a limited number of grain types. He suggested oats (low test weight), sunflowers (conductivity), soybeans (uniformity), corn, and wheat. It may be possible to collect all the data needed for precision testing at the same time that accuracy testing is being performed. This item was not resolved.

D. Additional Issues and Action Items

Jack Barber noted that the State of California lists calibration constants on the Certificate of Conformance they issue for moisture meters. It was recommended that calibration constants be listed on NTEP certificates.

The sector needs to develop criteria for determining when a calibration needs to be updated.

There needs to be a procedure to phase out instruments if calibrations are not being maintained by the manufacturer. This is a particular concern if instrument users are bearing the cost of collecting calibration data.

Handbook 44 code should require that only the most recent calibration be available to the operator. Inspectors should destroy old calibration charts or disk.

Attendees

I. Jack Barber, Dickey-john
2. Dave Funk, FGIS
3. Henry Oppermann, NIST
4. Rich Pierce, FGIS
5. Jim Rampton, FGIS
6. Hugh Shown, Dickey-john
7. Cliff Watson, Consultant
8. Bob Wittenberger, Missouri W&M

ATTACHMENT I

PUBLICATION 14 - ADMINISTRATIVE PROCEDURES, TECHNICAL POLICY, CHECKLISTS, AND TEST PROCEDURES

I. Application Form

Standard application form specifying the information and performance data to be supplied by the manufacturer when applying for type evaluation.

Evaluation Process

Overview of application procedure, performance testing that will be required, procedure for assembling sample sets, and performance tolerances.

III. Certificate of Conformance

Applications (grain types, moisture ranges, temperature ranges, etc.), Requirements for Use (approved calibration, auxiliary equipment, etc.), and Post-Evaluation Responsibility of the Manufacturer (i.e. on-going calibration development and updates, inform NCWM of any changes in the instrument).

IV. Checklist of Design Features

Verify that the instrument meets design specifications in Handbook 44 code.

V. Test Procedures

Detailed test procedures for performance tests. Format for reporting test results.

NOTE: A type with a valid Certificate of Conformance may be reevaluated in order to encompass additional features, such as the range of the measured quantity or the kinds of commodities that may be measured.

In most such cases, it will be sufficient to determine the validity of the added features: the evaluation(s) will not go through the entire checklist, but will test the new features through their ranges of performance.

ATTACHMENT 2

TYPE EVALUATION REQUIREMENTS

FGIS Moisture Handbook - Chapter 2. Performance Requirements

A. Power Supply

B. Vibration

C. Storage Temperature

D. Electromagnetic Susceptibility

E. Leveling

F. Life Test

G. Hardware Performance

1. Accuracy
2. Warm-up Time
3. Stabilized Readout
4. Display Resolution

H. Operational Performance

1. Accuracy and Allowable Quality Limits
2. Reproducibility
3. Precision

Sample Preparation Equipment (Auxiliary Equipment)

OIML Rec. No. 59 - Moisture Meters for Cereal Grains and Oilseeds

A. Test for conformity with design requirements

B. Accuracy tests under reference conditions

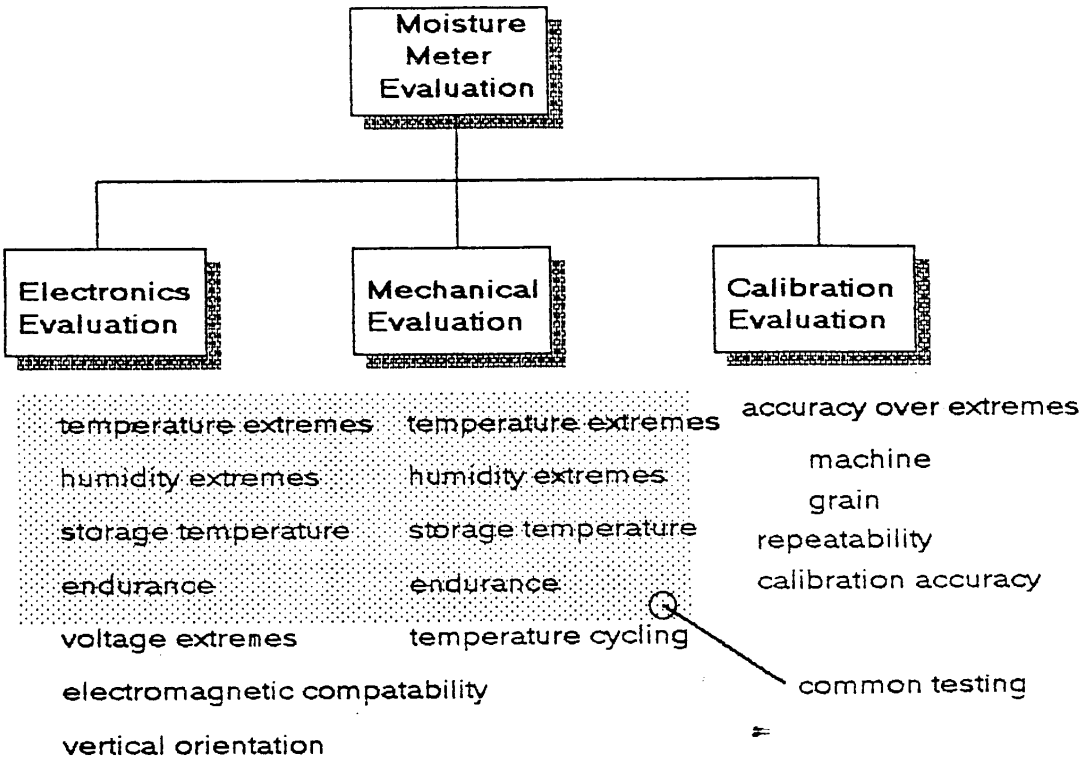
C. Tests including the various influence quantities

1. Temperature Variations
2. Impurities
3. Voltage (possibly frequency)
   Humidity

D. Influence of external disturbances

External magnetic fields
Electro-magnetic radiations
Electrostatic discharges
Failure of the electrical power supply

Attachment 3 - Prepared by Jack Barber, Dickey-john



National Type Evaluation Technical Committee
Moisture Meter Sector and
Near Infrared Grain Analyzer Sector
Meeting Summary
June 10 – 12, 1992

Agenda Items

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1. Goals of the Moisture Meter Sector

In addition to the items listed above, the group reviewed part of the Handbook 44 chapter drafted for Near-Infrared Grain Analyzers. This review resulted in additional recommendations for changes to the Grain Moisture Meter chapter. These recommendations are presented below following discussion of Handbook 44 Code considerations for grain moisture meters.

RESULTS AND DISCUSSION

2. Handbook 44 Code considerations

A. Specifications and Tolerances Committee Item 360-5

B. Minimum sample size

Results of the Meeting

Sector members agreed that a minimum sample size should be specified for moisture meters. The minimum sample size will be 100 g, 400 kernels or seeds, or the volume equivalent, whichever is smallest.

Discussion: There was some discussion that this requirement might not be needed. It was suggested that we let the manufacturer specify the sample size, then test to see if an instrument meets type evaluation requirements using that size of sample. This raised concerns that it would then be necessary to prepare non-homogeneous test samples to test whether the sample size was adequate. These samples would be inherently unstable and difficult to characterize. Concern was also expressed that some single kernel moisture testers could be set to provide a moisture result based upon analysis of a single kernel. The group agreed that a minimum sample size should be specified.

It was suggested that the recommendation for a minimum sample size be changed from 150 g to 100 g because some Motomco charts currently specify the use of a 100 g sample. The volume and kernel equivalents were suggested to accommodate low test weight grain and grains with small seeds, respectively. It was initially suggested we put a requirement

in Handbook 44 specifying a minimum sample size of 100 g or the equivalent, then specify in Publication 14 what we mean by "equivalent." There was concern expressed that this would force non-NTEP states to make their own interpretation of equivalence in enforcing Handbook 44 requirements. It was suggested that minimum sample size be included in Handbook 44 as a user requirement. Again, this could create problems for non-NTEP states trying to interpret Handbook 44. There was a recommendation that reference equivalence charts be developed.

It was asked whether specifying a minimum samples size implies that an instrument should not provide a reading when the sample size is below the specified minimum. The question was expanded to include existing meters, i.e., Should the Motomco 919 provide a reading on a 249g sample? The committee agreed that the intent of the minimum sample size requirement was not to preclude a meter from indicating a result if the sample size is less than the specified minimum. The minimum sample size is a design requirement that should be verified as part of type evaluation. Ensuring that the appropriate size sample is used in the instrument is the responsibility of the user.

C. Design specifications to reduce facilitation of fraud

Results of the Meeting

The consensus was that calibrations and other non-metrological adjustments must be sealed. It was recommended that, for purposes of type evaluation, this requirement be adopted nonretroactively after 5 years. After 10 years, the requirement will be adopted retroactively in Handbook 44. This should allow sufficient time for manufacturers to make modifications to their instruments. In the interim, meters having provisions for sealing must be sealed.

Discussion: As in previous discussion of this topic, the opinion was expressed that someone bent on fraud will find a way to cheat. Falsifying data or using incorrect sample weights were cited as examples of bow this might be done. The response was that other requirements in Handbook 44 help to reduce fraud, i.e., samples being weighed must be visible to the customer. It was acknowledged that instrument design cannot eliminate all fraud, but was felt that it is reasonable to ask that instruments be designed in such a way that fraud is not made easy.

To accomplish this, the sector feels that it will be necessary to look at different levels of instrument adjustment and determine what adjustments could legitimately be made by the operator. It was agreed that calibrations should be sealed, and that the operator should not be able to make bias adjustments. The goal is to minimize operator adjustment, with future requirements being that no operator adjustments are allowed.

The sector recognizes that the NCWM will determine what the dates should be for implementing recommendations on sealing instruments, but has suggested dates we feel are realistic if manufacturers are to have adequate time to design to future requirements. Manufacturer questions related to these requirements are: (1) How long will it take to introduce a new product?, (2) How long can current models be used?, and (3) How long will the future version be able to be used?

D. Acceptance tolerances

Results of the Meeting

The group agreed that current tolerances appear to be too stringent for certain grain types, oats in particular. The moisture meter subcommittee was tasked with recommending any changes required to bring Handbook 44 tolerances in line with tolerances established for type evaluation testing and verification of calibration adequacy.

E. Calibration verification

Results of the Meeting

It was agreed that UR 3.10 adequately covers the requirement that only the most recent calibration and calibration constants should be used. The current calibration identifier/number and the calibration constants, if appropriate, will be listed on the certificate of conformance.

The sector agreed that each calibration must be identified by a unique name and version number, and that inspectors must be able to recall and verify the version of the calibration being used.

If instrument calibrations are digitally stored in an electronically alterable form, the instrument must make automatic calibration checks. This requirement would be nonretroactive and effective immediately upon adoption for both type evaluation and field enforcement of Handbook 44 code.

Discussion: Concern was expressed over how inspectors will verify that the correct calibration is being used on devices where the calibration is stored on a disk in files that cannot be read by the user. Is identification of the calibration contained on the disk sufficient? Is it adequate to have the version number displayed when a calibration is selected on the instrument? A similar question was asked regarding instruments where the calibration is transferred onto the instrument via a modem. How do we verify that the correct calibration is being used? It seems necessary that calibrations be identified positively by a unique name or version number, and that inspectors be able to recall or verify the version being used, by viewing either the actual calibration constants or the version number.

It was pointed out that automatic calibration checks are different from audit trails, because audit trails are not being used to look at the integrity of numbers. A calibration check is something that the instrument needs to do automatically. The important consideration is that the instrument not give an erroneous answer if the calibration is corrupted. In fact, it was felt that the instrument should not give a moisture reading if the calibration has been corrupted. The instrument should provide an error code or other indication that there is a problem. This may be difficult to check. In order to check this, type evaluation personnel would need to corrupt a calibration and check to see that the instrument shows an error code. The manufacturer would have to provide procedures for checking this feature. It is recommended that this requirement be nonretroactive and adopted immediately for purposes of enforcing Handbook 44 code, and that all devices submitted for type evaluation meet this requirement.

NIR Handbook 44 Chapter

The sector agreed that the following changes apply to both the Moisture Meter Code and the Near-Infrared Analyzer Code:

1. The Grain Moisture Meter code should include a statement indicating that the minimum height of the digital characters used to indicate moisture content shall be consistent with OIML requirement 4.4.5. "Digital Indicating Devices." This requirement specifies a minimum character height of 10 mm.

2. In Section S.1.7.1.(a) of the Grain Moisture Meter code, it and over the frequency range of 59.5 to 60.5 Hz" should be changed to "at a nominal frequency of 60 Hz."

A constituent value (moisture or protein) should not be recorded or displayed when the constituent value is beyond the operating range of the device or the calibration. Simply flashing the displayed constituent value is not in itself an adequate indication that the constituent range has been exceeded, and language indicating that this is an acceptable indication shall be deleted from the Grain Moisture Meter code (S.1.6.2). Flashing the displayed constituent value is acceptable if this action is clearly defined as an error indication. It is recommended that the requirement that constituent values not be recorded or displayed when the calibration range is exceeded be adopted nonretroactively for type evaluation purposes after 5 years, and be adopted retroactively for purposes of Handbook 44 enforcement after 10 years. This should allow sufficient time for manufacturers to make design changes.

3. Type Evaluation Criteria (Publication 14)

A. Evaluation Process

Results of the Meeting

1. The manufacturer shall provide an instrument equipped with all calibrations required for type evaluation testing and subsequent field use. Calibrations will not be developed as part of type evaluation testing.

2. Instruments meeting tolerances for accuracy, precision and reproducibility for a test set representing a limited, 6% moisture range will be approved for that grain type. The manufacturer will provide data supporting use of the meter in the field over a wider moisture range. The certificate of conformance shall indicate both the moisture range verified by type evaluation, and the full moisture range of the manufacturer supplied calibration.

3. Participation in the on-going national calibrate lion program will be mandatory. Calibration adequacy will be reviewed each year, and the calibration range on the certificate of conformance updated as appropriate. Manufacturers will be responsible for making calibration updates, and failure to make required updates shall result in revocation of the certificate of conformance.

Discussion: Sector members did not feel that it was realistic to calibrate and type evaluate a moisture meter in a single harvest season. It was decided that the manufacturer must be responsible for supplying a calibrated instrument. It is further assumed that the manufacturer will be responsible for developing updated calibrations as required.

One concern with using manufacturer supplied calibrations is that the reference results used to develop the calibration may not be in line with FGIS air oven results. The committee discussed whether or not manufacturers should be required to participate in a round-robin collaborative study with FGIS to demonstrate agreement between reference laboratories. Although there was not a lot of enthusiasm for this idea, the issue was not clearly resolved.

The sector members did not agree to the second phase of the proposed two-phase evaluation process that would have allowed evaluation over the entire calibration range. It was noted that NCWM members would have to be assured that type evaluation over a 6% moisture range was an adequate test of the calibration. The group agreed that the manufacturers data was the key to demonstrating that the calibration would perform adequately over the moisture range.

There was some discussion of what to do in the event that an instrument (or calibration) fails to perform adequately over the 6% moisture range. It was generally agreed that the manufacturer should be supplied the test data and have an opportunity to revise the calibration and resubmit the instrument with the new calibration. The manufacturer would need to demonstrate that the entire calibration bad been improved, and not just the portion of the calibration falling into the test range. It was felt that a different test set would have to be used when the instrument was resubmitted for testing.

The group agreed that participation in the national calibration program should be mandatory. There are several issues related to the on-going calibration effort that require further discussion. Criteria need to be developing for determining when a calibration update is required. It was suggested that the criteria for updating calibrations be the same as that used by FGIS to update calibrations on their official instrument. This may not be possible because FGIS uses calibration data collected over a three to five year period, and similar data will not be available when the national calibration program is initiated. Questions were also posed regarding verification that calibration changes or updates have the desired effect.

Several members of the group indicated that the goal of uniformity could be best achieved if instruments are calibrated to agree with the FGIS official meter instead of the air oven reference method. The question was asked whether it would be permissible to change a calibration to bring it into line with the FGIS official meter, even if this moved the calibration further away from the air oven reference. It was pointed out that trying to achieve agreement with the FGIS official meter was not desirable because FGIS calibrations are periodically updated, and that the best long term strategy was to achieve agreement with the air oven reference method.

B. Checklist for compliance with Handbook 44 Code

<u>Results of the Meeting</u>

Review of the checklist resulted in the following recommendations for revision to Handbook 44:

1. Digital display of moisture results should be required. It was recommended that this requirement take effect immediately upon adoption for purposes of type evaluation, and be adopted retroactively in Handbook 44 in 10 years.

2. Final readout must be in percent moisture content (wet basis) with no adjustment of the results required. Calibration or conversion charts will not be allowed. It was recommended that this requirement take effect immediately upon adoption for purposes of type evaluation, and be adopted retroactively in Handbook 44 in 10 years.

Discussion: The sector expressed concern over how to handle instruments that provide multiple measurements including "unapproved" results such as test weight, or instruments that measure moisture content for grain types not included in the type evaluation program. Several members felt that manufacturers should have the option of displaying this "unapproved" information on NTEP approved meters. It was suggested that the Executive Committee be consulted as to whether this information should be displayed on NTEP approved instruments. If not, does NCWM want to regulate measurement of these factors?

Suggested revisions to the checklist include:

G-S.2. Facilitation of Fraud - Include recommendations discussed earlier regarding sealing calibrations and non-metrological adjustments.

G-S.5.1. Indicating and Recording Elements - The intent of defining a zero indication is to enable the customer to identify the starting and ending point of a measurement. This requirement is only applicable for those meters that go to 0.00 before a reading, and the wording should be revised to say “If provided, the zero indication …..”

G-S.5.2.2. Digital Indication and Representation - Reference to this code item needs to be added to the checklist. (Question - Can we verify that a digital value "rounds off" to the minimum unit that can be indicated or recorded? Does this mean using intermediate results and calibration coefficients to calculate the final moisture as a check?)

G-S-5.2.3. Size and Character - Adopt the OIML minimum height requirement (10 mm) for displayed digits.

G-S.5.4. Repeatability of Indications - Remove this item from the checklist.

Remove reference to analog indications from the checklist: S.1.2.1 to S.1.2.3, S.1.3.1 to S-1.3.5, and G-S.5.2.1.

S.1.6.2. Operating Range - The committee discussed whether instruments should automatically indicate whether any operating range has been exceeded, including test weight and operating temperature. There was no clear consensus on this issue.

S.1.7.2. Power Interruption - Remove this item from the checklist.

S.1.9. Operating Temperature - The subcommittee was tasked with determining how to specify and verify operating ranges for sample and instrument temperature. The group felt it will be necessary to develop tolerances for room temperature accuracy, before acceptable performance at temperature extremes can be defined.

S.3.3. Conversion and Correction Tables - This requirement should be dropped from the checklist, but retained in Handbook 44. (The reasoning for retaining the requirement in Handbook 44 is that the moisture for some specialty crops are apparently determined using a conversion chart to adjust moisture results obtained on a fully automatic meter using the calibration for another grain type. The states may need this requirement to regulate non-NTEP seeds.)

The sections "Digital Indications and Recording Elements" and "Design of Direct Reading Grain Moisture Meters" should be combined.

C. Test procedures and tolerances

Results of the Meeting

The sector endorsed subcommittee recommendations that a stable moisture Hard Red Winter wheat sample or the most consistent applicable grain be used to conduct tests verifying the effects of fluctuations in power supply, power interruptions, storage temperature, temperature cycling, leveling, endurance (life test), warm-up time, operating temperature, and humidity. The subcommittee will continue with the development of basic instrument tests.

The sector agreed upon the 6 percent moisture ranges to be used for accuracy, precision, and reproducibility tests for the different grain types. The moisture ranges for corn and rice were changed from 10-16% to 12-18%. The moisture meter subcommittee will recommend tolerances for individual 2% moisture intervals.

4. Funding for the National Calibration Program

A. Calibration requirements for type evaluation approval

Results of the Meeting

Sector members agreed that the manufacturers should be responsible for type evaluation costs. The manufacturers were unwilling to commit to covering the cost of the first year of participation in the national calibration program without knowing what the cost of the program will be.

Discussion: It was clarified that not all models of an instrument "type" need to be tested. Typically, the most sophisticated model in a model series is tested.

Costs associated with participation in the NTEP program were roughly estimated at $5000 for type evaluation, and $1000-2000 per grain type per year for collecting calibration data. Concern was expressed that paying for the first year of participation in the calibration program could exceed $20,000. Better estimates of costs are needed once the testing and calibration programs have been more fully defined.

B. Funding long-term calibration support

Results of the Meeting

Fees need to be collected to support an on-going calibration program. There is general agreement that moisture meter users will ultimately be charged for the calibration development phase of the NTEP approval program. It is unclear how such charges can be assessed and collected. One difficulty faced by manufacturers in assessing a calibration fee is that calibrations are not typically updated on an annual basis. Thus, user fees could not be uniformly and regularly assessed by simply charging users for calibration updates. Many state Weights and Measures programs are not currently charging fees for field inspection of moisture meters. It was suggested that problems associated with assessing a user fee should be reported to the Executive Committee to see if there is any way that the NGKM could assess a calibration fee as part of a national program. One possibility is for NTEP to collect an annual maintenance fee on the certificate of conformance. In this instance, the maintenance fee would be collected from users instead of from the manufacturer. One key to supporting a national calibration program appears to be collecting user fees for all meters used in commercial grain sales, regardless of whether or not the instrument is NTEP approved.

5. Status of Equipment Currently Approved by the States and by FGIS

Results of the Meeting

It was agreed that instruments currently approved by either the states or FGIS should not receive NTEP approval on the basis of a "grandfather" clause.

6. Scheduling Future Meetings

Results of the Meeting

The next sector meeting was scheduled for October 5-7, 1992 in Chicago at a hotel near O'Hare airport. This meeting will concentrate on development of test criteria for moisture meters. NIR wheat protein analyzers will be addressed at subsequent meetings. It was agreed that a meeting of the subcommittee will be arranged prior to the next sector meeting.

7. Additional Issues Requiring Discussion

Results of the Meeting

The following items were suggested for discussion at future meetings:

1. How does state enforcement fit into the program? i.e. Will national calibrations be checked using samples from a specific state or location?

2. Coordinate activity with states to get more grain samples in to support this effort.

Participants
June 10-12, 1992

Name	Organization
Jack Barber	Dickey-john Corp.
Carroll Brickenkamp	NIST
Randy Burns	Arkansas Bureau of Standards
Tina Butcher	NIST
Dieter Curlis	Perstorp Analytical, Inc.
Cassie Eigenmann	Dickey-john Corp.
Dave Funk	USDA/FGIS
Lowell Hill	University of Illinois
Charles Hurburgh	Iowa State University
Chuck Lowden	Foss Food Technology Corp.
Henry Oppermann	NIST
Allison Pflug	CSC Scientific
Rich Pierce	USDA/FGIS
Joseph Rothleder	California Div of Measurement Standards
Tom Runyon	Seedburo Equipment Company
Fred Seeber	Shore Sales Co., GEAPS
Cheryl Tew	NC Dept of Agriculture
Robert Wittenberger	Missouri Weights and Measures
Richard Wotthlie	Maryland Weights and Measures

National Type Evaluation Technical Committee
Grain Moisture Meter Sector
Meeting Summary
October 5 – 7, 1992

Agenda Items

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1. Goals for the Meeting

Sector members discussed the general topic of allowing test weight results to be displayed on NTEP approved moisture meters. It was agreed that, for now, test weight features need to be disabled and sealed. The sector has little choice in this matter because there are no type evaluation test criteria for test weight. Manufacturers may want to approach NCWM regarding the development of Handbook 44 code and type evaluation test criteria for test weight.

2. Review Sector Activities

The sector previously agreed that proposed revisions to Handbook 44 should be adopted immediately for purposes of type evaluation, and that these items should be adopted non-retroactively in 5 years and retroactively after 10 years for purposes of enforcing Handbook 44. Attachment 1 outlines implementation requirements.

3. Handbook 44 Code

A. Proposed wording for previously agreed to changes

Results of the Meeting

1. It was agreed that Handbook 44 code should be changed to allow display and recording of moisture contents beyond the moisture operating range if the moisture result is accompanied by an appropriate error message. This change was approved because moisture calibrations generally extrapolate well if calibrations are developed in a reasonable manner, and because grain moisture content is not a variable that can be controlled.

2. The sector decided not to specify a nominal power line frequency of 60 Hz instead of the current 59.5 to 60.5 Hz test range. Current Handbook 44 requirements are consistent with OIML requirements

3. The recommendation on provisions for sealing was editorially changed to clarify that calibrations and metrological adjustments must be sealed. Audit trails will be specified as an alternative to sealing an instrument.

4. Minimum sample size shall be specified as 100 g or 400 kernels or seeds. No volume equivalent will be specified.

B. Proposed changes not yet resolved

Results of the Meeting

1. It was agreed that Handbook 44 acceptance tolerances should be set equal to maintenance tolerances and that oats should be grouped with corn, rice, sorghum, and sunflower seeds in Table 1.

2. Moisture results shall not be displayed or recorded when operating temperature ranges are exceeded because temperature is a variable that can be controlled. The following minimum temperature ranges were specified.

Environmental temperature	- 10 to 30 °C
Grain temperature	- 0 to 40 °C
Difference between meter and sample temperature	- 10 °C

4. Type Evaluation Criteria (Publication 14)

A. Review Handbook 44 requirements after an evening "hands on" session with different meter types

Results of the Meeting

After the "hands on" session and review of the checklist, sector members agreed to the following changes to Handbook 44.

1. Meters shall be equipped with a communications interface and software supporting the printing of ticket showing information such as date, grain type, grain moisture result, customer identification, an calibration version identification. Customers shall be provided with a printed ticket.

2. For purposes of type evaluation, moisture results need to be reported to the nearest 0.01 percent.

3. Standard abbreviations-should be adopted for indicating grain types and classes. It was suggested that FGIS standard abbreviations be used in developing recommended changes to Handbook 44.

B. Basic instrument tests

Results of the Meeting

The sector approved the recommendations made by the Grain Moisture Meter subcommittee for both the basic tests using HRW wheat and the tests for verifying temperature operating ranges. It was noted that detailed laboratory test procedures still need to be developed.

Room temperature was defined as 20 °C +/- 2 °C. The recommendation was that room temperature be defined as 22 °C +/- 2 °C.

C. Basic instrument/calibration approval testing

Results of the Meeting

1. The subcommittees recommendation that basic instrument/calibration approval be based upon performance with corn, HRW wheat, and soybeans over limited 6% moisture ranges was approved. Manufacturer data will be used to verify calibration performance outside these moisture ranges. Instruments meeting all performance requirements will be eligible for the National Calibration Program. Instruments not meeting performance requirements for all three grains will be failed.

2. Instruments not designed for measuring moisture contents of corn, HRW wheat, and soybeans may be type evaluated and approved based upon their performance with individual grains. Approved instruments would be enrolled in the calibration program for that grain and others in the same "grouping." The 17 proposed NTEP grains were separated into the following seven groups*

- Corn
- Durum wheat, Eastern White wheat, Western White wheat, Hard Red Spring wheat, Hard Red Winter wheat, Hard White wheat, and Soft Red Winter wheat
- Sunflower Seed
- Sorghum
- Soybeans
- Two-rowed Barley, Six-rowed Barley and Oats
- Long Grain Rough Rice, Medium Grain Rough Rice, and Short Grain Rough Rice

3. The sample set will be screened using-the FGIS official meter. - -Samples where the official meter disagrees with the air oven 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 FGIS official meter model and the air oven for the 10 samples in a moisture interval exceeds one-half the Handbook 44 acceptance tolerance minus 0.1, i.e., in the 12-14% interval for corn the standard deviation of the differences should not exceed (0.4 - 0.1) = 0.3. Finally, any sample (within a 2% moisture interval) not within three standard deviations of the mean for the test meter will be dropped before analysis of the data.

4. Accuracy, precision and reproducibility tests were basically adopted as recommended by the subcommittee. One change was to allow the manufacturer to make a bias adjustment to the test results for the it accuracy" test. This bias adjustment will be applied across the calibration range.

D. Instrument approval for additional grain types

<u>Results of the Meeting</u>

1. It was agreed that the following grain types and classes should be included in the NTEP program:

Corn
Durum wheat
Eastern White wheat
Western White wheat
Hard Red Spring wheat
Hard Red Winter wheat
Hard White wheat -
Soft Red Winter wheat
Sunflower Seed

Sorghum
Soybeans
Two-rowed Barley
Six-rowed Barley
Oats
Long Grain Rough Rice
Medium Grain Rough Rice
Short Grain Rough Rice

2. The subcommittee recommendation that calibrations for grain types not included in type evaluation testing be approved based upon data collected as part of the National Calibration Program was approved. Tolerances will be one-half of the acceptance tolerance and will be applied in 2% intervals over the range of available data. A minimum of 10 samples will be required for the 6% moisture ranges specified for type evaluation. A confidence interval will be applied to tolerances for 2% moisture intervals outside the type evaluation range. A mathematical bias. adjustment may be applied to the calibration in making approval decisions.

5. Funding for the Approval Program

A. Type evaluation costs.

This item was not discussed due to time constraints.

B. Support for the National Calibration Program

Results of the Meeting

Dave Funk estimated the cost of collecting calibration for a single instrument model for the 17 NTEP grains at $12,500/year. This assumes that the samples and air oven results used for the annual FGIS moisture survey will be utilized.

6. Enforcing Handbook 44 Code

A. State weights and measures activities to support the NTEP moisture meter program.

This item was not discussed due to time constraints.

7. Schedule Sector Activities

Results of the Meeting

The next meeting was scheduled for March 3-5, 1992 immediately following the GEAPS meeting in Phoenix.

Participants
October 5-7, 1992

Name	Organization
Jack Barber	Dickey-john Corp.
Randy Burns	Arkansas Bureau of Standards
Tina Butcher	NIST
Dave Funk	USDA/FGIS
Mike Hile	Arkansas Bureau of Standards
Lowell Hill	University of Illinois
Michael van der Matten	Tecator (Sinar Technology)
Don Muller	Bran+Luebbe
Henry Oppermann	NIST
Allison Pflug	CSC Scientific
Rich Pierce	USDA/FGIS
Joseph Rothleder	California Div of Measurement Standards
Tom Runyon	Seedburo Equipment Company
Fred Seeber	Shore Sales Co., GEAPS
Cheryl Tew	NC Dept of Agriculture
Russ Tkacbuk	Canadian Grain Commission
Cliff Watson	Consultant
Robert Wittenberger	Missouri Weights and Measures
Richard Wotthlie	Maryland Weights and Measures

Grain moisture meter Sector

Implementation of Requirements

The implementation of nonretroactive requirements and the dates at which they will become effective for the National Type Evaluation Program and State enforcement are summarized below.

First, add a paragraph to the "Application" section of the Grain Moisture Meter Code that will state that NTEP will only accept devices for type evaluation that comply with the nonretroactive requirements scheduled to take effect on January 1, 1998. State enforcement will be based upon the effective dates identified with each requirement when specific dates are shown.

	NTEP Evaluations	State Enforcement
Nonretroactive Requirements	Effective immediately. All Devices submitted for type Evaluation must comply with The nonretroactive requirements.	Enforced when the effective date occurs, i.e., January 1, 1998* This will allow manufacturers to sell current models until January 1, 1998. These devices can be used until January 1, 2003, which is the retroactive date for the requirements.
Retroactive Requirements	Same as for nonretroactive Requirements, since the Requirements are the same.	All devices used after January 1, 2003 must comply with the requirements that become retroactive as of that date. Essentially, no analog indications will be permitted after January 1, 2003.

*NTEP States are not to prohibit the sale of devices without NTEP Certificates of Conformance into commercial applications until the nonretroactive requirements take effect.

National Type Evaluation Technical Committee
Near Infrared Grain Analyzer Sector
Meeting Summary
March 4 – 5, 1993

Agenda Items

RESULTS AND DISCUSSION

1 Goals for the Meeting

The emphasis of this meeting was placed upon the development of code for an NIR Analyzer chapter in Handbook 44. Sector members recognized that this code must be applicable for existing NIR instruments, and provide clear guidelines for the design of new NIR instruments. It was agreed that the next draft of a Handbook 44 chapter should reflect design requirements directed toward development of state-of-the-art instruments. Once the sector has agreed on these design requirements, we can discuss ways of accommodating existing instruments.

Sector members reviewed proposed revisions to the Grain Moisture Meters code to determine which of these design requirements also should be applied to NIR wheat protein analyzers. Design requirements agreed upon at the initial meeting were also reviewed and compared to proposed requirements for grain moisture meters. Sector members previously recognized that NIR wheat protein analyzers can be separated into two basic categories - those instruments that analyze a ground sample and those that analyze a whole grain sample. Not all design requirements are applicable to both measurement technologies, and Handbook 44 code will need to be developed accordingly.

2. Handbook 44 Code

Results of the Meeting

Sector members discussed and agreed to the following design requirements for NIR wheat protein analyzers.

1. A minimum sample size of 20 g shall be specified for both ground grain and whole grain NIR instruments.

   Comments: Concern was expressed that the sample size specified for moisture meters is unrealistically large for NIR protein analyzers. The 100 g sample size recommendation for moisture meters was based on the variability in moisture content of individual corn kernels. It was noted that the minimum sample size for wheat could be smaller than that for grains having large kernels or seeds. (A subsequent check indicated that a 20 g wheat sample consists of approximately 670 seeds, more than the minimum sample size of 400 seeds specified for grain moisture meters.) It was also agreed that protein variation within a wheat sample probably would be less than the variation in moisture.

2. NIR instruments shall have the capability of providing an audit trail indicating when changes were made in bias, slope, and calibration constants. A written explanation and record of bias and slope changes shall be a user requirement.

   Comments: It was agreed that frequent bias checks and adjustments will be required for NIR wheat protein analyzers. This is a marked departure from the approach adopted for moisture meters where slope and bias values are sealed and are not to be adjusted. There are a couple of reasons for this difference in requirements. First, differences in protein values represent more dollars at the point of sale than a similar difference in moisture content. Second, the moisture bands are larger (10 times?) than those for protein which should reduce the need for frequent moisture bias adjustments.

Physical seals are not a meaningful security measure if frequent bias adjustments are needed. Use of an event counter may not provide meaningful information. One arbitrary change may be inappropriate, whereas weekly bias changes may be appropriate. The situation is further complicated because NIR instruments can be connected into a network where calibrations, slopes and biases can be updated via modem from a central computer. Security measures for NIR instruments are complex and probably will exceed those specified for Category 3 devices in the General Code.

Providing accurate protein results in the field typically requires implementation of an on-going quality control program. Good quality control programs should include documentation verifying that instrument adjustments were made in order to move into closer agreement with the reference method. It was agreed that maintenance of such records should be a user requirement. Concern was expressed that a written log was not a meaningful security measure, that an instrument operator could write down anything they want.

3. Calibrations must be identified by a unique name or version number**.** Inspectors must be able to recall and verify calibration constants, names, or versions.

4. If calibration constants are digitally stored in an electronically alterable form, the instrument must make automatic calibration checks to detect corruption of calibration constants.

5. The minimum height for the digits used to display protein values shall be 10 mm.

6. An instrument shall not display or record any protein value when the protein level of the grain sample is beyond the operating range of the device, unless the protein representation includes a clear error indication (and recorded error message with the recorded representation).

   Comments: A similar requirement was suggested for samples having moisture contents outside the range of moistures represented in the calibration. Protein calibration samples should cover a range of moisture contents * in order to more accurately provide wheat protein values adjusted to a constant 12% moisture basis. This issue was not resolved and requires additional discussion.

7. Digital display of protein results is required. Final readout must be .in percent protein, adjusted to a constant 12% moisture basis, with no further adjustment of the results required. Conversion charts will not be allowed.

   Comments: These items were discussed and resolved at previous meetings.

8. It was agreed that, as with moisture meters, acceptance and maintenance tolerances shall be equal. Five wheat samples (for each wheat class) will be used to check instrument performance in the field. Test samples will be selected such that the difference between protein values obtained using the FGIS standard reference method and an official FGIS NIR wheat protein analyzer shall not exceed 0.3 for individual test samples or 0.15 for the average of 5 samples. Field tolerances shall be 0.6 for individual samples and 0.4 for the average of 5 test samples.

   Comments: It was noted that individual states use widely varying tests for moisture meters, and that clear, uniform field test procedures should be established at the start of the new NIR program. Because of the possibility that results obtained on field test samples may be used to make bias adjustments, it was stressed that baseline values established for test samples should agree closely with results obtained by FGIS. It was suggested that protein values established for test samples assembled by the states should be verified by FGIS

9. NIR instruments shall be equipped with a communication interface that permits interfacing with a recording device. The customer shall be given a printed ticket showing the date, grain type, protein result, and calibration version identification. The ticket shall be generated by the NIR analyzer system.

   Comments: Previous concerns related to this requirement were based upon the fact that not all existing instruments have a communications interface. It was agreed that new instruments should have feature, and that the application of this requirement to existing instruments is a separate issue related to phasing in the new program. It was previously agreed that a communication interface should be required to facilitate collection of type evaluation data.

   It was clarified that "generated by the NIR analyzer system" does not mean typing information into a computer in order to generate a printed result. The instrument must transmit data directly to a printer or automated accounting system. Concern was expressed that this is an unreasonable requirement for grain elevators and that there would be

opposition to such a requirement. A similar requirement for grain moisture meters will be voted on by the NCWM at the July 1993 Annual Meeting.

10. Protein results shall not be displayed or recorded when operating temperature ranges are exceeded. The following minimum temperature ranges were specified.

Whole grain analyzer.

Environmental temperature	- 10 to 30 °C
Grain temperature	- 0 to 40 °C
Difference between instrument and sample temperature	- 10 °C

Ground grain analyzer.

Environmental temperature	- 10 to 30 °C
Grain temperature	- Not applicable
Difference between instrument and sample temperature	- Not applicable

Comments: A wide range in temperatures is unusual for ground grain samples because grinding typically heats the sample. Thus, sample temperature is less of a concern with ground grain samples than it is for whole grain samples.

11. The value of the minimum indicated or recorded protein indication shall not be greater that 0.1 percent. For purposes of type evaluation, the maximum value for the protein indication shall be 0.01 percent.

12. NIR instruments should be capable of indicating the grain type using acceptable abbreviations consisting of up to four characters.

Comments: Some existing meters use a numerical code when selecting calibrations. A decal identifying the calibration represented by each number is attached to the instrument. It was agreed that this arrangement would not meet proposed code or type evaluation requirements. This is an example of where the adoption of Handbook 44 code may have to be phased to accommodate existing instruments.

The following design requirements were previously agreed to by the sector, but were reviewed to ensure that the intent of each requirement was clear.

13. Calibrations must be transferable between different instruments of a given model type.

Comments: Allowable techniques for transferring calibrations have not been specified. It was generally agreed that calibrations developed on a master instrument(s) must be "mathematically" transferable to other instruments. The intent of this requirement is to avoid approval of instrument model types where it is necessary to individually calibrate each instrument within the model type.

14. The operator shall be able to verify either the calibration constants, a unique calibration name, or a unique calibration version on location without the use of an auxiliary computer.

Comments: Previously agreed to wording indicated that the operator should be able to load calibration constants and standardize the instrument on location without the use of an auxiliary computer. Because it is possible to download calibrations from a central computer to instruments in a system or network, it was agreed that the requirement for loading calibration constants should be dropped. The sector did not discuss whether this also applied to other "standardization" information such as slope and bias adjustments. It seems to be generally accepted by members of

the sector that operators will need to make on-site wheat protein bias adjustments. Further discussion of this issue is required.

15. Performance requirements shall be met with line voltage variations from 100 to 130 volts at 59.5 to 60.5 cycles per second.

16. It was agreed that warm-up requirements should be similar to those used for grain moisture meters. Requirements for indicating over-temperature conditions should be combined with requirements for warm-up time.

17. Instrument optics and electronics must be protected from exposure to dust by either sealing both areas or by protecting them with a dust filtration system suitable for the removal of airborne dust.

    Comments: It was agreed that the requirement that instruments not overheat at 50 percent blockage of the filter within the operating temperature range be dropped. It was felt that identifying when a filter is 50 percent blocked with dust would be an extremely subjective determination.

18. Instruments that must be positioned to within 5 percent (approximately 3°) of an upright normal position to a level plane in order to meet performance specifications shall have a level indicator and leveling adjustments.

Sector members also reviewed Sections S.4, N.1 - N.2, T.1 - T.2, and UR.1 - UR.10 of a draft of a Handbook 44 chapter for Near-Infrared Grain Analyzers. Since most of the suggestions were editorial in nature, they will simply be incorporated into the next draft and not documented in the meeting summary. Recommended procedures for field testing NIR analyzers will be summarized for additional discussion at the next meeting.

3. Type Evaluation Criteria

Results of the Meeting

The sector agreed that basic instrument tests developed for grain moisture meters should be adapted for use in type evaluating NIR wheat protein analyzers. Basic instrument tests include power supply, storage temperature, leveling, warm-up time, humidity, instrument stability, and sample temperature stability.

Comments: The sector discussed whether it was necessary to repeat basic instrument tests for NIR wheat protein analyzer evaluations if similar tests have already been conducted during a grain moisture meter type evaluation. The general feeling was that this would be necessary because tolerances will probably be different and because instrument response might be different for protein than it is for moisture. Depending upon test procedures, it might be possible to use one set of log data for both moisture meter and wheat protein analyzer evaluations. This would not be possible if a different number of subsamples are used for different grain types or different constituents.

4. Status of NIR Analyzers Currently Approved by FGIS.

This issue was not discussed due to time considerations.

5. Additional Issues Requiring Discussion

The next meeting for the Grain Moisture Meter and NIR Wheat Protein Analyzer sectors was scheduled for August 17-19, 1993 in Kansas City. A noon-to-noon meeting format was suggested. Items requiring additional discussion at that meeting include:

1. Once a type evaluation program is in place, there are several questions relating to implementation of an on-going standardization' program that need to be addressed. What type of quality control program will be put in place? How will standard reference samples be assembled, distributed and used? Could this be done by service companies already in the business of supplying reference samples? How will the approximately 3000 NIR instruments currently in use be handled?

2. The use of non-NTEP calibrations on NTEP approved NIR wheat protein analyzers needs to be discussed. For example, could a soybean protein and oil calibration be used on an instrument that is NTEP approved for determining wheat protein?

3. Most sector members feel that an on-going calibration program should be required for NIR wheat protein analyzers. Items that need to be discussed and clarified are how this program would be structured, whether participation in the calibration program would be mandatory, and how the program would be funded.

Participants
March 4-5, 1993

Name	Organization
Jack Barber	Dickey-john Corp.
Randy Burns	Arkansas Bureau of Standards
Tina Butcher	NIST
Allen Butler	Perten Instruments
Carol Dickey	Bran+Luebbe
Cassie Eigenmann	Dickey-john Corp.
Dave Funk	USDA/FGIS
Charles Hurburgh	Iowa State University
Lowell Hill	University of Illinois
Rich Pierce	USDA/FGIS
Scott Reed	Perten Instruments
Joseph Rothleder	California Div of Measurement Standards
Cheryl Tew	NC Dept of Agriculture
Cliff Watson	Consultant
Richard Wotthlie	Maryland Weights and Measures

National Type Evaluation Technical Committee
Grain Moisture Meter and Near Infrared Grain Analyzer Sector
Meeting Summary
August 17, 1993, Kansas City, Missouri

Agenda Items

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1. Moisture Meter Sector

1. The code requirement limiting displayed results on NTEP approved meters to NTEP approved attributes was discussed by the sector members. The restriction on test weight was the primary concern. Individual states will have responsibility for monitoring and controlling the displaying of test weight in the field, however, NTEP approval requires a manufacturers' design that allows disabling and sealing of the test weight feature.

2. Displaying of other constituents values was also discussed by the sector. The recommendation that "NIR analyzers that have been NTEP approved as grain moisture meters should be allowed to display constituent values such as protein, oil, and starch." was accepted by consensus.

3. Sector members requested more detail on the check list and test procedures that will be used in moisture meter type approval. The most urgent concern on the part of the manufacturers was the procedure for testing temperature limits. Dr. R. Pierce agreed to develop additional details.

4. Dr. R. Pierce reviewed the anticipated time sequence for type evaluation testing. Part of the time restriction is the approval of NTEP Laboratories. The criteria for use in approving the laboratory are not yet available, but it is anticipated that this decision will be made in the near future. Manufacturers present at the meeting were asked to provide an estimate of the number of meters to be submitted for type evaluation and the approximate date when those submissions would be feasible. The information was treated as confidential and tabulation of the results indicated the possibility of as many as 12 models. Only 1 manufacturer anticipated submitting before March of 1994. A sample application form was circulated among the committee for comments. Following a brief discussion of items that would be required to be submitted in an application for type evaluation, it was agreed that the manufacturers would look over the application and respond in writing with any changes.

5. A discussion of the sealing and audit trail required on the moisture meter code was followed by a recommendation that a change in wording was required and that change should be as consistent as possible with the recommendation coming from the wheat protein analyzer.

6. There was consensus that any additional changes in the moisture meter code, application forms, or test procedures, should be handled by mail.

7. Previous decisions about testing accessory equipment, such as scales and grinders, in NTEP approval of moisture meters were questioned. The members present had divergent views and interpretations of the previous action by the committee, which was included in the handbook 44 code. Some felt that the device should be entirely operator independent, with weight and grin ding internally controlled. Others understood the code to mean that scales and grinders recommended by the manufacturer would be tested for accuracy as part of the NTEP procedures. While everyone agreed that we should encourage manufacturers to go fully automatic, and prohibit an external scale and grinder, the revised code currently does not require that. The cost of the accessory equipment, and the timing and convenience of a fully automated system was thought to be a strong inducement for fully automatic whether or not it was required for NTEP approval. A show of hands was requested for those wanting to change the code to require fully automatic equipment. The vote was 11 to 5 in favor of changing the code. It was ruled that this did not constitute a consensus, the code would be left as written.

8. The Moisture Meter Sector meeting was adjourned on August 18, and the Wheat Protein Analyzer Sector meeting was opened. The following actions were taken by the Wheat Protein Analyzer Sector.

2 Wheat Protein Analyzer Sector

1. Dave Funk provided an overview of the sources of variation and the difficulty of maintaining consistent comparable results among models, instruments and locations.

2. There was a discussion of the robustness of FGIS samples, both with regard to moisture determination and wheat protein analysis. It was concluded that the NTEP laboratory will seek to maintain as robust a set of samples as cost effectiveness will permit.

3. The committee reviewed the draft code for near infrared grain analyzers item by item. Minor editorial changes in wording were suggested, but the code was essentially approved in its current form by consensus of the committee. The provision in the proposed code requiring a means of security, such as an audit trail, was revised. That section will be reworded and submitted for further consideration by the full committee prior to finalizing handbook 44 code.

4. Dr. R. Pierce identified actions still required for moisture meters; including 1) revision in the handbook 44 code; 2) type evaluation procedures, especially temperature test procedures; 3) distribution of a draft application form; 4) additional information related to publication 14. He agreed to distribute these materials by mail, by September 1, to the sector mailing list for comments.

5. The actions required for wheat protein analyzers included; 1) revision and editing of the handbook 44 code based on the discussion of the sector meeting; 2) distribution of the checklist for testing procedures for type evaluation; 3) developing basic test procedures for NIR analyzers, including accuracy calibrations; 4) a revision fin the wording relating to security and audit trails. Dr. R. Pierce agreed that this set of materials could be distributed by mail, by October 1.

3. Next meeting date and location.

Alternative dates and locations were discussed by the members present. March 27 - 29 or March 28 -30, were suggested as preferable dates. Dr. Pierce was instructed to identify suitable conference facilities in Las Vegas, Nevada for those dates.

National Type Evaluation Technical Committee
Near Infrared Grain Analyzer Sector
Meeting Summary
March 29 – 30, 1994

Agenda Items

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1. Goals for the Meeting

Review the tentative Handbook 44 code proposed for Near-Infrared Grain Analyzers. Make final editorial revisions prior to the NCWM Annual Meeting.

Develop type evaluation test criteria and tolerances for NIR Wheat Protein Analyzers.

Define the scope and objectives for a National Calibration Program, including development of procedures and tolerances for reviewing calibration performance.

2. Handbook 44 Code

A draft of a tentative code for Near-Infrared Grain Analyzers was mailed to sector members for review last October (Attachment 1). Responses from sector members are included as Attachment 2. Suggestions include:

1. S.1.2. should include a table listing specific wheat classes included in the type evaluation and calibration program, along with approved abbreviations.

   Recommendation for Consideration: A table should be added with the following information.

Durum Wheat	DURW*
Hard Red Spring Wheat	HRSW*
Hard Red Winter Wheat	HRWW*
Soft Red Winter Wheat	SRWW*
Soft White Wheat	SWW
Hard White Wheat	HDWW*

   * Abbreviations already adopted in the Grain Moisture Meters code.

2 There may be some confusion in the use of "ambient temperature" and "instrument environment" in S.1.3. (a) and (d), respectively. It is suggested that instrument environment be used instead of ambient temperature in S.1.3.(a).

3. There were questions about why **N.1.1. Testing Procedures** specifies that constituent values will be assigned to test samples by FGIS rather than by an authorized type evaluation laboratory.

Because these comments were primarily editorial in nature it was determined that the tentative code should be submitted to the Standards and Specifications Committee for discussion at the NCWM Interim Meeting. There were no comments regarding code items at the Interim meeting.

This is the last opportunity for sector members to suggest changes to the code prior to the vote at the NCWM Annual Meeting. To assist in review of code items, a copy of the checklist is attached (Attachment 3).

3. Type Evaluation Criteria

A. Type Evaluation Tests

The sector agreed that type evaluation tests for NIR wheat protein analyzers should be adapted from tests developed for grain moisture meters and test criteria used in past type evaluation tests by FGIS. Test procedures for storage temperature, humidity, instrument stability, and instrument/sample temperature sensitivity are available from both sources. For the initial draft of test criteria, basic instrument tests were patterned after those developed by the Grain Moisture Meter sector to provide for greater continuity in the NTEP program.

Test procedures and tolerances (Attachment 4) need to be reviewed and revised. Review test procedures carefully because some tests, even though they are similar, are different from the tests developed for moisture meters.

Note: A comment was received that the accuracy test will be fairly costly because of the number of samples required. It was suggested that the number of samples be reduced from 50 to 25. It was noted that 50 samples were not enough to generate a new calibration, but were more than enough to check calibration performance.

B. Tolerances for Type Evaluation Tests

Tolerances for the "basic instrument tests" were developed for moisture meters as a percent of Handbook 44 acceptance tolerances. The same percentage was applied to proposed NIR Handbook 44 tolerances for individual samples to derive possible tolerances for NIR analyzers. These tolerance are slightly smaller than those used for moisture meters and are not "even" numbers.

One option for consideration is to use the larger tolerances developed for moisture meters. These tolerances were left in the current draft with the tighter, NIR tolerances following in brackets. There would appear to be justification for using tighter tolerances for protein analyzers, because the instability of moisture samples was considered when setting tolerances for moisture meters. Stability should be less of a problem with protein samples.

4. National Calibration Program

A. Calibrations used in Type Evaluation Testing

The sector has agreed that:

1. It is the responsibility of the manufacturer to provide the calibration to be used during type evaluation testing. These calibrations are developed without input from the type evaluation laboratory.

2. An option is provided for having the NTEP laboratory collect calibration data, using an instrument provided by the manufacturer, on 100 samples per wheat class. These samples will be nationwide in scope and represent a protein range suitable for calibration development. The manufacturer win then be responsible for developing a calibration for use in type evaluation testing. The cost of collecting calibration data will be billed as part of type evaluation testing.

3. Type evaluation testing of calibration performance (accuracy, repeatability, and reproducibility) is required for each class of wheat.

4. Instruments using all-class calibrations may be submitted for type evaluation testing. The instrument and calibrations will be tested using a single slope and bias setting for all classes of wheat, assuming that represents how the instrument will be used in the field.

5. For ground grain instruments, the make and model of the grinder used in calibration development must be specified.

The sector has not discussed procedures or tolerances for reviewing calibration performance. This item needs to be discussed in the context of the proposed national calibration program.

B. On-Going Calibration Program

The sector has agreed that an on-going calibration program should be established for NIR wheat protein analyzers, similar to the program being planned for grain moisture meters. The sector has not yet defined the scope of the proposed calibration program or determined how calibration data will be used in reviewing calibration performance.

The sector needs to review expectations for an on-going calibration program. Because NIR protein instruments may not be as stable as moisture meters, the benefits of an on-going calibration program with annual calibration review may not be as great. More emphasis may be placed on field inspection, standardization procedures, and on-going quality control programs.

Once the scope and expectations of the calibration program have been discussed, the sector needs to discuss projected costs of an on-going calibration program.

5. Scheduling Sector Activities

It is proposed that the NIR Wheat Protein sector meet September 13-14, 1994 in St. Louis. Refer to the agenda for the Grain Moisture Meter sector for additional information.

National Type Evaluation Technical Committee
Grain Moisture Meter Sector
Meeting Summary
September 21 – 22, 1994, Indianapolis, IN

Agenda Items

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1. General Policy Matters

A. Review of the Mission of the Sector

To answer questions which had been raised regarding the scope of Sector activities, especially as they extend beyond recommending changes to the Grain Moisture Meter Code in Handbook 44 and the Test Procedures spelled out in Publication 14, Carroll Brickenkamp, National Institute of Standards and Technology (NIST), Office of Weights and Measures, outlined the National Conference of Weights and Measures (NCWM) standards development process, explained NIST's role in the process, and summarized the goals and objectives of the Sector.

NIST has statutory responsibility for "cooperation with the States in securing uniformity of weights and measures laws and methods of inspection." To fulfill this responsibility, NIST sponsors the NCWM, provides Technical Advisors to NCWM committees and publishes Handbook 44 "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Equipment." NCWM is a voluntary standards-development organization. NCWM Technical Committees recommend standards to the voting body made up of State and local weights and measures officials. The voting body adopts standards as recommendations for Federal, state, and local government agencies. The standards are published in Handbook 44. Agencies adopt the standards as regulations. All 50 states have adopted Handbook 44.

The 3300 members of NCWM include representatives from: 1) State and local government (the voting body); 2) Federal government; 3) industry and business; 4) consumer and trade associations; and 4) universities and foreign governments. All members are invited to participate in standards development. The NCWM standards development process has been structured for broad input, thorough discussion, and quick responsiveness to changing marketplace needs.

To provide some assurance to potential device customers that they are buying devices capable of meeting requirements, the National Type Evaluation Program (NTEP) has been established by NCWM. Under this program, an NTEP laboratory tests prototype devices to determine whether the device will be able to meet Handbook 44 requirements when installed in the field.

Two Technical Committees have responsibility for matters in the grain area: 1) the Specifications and Tolerances Committee (S&T Committee) which manages Handbook 44, and 2) the National Type Evaluation Technical Committee (NTETC) which manages standards for type evaluation following Handbook 44. The S&T Committee has delegated the details of code development in the grain area to two NTETC Sectors: 1) the Grain Moisture Meter Sector, and 2) the Near Infrared Grain Analyzer Sector. The NTETC has delegated the details of relevant type evaluation criteria and test procedures to these same two Sectors.

Under the 1990 Farm Bill, the Federal Grain Inspection Service (FGIS) was directed by Congress to cooperate with NCWM to standardize grain grading equipment used in the commercial sector. The Grain Moisture Meter and the Near Infrared Grain Analyzer Sectors were established by the NCWM/National Type Evaluation Committee to develop the necessary standards and programs. FGIS, until recently, provided a Technical Advisor to the Sectors and is now an NTEP Participating Laboratory for grain moisture meters. The goals of the Sectors are to improve the uniformity of grain moisture and protein measurements used in commercial inspections and sales transactions by: 1) reducing uncertainty between Official and commercial systems, and 2) increasing precision (reducing the "spread") of readings from one meter, model, brand to another.

To accomplish these goals, the Grain Moisture Meter Sector has set the following objectives:

1. Improve Grain Moisture Meter Code (Handbook 44)
2. Devise type evaluation criteria and test procedures for grain moisture meters (Publication 14)
3. Plan improvements in the grain moisture measurement system to correct the following problems:
    - Grain moisture meter calibrations have not always been uniformly maintained by manufacturers as grain varieties change over time.
    - Grain moisture meter calibrations are produced by each meter manufacturer using totally different sets of independently collected grain samples.
    - Results from one grain moisture meter brand are offset from the results of another.
    - Official system (FGIS) is not closely tied to the commercial system.

Toward fulfillment of these objectives, the Sector has recommended changes to the Grain Moisture Meter Code of Handbook 44, recommended type evaluation criteria and test procedures, and defined a program for on-going calibration maintenance and review which involves collecting data on all NTEP approved meters (and the Official meter) with a common sample set. The Sector is continuing to refine test procedures and, as background for proposed modifications of the code and tests, provides a forum for discussion of cost/benefit as well as technical issues.

B. General Review of NTEP Policy on Protecting Proprietary Information

NIST and the NTEP Participating Laboratory at FGIS have received several inquiries from interested parties for information on instruments submitted for type evaluation and for information on test results. In brief, the NTEP/NIST position is: The company that pays for the evaluation owns the information and the rights to any Certificate of Conformance issued as result of the evaluation. If multiple companies submitted meters for evaluation and one or two didn't pass the first time, NIST will not release the information on who has submitted or who has failed, since that information might influence a potential customer's opinion of that company, and because a manufacturer has the opportunity to correct shortcomings and have a corrected meter tested and pass at a later time. Interested parties may contact companies for information, but NIST will not release the information except when a device is issued a Certificate.

Sid Colbrook, Illinois Weights and Measures, explained that Illinois granted "provisional approval" for moisture meters allowing them to be sold and used commercially prior to type approval on the condition that the manufacturer agree to take the unit back (at no cost to the user) if the meter failed type approval. Without knowing which meters had been submitted for evaluation, Illinois would have no way of knowing if they should grant provisional approval. NIST maintained that NTEP will not release the information of which meters have been submitted, but that the manufacturer may provide that information voluntarily. Manufacturers were divided in their responses to the question of whether they would be willing to take meters back if they didn't receive approval. One said that it was a risk the manufacturer was taking. It was a business decision. Another reported that they were advising potential customers to wait until tests had been completed. Customers buying now bought at their own risk.

The NIST representative pointed out that although meters submitted for NTEP testing must comply with the nonretroactive requirements of the code, the code specifically states that "enforcement will be based upon the effective dates identified with each requirement when specific dates are shown." This provision allows non-NTEP meters to be sold until January 1, 1998. By implication, Illinois did not have to change its manner of treating grain moisture meters prior to the adoption of the revised Grain Moisture Meter Code, since newly installed meters were not required to meet the new code until 1998.

One representative suggested that a question be put on the type evaluation application asking if the applicant would permit the release of preliminary information. Representatives of both the NTEP laboratory and NIST strongly objected to this proposal. They felt that there would always be a question of how much information to release. Manufacturers agreed that the release of preliminary information or test data should be at the discretion of the manufacturer and should come directly from the manufacturer.

The NTEP lab representative expressed concern that this emphasis on early release of type evaluation information implied that a meter which has passed type approval is the best it can be; whereas Phase I approval checked hardware performance mainly. From a calibration standpoint, he felt that it would be two or more years before all instruments were brought into alignment with each other with respect to their moisture results.

C. Issuing of Certificates of Conformance

Earlier, the Sector had agreed that certificates for the first round of approvals would be issued simultaneously so as not to give any one manufacturer an unfair marketing advantage. The Sector did not address the possibility that one or more meters might have to be re-tested, thus delaying the issuance of certificates for meters which had passed in the initial round of testing. At the end of the first round of testing the NTEP lab could not recommend the issuing of certificates. Failures were due to two causes: 1) problems with test procedures, and 2) problems with the meters themselves. Since then, an additional meter has been submitted and tested. Original samples sets have been exhausted, so additional retesting has had to be delayed. The proposed cut off date of October I for inclusion in the group of certificates to be issued simultaneously is no longer viable. The Sector agreed that *Certificates of Conformance for qualifying meters need not be issued simultaneously.*

The Sector had also previously agreed that, for grains other than corn, soybeans and hard red winter wheat, *a calibration should not be listed on the Certificate of Conformance until it has had its calibration bias checked using a set of 10 to 12 samples referenced to the FGIS air oven laboratory and the FGIS official meter.*

Rich Pierce, representing the NTEP laboratory, explained that for the grains in question, individual meter results were compared to FGIS air oven values on 10 to 12 samples which came from previous years' stored samples which had been used for calibrating the FGIS official meter. The official meter was used to screen samples, not for direct comparison. With the exception of rice, each set of samples was composed of 4 samples in each of three 2% moisture intervals. Samples were chosen so that the entire set of 10 to 12 samples had minimal bias with respect to the official meter. Rice samples did not closely match the official meter. This is being investigated.

Charles Hurburgh, Iowa State University, expressed opposition to pre-selection of samples to match the official meter. He questioned whether results in the field [using random samples] will match results using a limited set of pre-selected samples, especially for multiple variable meters (NIRT). If the official meter has a bias [with respect to the full population of random field samples], pre-selecting samples for close agreement between oven and official meter will introduce this bias into the pre-selected sample set resulting in checking against virtual "outliers." Rich Pierce reported that tests at FGIS did not show any significant bias between the official meter and random field samples. The selected samples produced typical mid-range results and did not favor any one technology. His data suggested that pre-screening samples was a viable technique for the preliminary bias check.

To guide the NTEP laboratory in instances when instruments exhibit significant bias differences on grains other than corn, soybeans, and hard winter wheat, the Sector agreed to the following procedure:

> *If, during bias testing of provisional calibrations, biases are detected which exceed the limits shown below, the Type Evaluation Laboratory shall immediately notify the Manufacturer. The Manufacturer shall make changes or adjustments to the calibration which, in the Manufacturer's best judgment, minimize the differences between the Manufacturer's meter and the official air oven. The Manufacturer shall forward to the Type Evaluation Laboratory: 1) detailed descriptions of the changes; 2) an explanation of how the changes affect the previous test results; 3) the calibration coefficients for the revised calibration; and 4) the unique identifier of the revised*

calibration. The Type Evaluation Laboratory shall not forward a recommendation for certification to NIST until the Manufacturer supplies this information or notifies the Type Evaluation Laboratory that it wishes to amend the application for type approval to show the calibration in question as "NOT A VAILABLE ". Testing of the revised calibration by the Type Evaluation Laboratory will not be required.

The Maximum allowable overall bias between Meter under test and air oven is: ±0.4

2. Reports

A. Review of Actions Taken by NCWM at the Annual Meeting

At the annual meeting held July 17-22, the National Conference adopted the Handbook 44 Grain Moisture Meter Code changes (and the corresponding changes to Publication 14) previously recommended by the Sector with the exception of the recommendation that the requirement for a leveling adjustment be removed. The S&T Committee was of the belief that if a grain moisture meter required a level indicating means, then the meter should also be equipped with a means to level the meter and that the requirement for a leveling adjustment should be a design requirement for the meter to ensure that appropriate means are consistently provided with the device.

An amendment was proposed from the floor to remove the retroactive requirement from the proposed new paragraph S.2.4. This proposal was made with the understanding that, if it passed, all other retroactive requirements would be removed from the Code the following year. This amendment was defeated on a split vote, with the House of Representatives voting for the amendment (31-15) and the House of Delegates voting against the amendment (26-34). [Note: An amendment requires 2/3 vote from each house for passage.]

The Proposed Code for Near Infrared Grain Analyzers was adopted by the Conference as a "Tentative Code." As such, it has a trial or experimental status and is not intended to be enforced. The requirements are designed for study prior to development and adoption of a final Code for Near Infrared Analyzers. The Tentative Code will be published in Handbook 44, and once an NTEP Participating Laboratory has been authorized, the National Type Evaluation Program will accept for type evaluation devices that comply with the nonretroactive requirements scheduled to take effect on January 1, 2000.

B. Status of Type Evaluation

Rich Pierce reported that seven applications had been received for type evaluation testing and that five instruments had been through at least one round of testing. Calibration accuracy tests for corn, hard red winter wheat, and soybeans have shown some large biases with respect to air oven and even larger differences between some meters of different model. The results of initial accuracy tests are shown graphically in Appendix A. Model designations have been deleted to protect the identity of the manufacturers. Sample temperature tests have indicated calibration deficiencies in some cases. No one instrument has performed poorly across the board, but several of the calibrations will have to be modified before approval can be granted. Based on the results of initial accuracy testing, it appears that the NTEP type evaluation and continuing calibration programs will have a positive impact on uniformity of commercial grain moisture measurement. The initial round of testing has involved testing the test procedures as well as testing the instruments. Several of the procedures will have to be revised (see Sections V.B. & V.C.).

C. Status of Funding for On-going Calibration Review and Maintenance

An Interagency Agreement between NIST and the U.S. Department of Agriculture, Federal Grain Inspection Service (FGIS) will be executed as a means to fund 5 years of the National Calibration Program for grain moisture meters, also known as Phase 11 of the National Type Evaluation Program for Grain Moisture Meters. As part of that agreement, a fee for participation in the National Calibration Program for grain moisture meters will be assessed at $3,500 per meter model per year. NIST will bill meter manufacturers for the testing needed to review or update calibrations. This amount is in addition to the annual $100 Certificate of Conformance maintenance fee charged by NIST to cover administrative costs of the NTEP program. NIST will transfer $36,000 per year plus the calibration fees collected from manufacturers to FGIS. FGIS will supplement these funds with $180,000 of FY95 revenue to be used over the 5 years of the program to collect samples, analyze them by the appropriate official air oven method, collect moisture results and instrument parameters on each NTEP meter, compare performance of each meter to NTEP established tolerances, and provide calibration data and

reports to manufacturers through NIST and NTEP. FGIS will also meet with the meter manufacturers and other interested parties to discuss issues associated with the National Calibration Program as they arise.

It was noted that the program now covers only grain moisture testers. The Sectors have yet to decide what type of on-going calibration program will be appropriate for NIR grain analyzers.

Carroll Brickenkamp urged the Sector to devise a workable plan for funding the work of Phase 11 after the 5 year Interagency Agreement expires. Joe Rothleder, California Dept. of Food & Agriculture, Division of Measurement Standards, suggested that selling the program in the future would be easier if objective evidence of the program's benefits could be provided. Toward that end, he suggested that states collect data, on a formal basis, comparing results of different meter models on the same samples. This data would provide a measure of uniformity which would indicate over time if the program is improving the situation. The Sector agreed that it would be desirable to initiate a uniform system for collecting and analyzing comparative data. Similar comparative data has been collected in a pilot program in North Carolina. Cheryl Tew of the North Carolina Dept. of Agriculture, Standards Division, offered to send a copy of the protocol used there to Charles Hurburgh for review. Dr. Hurburgh agreed to look at the comparative data and suggest how the information might best be reduced and presented.

D. Additional Code References to be Included in the Grain Moisture Meters Check List

Several paragraphs in the Grain Moisture Meter Code of Handbook 44 are not presently referenced as checklist items in the Grain Moisture Meters Checklist in Publication 14. (References are made to several of these paragraphs in the testing procedure; however, no reference is made in the checklist.) The Sector agreed to the addition of the following items to the Grain Moisture Meters Checklist of Publication 14.

Code Reference S. 1. Z 1. Power Supply, Voltage and Frequency.

(a) A meter that uses alternating current must perform within applicable tolerances:

over the voltage range 100-130 volts or 200-250 volts rms, as designed

over the frequency range of 59.5 to 60.5 Hz

(b) Battery-operated instruments shall not indicate or record values outside the applicable tolerance limits when battery power output is: excessive deficient

Code Reference S. 1. 7 2 Power Interruption.

A power interruption shall not cause an indicating or recording element to display or record any values outside the applicable tolerance limits.

Code Reference S. 1. 8. Level Indicating Means.

A meter shall be equipped with a level indicator and leveling adjustments if *its performance is changed by an amount greater than the applicable tolerance when the meter is moved from a level position to a position that is out of level in any upright direction by up to 5 percent (approximately 3 degrees).*

Code Reference S. 1. 10. Operating Temperature.

(a) A meter shall not record any usable values until the operating temperature necessary for accurate determination has been attained, or

the meter shall bear a conspicuous statement adjacent to the indication stating that the meter shall he turned on for a time period specified by the manufacturer prior to use.

(b) A meter shall meet all applicable tolerances when: operated in the temperature range of 10 °C to 30 °C (50 °F to 86 °F), or within the range specified by the meter manufacturer

(c) *If the manufacturer specifies a temperature range, the range shall be at least 20 °C (36 °F) and shall be marked on the device.*

Note: Questions were raised regarding the requirement for marking the operating range on the device (if other than 10 °C to 30 °C) as specified by Code paragraph S.1.10.(c). The requirement for marking does not appear in the NIR Code. Some have suggested that the Sector did not intend to require marking of the temperature range on the device if the device did not display or record any usable values until the operating temperature necessary for accurate determination had been obtained. The necessity for marking the operating range on the device would seem to be superfluous if the device cannot display or record results until a proper temperature has been reached. The Sector adjourned without settling this matter; however, paragraph S. 1. 1 0.(c) requires that the operating temperature range be marked on the device if the manufacturer declares an operating range outside of the 10 to 30 °C range not requiring specifying by the manufacturer.

3. Review of Industry Concerns

Sector Chairman Lowell Hill has responded to all who submitted comments on the Sector's recommended changes to the Grain Moisture Meter Code and the proposed National Calibration Program. The majority of the concerns focused on two areas: 1) accuracy and 2) retroactive dates. Those commenting on accuracy questioned if accuracy would be improved since Handbook 44 maintenance tolerance limits remained the same. Chairman Hill explained that while meters themselves would not necessarily be more accurate, by specifying uniform methods for data collection and calibration using a single reference laboratory and a common set of samples, the Sector was proposing a system which would be more accurate overall and more uniform than the existing system. Regarding retroactive dates, Chairman Hill pointed out that the retroactive date could be acted on any time between now and one year before the date is to become effective. It was pointed out that the S & T Committee reviews nonretroactive dates on a 10 year basis to determine if nonretroactive dates should be made retroactive. One representative noted that a phaseout period (typically 5 years) is normally allowed when nonretroactive dates are made retroactive. The Sector had previously decided that, in terms of planning, it was better to have a definite date.

Sid Colbrook, Illinois, speaking in favor of removing the retroactive date from the Code, pointed out that the 31 states which voted to remove the retroactive requirement produce 88% of the U.S. corn crop, 85% of the U.S. soybean crop, and 78% of the U.S. wheat crop (based on 1993 USDA statistics). The National Association of State Departments of Agriculture have also recommended that retroactive dates be removed. (See Appendix B) . Doug Pond, Commissioner of Agriculture, State of Indiana, reported that the state legislature would not allow Indiana to remain in the NTEP program if the retroactive date remained in the code. Darryl Brown, Iowa Dept. of Agriculture, Division of Weights and Measures, supported Illinois' position. At their spring meeting, the Central Region of NCWM voted in favor of removing the retroactive requirement.

The grain trading industry also opposes the retroactive date. Most existing meters in use today will not meet the revised Handbook 44 code requirements and will thus never be NTEP approved. Industry will be required to purchase new meters to replace meters which may still be capable of passing the maintenance tolerances for field evaluation. Some industry representatives would like to wait until FGIS has selected a new official meter (or meters) so they could purchase the same model as used by FGIS. An eastern grain belt representative stated, "If FGIS hasn't approved it, I won't buy it." Don Onweiler, Nebraska Public Service Commission, Warehouse Division, noted that of the 1100 or so commercial moisture meters in Nebraska only 90 are Motomco (the current FGIS official meter). The majority of meters in Nebraska are a model which is fully automatic and which uses the same calibrations as a model which has been submitted for type evaluation. It is estimated that some of these will still be in use by the retroactive date . Nebraska plans on enforcing the program if the retroactive date remains in the code, but forcing the grain trade to replace these meters is anticipated to be a problem. Similar situations exist in Iowa and Illinois.

Those supporting the retroactive date felt that this was the only way that the system could be purged of older meters. It was noted, however, that even if the retroactive date remained in the Code, older meters would still continue to be used in non-NTEP states and states which had no active moisture meter program. David Miller of the American Farm Bureau Federation expressed the desire to see additional effort made to bring more states into the NTEP program.

Representatives of the grain industry and the weights and measures community of major grain states expressed the belief that if the accuracy of the system is improved as anticipated, and if FGIS adopts as official one or more NTEP approved meters, market forces will drive acceptance and purchase of new equipment. As of the nonretroactive date, only meters meeting NTEP requirements can be sold.

Chairman Hill asked if those who opposed the retroactive date had any objections to the nonretroactive date. All supported retaining the nonretroactive dates and indicated they could support the program if the retroactive dates were removed. It was generally felt that the retroactive date was not workable, but without the nonretroactive date there would be no program at all. A motion was made and seconded to *remove the January 1, 2003 retroactive date from the Grain Moisture Meter Code of Handbook 44*. The motion passed by a vote of 10 yes, 3 no, 7 abstain. Cliff Watson, Consultant, then requested that his abstention vote be changed to a "yes" in the interest of giving the program a chance. He asked others who had abstained to consider changing their votes to "yes" also. After this appeal, the final vote on the motion was 14 yes, 3 no, and 3 abstain.

4. On-going Calibration Review and Maintenance

To provide the Sector with background information, Rich Pierce, FGIS/QARD, presented an overview of how FGIS conducts its annual review of calibrations. Samples are obtained from FGIS field offices and from certain participating state agencies. Sample quotas are set to reflect the production in a given region with the sample population heavily skewed to regions where production is greatest. The number of samples in any 2% moisture interval will heavily influence the decision of whether or not to make a change. The guidelines for examining a calibration for possible change are shown below.

I. Analyze by 2% Moisture Intervals

(1) Use samples from only the most recent 3 or 5 years (don't use more than 5 years' samples)
(2) Summarize results for the most recent 3 years and most recent 5 years
- use the 3 year summary to look for trends
- use the 5 year summary if there was an abnormal year (drought, etc.) in the 3 summary

(3) A change *may be indicated* if the bias in any 2% interval exceeds:
± 0.30
± 0.50 for corn

A 90% confidence interval is to be applied to the above tolerances.

Where the confidence interval = $\frac{t * SD}{\sqrt{n}}$ and t = one tailed T-test (0.05)

SD = standard deviation of n samples
n = number of samples

Examples (assumes *SD* = 0.25)

n	t	confidence interval
10	1.833	0.145
20	1.729	0.097
30	1.699	0.078

11. Alternatively, a change *may be indicated* if moderate sustained bias (across entire range) is seen which:

(a) Exceeds .15 across entire range on the 3 year average basis; or
(b) Exceeds 2 SD of moving averages for the previous three years
(i.e. SD of avg. of years 1,2,3 ; avg. of years 2,3,4; and avg. of years 3,4,5); or
(c) Exhibits no circumstances which indicate that a bias change should NOT be made.

The Sector considered adopting FGIS criteria for deciding when a calibration change should be mandated. It was argued that the criteria should be the same for FGIS and NTEP, to promote uniformity when FGIS chooses an NTEP meter as the official meter. Others were concerned that using FGIS criteria might result in unnecessary and inappropriate changes (bias chasing), especially to pending calibrations during the initial years of the program when little data is available. *The Sector finally decided that the tolerances described in Draft Publication 14 (one hat(the maintenance tolerance plus a 95%*

confidence interval) would be used to determine when a change was mandated The Sector also agreed that this limit would not prevent a manufacturer from changing a calibration for which a change had NOT been mandated, provided the manufacturer could demonstrate that the change brought the calibration closer to the official air oven. It was also reasoned that should FGIS adopt an NTEP meter, uniformity would not be a problem as the manufacturer of the NTEP meter would not object to using, as the NTEP calibration, any calibration which FGIS thought appropriate.

The Sector also considered forming an advisory group to recommend changes after a review and analysis of the data. It was also suggested that this group might also identify the issues which must be considered in bringing commercial and official systems together when FGIS adopts an NTEP meter or meters as official. In the ensuing discussion, it became apparent that including all interested parties would result in a group almost as large as the Sector. Further, involving all parties would complicate the matter of keeping the data confidential and might inhibit the necessary free interchange of information between the NTEP lab and the manufacturer. *The Sector decided that FG1S, as the Participating NTEP Laboratory, and NIST would confer with each manufacturer to discuss the data which had been collected and to inform the manufacturer of any required changes.* In the unlikely event that the manufacturer disagreed with the actions of this group, the matter could be appealed to the Sector.

The question of the adequacy of the FGIS sample set for calibration development was questioned. It was hypothesized that the FGIS sample set as drawn from the inspection channel is very good for evaluating meter performance, but it may not be adequate for developing calibrations for use at country elevators, especially for multi-variable meters (e.g. near infrared transmission instruments) which must be calibrated on as spectrally diverse sample set as will be seen at the country elevator. It was suggested that manufacturers should be prohibited from using only the FGIS sample set for calibration. A motion to require manufacturers to demonstrate with data that they have augmented FGIS data on an annual basis with samples representative of receipts at country elevators was defeated. Those opposing the motion believed that this was an unnecessary burden on manufacturers of dielectric instruments and that it should be left to manufacturers to decide if it would be necessary to augment FGIS data with additional samples. Further, if the inadequacy is in the FGIS sample set, the inadequacy should be attacked at the source.

In the past, it has been the practice of some states to adopt regional calibrations for some grains. The question was raised as to what impact National Calibrations might have on this. At least one manufacturer has had to issue regional calibrations because the state was rejecting meters on the basis of tests run with locally collected samples. It was suggested that this problem may be due as much to lack of standardization of the air oven method as to regional differences between grain. Under the program, calibrations will be based on FGIS air ovens and field inspection will be 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 FGIS air oven which is considered the standard. The air oven method is an empirical test which may have to be adjusted to account for differences of altitude or other differences between laboratories. One manufacturer commented that it would be impossible to address the question of regional calibrations until interlaboratory differences were eliminated. Carroll Brickenkamp suggested that groups of state regional "pivot" laboratories might be set up to exchange samples. The ideal number of labs might be 10 to 12 per pivot. She offered NISTs assistance in setting up a such a system . Manufacturers expressed a desire to participate in the interlaboratory comparison.

The Sector reaffirmed the goals of the on-going calibration program:

The goals of the on-going NTEP calibration program are: 1) to minimize the overall differences in moisture measurements among meters of different make or model and between meters and the official air oven; and thereby 2) to minimize differences between official measurements and commercial measurements.

5. Publication 14 Issues

A. Device Identification Criteria

The identification criteria for scales had been modified as part of the U.S./Canada Mutual Recognition of Type Evaluation Program for selected scales. The Sector agreed that it is desirable to maintain as much similarity between scales and grain moisture meter criteria as practical. The Sector recommended that the Grain Moisture Meters Checklist of Publication 14 be changed to read:

Grain Moisture Meter G-S. 1. Identification Description

1. Code Reference G-S. I Identification

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

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

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

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

2. Clean the marking or badge with the following cleaners presumed to be "readily available. a Disinfecting cleaning liquid and a damp cloth.

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

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

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

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

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

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

[editor's note: the following section numbers have been edited here for clarity] 1. 1. The name, initials or trademark of the manufacturer. A remote display is required to have the manufacturer's name or trademark and model designation.

1.2. The manufacturer's model designation that positively identifies the type or design.

1.3. A unique serial number. The serial number shall be prefaced by words, an abbreviation, or a symbol that clearly identifies the number as the required serial number.

1.4. If the manufacturer specifies a temperature range other than 10 EC to 30 EC then it must be marked on the device.

1. 5. If the information specified in the first three points is placed on a badge or plate, the badge or plate must be permanently attached to the device.

1.6 Identifying information shall be visible without disassembly requiring the use of a tool separate from the device.

1. 7. All markings must be clear and easily readable.

1. 8. The lettering for all markings must be permanent. Record the grade for the permanence of markings:

1. 9. If the markings for other than device identification (i. e., the first three points) are placed on a badge or decal, then the badge or decal must be durable (difficult to remove at all temperatures).

B. Test Limits for Power Supply and Warm-up Time Tests

Both of these tests involve comparing the averages of 10 drops of a single wheat sample (12 to 14% moisture content) made under two or more different conditions. The maximum allowable bias between conditions is presently 0. 1%.

In the case of the power supply test, the sample is dropped a total of 30 times (3 voltages x 10 drops). The Type Evaluation Laboratory reported that the sample is not remaining stable during these tests with the result that bias shifts in excess of 0.1% have been noted. Subsequent successful re-testing has convinced the Laboratory that the bias shifts observed were due to sample instability or air oven precision and not to instrument problems. The standard deviation on air oven determinations on replicates of the same hard red winter wheat sample over a period of time was in the neighborhood of 0.06, a value too close to a test limit of 0. 1. *The Sector considered the data (See Appendix Q and concluded that the power supply test should he modified to increase allowable bias to 0.2.* The number of drops will remain at 10 and the precision at 0. 1.

In the case of the warm-up test, the sample is dropped a total of 20 times (10 initial drops then 10 after waiting 2 times the specified warm-up time). On some instruments the time required to run the sample 10 times exceeds or equals the specified warm-up time. *The Sector agreed that the warm-up test should be modified to call for 5 drops each time and that the allowable bias should be increased to 0.2.*

C. Leveling Test

Present wording of the Leveling Test does not require that meters equipped with a level indicator be subjected to any kind of test to verify that they will perform properly when operated at the indicated limits of the level indicator. The NTEP Participating Laboratory suggested that the Leveling Test be modified to correct this oversight. During this test the laboratory has also experienced problems with sample stability or air oven precision which resulted in some instruments exceeding the bias of 0.1%. *The Sector recommends changing the maximum allowable bias shift to 0.20 and the number of drops (readings) from 10 to 5. The Sector also agreed to change the wording to require a test for meters equipped with a leveling indicator.* The revised wording is shown below:

Leveling . Tests *for leveling will be conducted using a single HR W wheat sample (12-14% moisture content). The leveling test will be conducted for a minimum of 2 orientations, front-to-back and left-to-right, at a tilt of 5 percent. Meters equipped with leveling indicators will be tested at the indicated limits of the level indicator rather than at a tilt of 5 percent. Additional orientations will be tested as deemed appropriate.*

The maximum allowable bias shift is +0.20% for the average of 5 readings.

6. Other Handbook 44 Issues

A. S.1.2.2.(c) Digital Indications and Recording Elements

To ensure that raw parameter values could be collected during type evaluation and Phase 11 calibration testing, it was suggested that paragraph S. 1.2.2.(c) be amended to include the following:

> For the purposes of type evaluation and on-going calibration review, meters shall also transmit the parameter values actually measured by the meter for use in the moisture prediction. These parameter values need not be transmitted in the normal operating mode.

The Sector decided that this requirement should be left to the discretion of the manufacturer. Paragraph S. 1.2.2.(c) will not be changed.

B. S.1.2.2. (g) Digital Indications and Recording Elements - New Paragraph

The present code assumes that meters measure only moisture, which is to be displayed and recorded in percent moisture wet basis. The anticipated approval, as moisture meters, of whole grain near infrared instruments which have the capability of measuring other constituents of grain (with results also expressing in percent), has created the potential for confusing moisture results with a protein results on a single instrument. To eliminate the possibility of confusion the Sector recommends the addition of the following paragraph to Section S. 1.2.2.:

> *(g) On multi-constituent meters (e.g. meters which also measure grain protein) provision shall he made for displaying and recording the constituent label (such as moist, prot., etc) so as to make it clear which constituent is associated with each of the displayed and recorded values.*

5. Next Meeting

The next meeting of the Grain Sectors is planned for March 27-29, 1995 from 8 am Monday to noon on Wednesday in Baltimore, MD. The meeting hotel is yet to be determined. Again, the first 1-1/2 days will be devoted to Grain Moisture Testers with the remaining time dedicated to NIR Grain Analyzers.

National Type Evaluation Technical Committee
Near Infrared Grain Analyzer Sector
Meeting Summary
September 22 – 23, 1994

Agenda Items

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1. Handbook 44 Issues

A. Modify UR.2.8., to specify the conditions under which slope and bias adjustments can be made.

One method of standardizing NIR analyzers involves applying a slope and bias adjustment to the uncorrected instrument measurement to arrive at an adjusted value which more nearly approximates the "true" value of the measured parameter. Determination of the slope and bias coefficients is accomplished by regressing uncorrected instrument results against "true" constituent values on a selected set of samples. "True" constituent values for protein are typically determined by means of a standard chemical reference method such as nitrogen combustion. A slope and bias adjustment of a calibration compensates for two sources of error: 1) differences in the spectral response between the instrument which was used to develop the calibration (the "master" instrument) and the instrument being "standardized"; and 2) differences in the standard method (either over time or between different labs).

NIR analyzers can also be standardized by comparing the spectral response of a "master" instrument against the spectral response of the instrument being standardized using a spectrally diverse set of samples (usually done individually for each commodity). The response of the unit being standardized is then mathematically related to the response of the master unit at each significant wavelength. The calibration developed in the master instrument can then be modified by means of these mathematical relationships for use in the new instrument. This method of standardization is called "spectral matching."

It has been suggested that a common set of slope samples to standardize devices is critical to achieving uniformity not only within the commercial system, but between the official system and the commercial system. The Sector inquired about the possibility of obtaining Standard Slope Samples (SSS) from the FGIS. Rich Pierce, FGIS/QARD, explained that slope sample sets were difficult to obtain in quantity. Slope sets are made up of blends of about 50 market samples which may have been collected over a period of as much as two years. They represent many varieties and geographic areas and are also chosen for close agreement between the reference method and the FGIS Master instruments. The reference values represent the average of replicates on six cuts of each sample in the set. A slope set consists of between 20 and 24 samples covering the upper and lower third of the protein range. At the present time, FGIS has only 25 sets of SSS which are used to slope 100 instruments in the official system. Because of scarcity and the possibility of loss or corruption of a set, FGIS does not, at the current time, release SSS for use outside the official system. It does not appear feasible for FGIS to provide SSS for all the instruments in the commercial system. Manufacturing representatives asked Dr. Pierce to check into the possibility of FGIS making SSS available to manufacturers seeking NTEP approval.

The need for users to determine slope adjustments (or to perform spectral matching) was questioned. Manufacturers indicated that the present generation of NIR instruments should not require slope adjustment (or spectral matching) more than once a year. *Because of the critical nature of this type of adjustment, the Sector decided that slope adjustments should not be determined by a user. This does not preclude the possibility of the operator installing manufacturer-specified*

calibration constants or standardization parameters under the instructions of the manufacturer or the manufacturer's designated agency.

In the Official system, instruments which have been standardized by slope and bias adjustment are checked daily with Standard Reference Samples (SRS) to: 1) see if the instrument has drifted, and 2) to keep instruments in the Official system lined up with the Master instruments in Kansas City. Samples for the standard reference set are selected for good repeatability. They must be clean with no evidence of infestation and very little dust or dockage. There is one set of SRS for each class of wheat with five samples in each set. SRS are matched to the Master instruments at FGIS/QARD. The value assigned to each sample in the set represents the average of multiple drops through the Master instruments.

One manufacturer reported that they are using 12 standard samples for users to bias adjust instruments in a national program in Europe. No slope adjustment is made by the user.

The Sector agreed that Standard Reference Samples would be desirable for users to monitor their instruments and keep them aligned with the Official system. The possibility of users obtaining SRS directly from FGIS/QARD was questioned. Because of the large quantities involved, this may not be possible, but arrangements might be made for users to obtain SRS from a source with accuracy traceable to FGIS. *On the assumption that a suitable source can be developed for SRS, the Sector proposed that Paragraph UR.2.8 be rewritten to eliminate references to user slope adjustments and to more explicitly describe the information which the user must keep to justify calibration adjustments. Following is the new wording agreed upon for Paragraph UR. 2.8:*

> *UR.2.8. Calibration Adjustments. - Bias changes shall be made only on the basis of tests run on a current set of Standard Reference Samples (SRS) traceable to FGIS Master Instruments. A written explanation and record of all calibration changes, including those changes made by a manufacturer or the manufacturer's designated service agency, shall be maintained The log shall Indicate the date and magnitude of changes in bias and slope constants, and the instrument serial number. A Calibration Adjustment Data Sheet, for each log entry, shall be available for inspection upon request by the field inspector. Data Sheets shall be retained by the user for a period of no less than 18-months following any calibration adjustment. The Data Sheet must show: Date of test and adjustment, serial number of the instrument, calibration identification, the nature of the adjustment, the unique identification number and source of sample sets used, and, for each sample in the set, reference values, initial instrument results (except in cases of instrument failure and repair), and instrument results after calibration adjustment or instrument repair.*
>
> *[1] Established error must be known.*

The decision to limit certain calibration adjustments to a manufacturer or the manufacturer's designated service agency requires corresponding changes to paragraph S.2.5. 1. Calibration Transfer. *The Sector agreed to add the following note to paragraph S.2.5. 1:*

> *Note: Only the manufacturer or the manufacturer's designated service agency may make calibration transfer or slope adjustments on near infrared grain analyzers and, except for instrument failure and repair, only at a prescribed period of time during the year. This does not preclude the possibility of the operator installing the manufacturer-specified calibration constants or standardization parameters under the instructions of the manufacturer or the manufacturer's designated service agency. Nor does it preclude operator bias adjustments when made under the conditions specified in UR.2.8.*

B. Editorial Changes to prohibit recording results any time the display of results is prohibited.

The Sector believes that any time the instrument is not permitted to display a constituent value it should also not record a constituent value. *The Sector recommends that paragraphs S. 1.3. (a), (h),* (c), *(d) and S. 1.4. (a). he modified to prohibit recording a constituent value whenever the display of a constituent value is not permitted, and that these paragraphs also he modified to require that a recorded error message accompany a recorded representation whenever a displayed representation is required to he accompanied by a clear error indication.*

2. Publication 14 Issues

A Review Section 1. Basic Instrument Tests and Section 11. Accuracy, Precision, and Reproducibility

The Sector noted that the paragraphs dealing with Sample Temperature Sensitivity have been included under Basic Instrument Tests by mistake. *Sample Temperature Sensitivity should he in a separate section inserted between Basic Instrument Tests and Accuracy, Precision, and Reproducibility (see Publication 14, Grain Moisture Meters Code for an example of the correct format). Thus, Sample Temperature Sensitivity becomes Section II, Accuracy, Precision, and Reproducibility becomes Section III, and Tolerances for Calibration Performance becomes Section IV.* The Sector also noted that the test procedure for Sample Temperature Sensitivity currently calls for testing only with HRW wheat samples. *The Sector agreed that the test procedure should he changed to call for testing with all six classes of wheat. Thus, the second paragraph of Sample Temperature Sensitivity will he changed as shown below:*

> Testing will be conducted using two ~~HRW wheat~~ sample sets from each of the six wheat classes representing low (10--11%) and high (13-14%) moisture ranges. Each set will consist of three samples, one from each of three protein ranges (~~10 12, 12 14, and 14 16~~) (the upper third, the middle third, if the protein range for the class). Separate bias analyses will be made for the low and high moisture sets. Three analyses will be made for each sample at room temperature, the hot temperature extreme, and the cold temperature extreme. For each class, the average protein for the 9 observations in each moisture set (I moisture level x 3 protein levels x 3 replicates) run at each temperature extreme must agree with the average protein obtained for the room temperature runs within ±0.35.

One sector member asked if it would be necessary to repeat Basic Instrument Tests for type evaluation of a Near Infrared Grain Analyzer which had previously been type approved as a Grain Moisture Meter. The similarity of the basic instrument tests for the two Codes was noted. Sector members were in general agreement that it should not be necessary to repeat the basic instrument tests. It was felt that the sample temperature sensitivity tests and the tests for accuracy, precision, and reproducibility for wheat protein would uncover any inherent instrument problems which were not discovered in the basic instrument tests for Grain Moisture Meter. *The Sector recommends the addition of the following footnote to the Basic Instrument Tests:*

> *At the discretion of the NTEP Participating Laboratory, successful completion of the Basic Instrument Tests specified in NCWM Pub. 14, Grain Moisture Meters Code may be accepted in lieu of actual tests, as evidence that the device meets the Basic Instrument Test requirements of the Near Infrared Analyzer Code. This exception is intended to reduce the need to perform Basic Instrument Tests two times on an instrument which has previously been submitted for NTEP evaluation as a Grain Moisture Meter or on an instrument which is submitted for simultaneous approval as a Grain Moisture Meter and as a Near Infrared Analyzer.*
>
> *The Sector agreed that the following table of protein ranges should be added to the Accuracy, Precision, and Reproducibility Requirements section of Publication 14:*

Protein Ranges for Type Evaluation	
Grain Type	*Protein Range at 12% moisture basis*
Durum Wheat	*10-18*
Hard Red Spring Wheat	*10-19*

Hard Red Winter Wheat	*8-18*
Hard White Wheat	*9-16*
Soft Red Winter Wheat	*9-12*
Soft White Wheat	*8-15*
"All Class" Wheat Calibration	*8-19*

B. Tolerances for Calibration Performance

The Sector agreed to add the following three paragraphs to the section entitled Tolerances for Calibration Performance:

> *Calibration performance must be tested against established criteria at the following stages of the type evaluation process: (1) evaluation of the calibration data supplied by the manufacturer with the application for type evaluation, (2) EVALUATING INSTRUMENT and calibration performance over the protein range specified for each class of wheat (see table and accuracy test in Section II), and (3) review of on-going calibration data collected as part of the national calibration program.*
>
> *For initial type evaluation (and prior to taking data in the on-going calibration maintenance program for the purposes of calibration evaluation), instruments shall be standardized by the Manufacture in cooperation with the participating NTEP laboratory.*
>
> *For initial type evaluation, the accuracy tolerances (SEP and Bias) of Section III, Accuracy, Precision, and Reproducibility, shall apply.*

With regard to on-going calibration review and maintenance, *the Sector agreed that participation in a monitoring program of some sort should be mandatory for NTEP instruments.* The Sector deferred adoption of guidelines to determine when a calibration must be changed until the program is more clearly defined.

Rich Pierce outlined the on-going wheat protein calibration program currently being followed by FGIS. At least 100 samples are collected annually for each of six classes of wheat. The samples are selected to represent geographic areas and constituent levels of interest (with moistures up to 14-16%). In the absence of noted problems, calibrations are updated on a 3 year cycle (2 calibrations per year). FGIS is very sensitive to the potential impact of calibration changes on the value of grain stocks. To minimize the economic impact to the grain trade, changes are generally timed to become effective when wheat stocks are at their lowest level.

The Sector agreed that data should be collected (and made available to manufacturers) annually by the NTEP laboratory on instruments in the on-going calibration review and maintenance program for NIR grain analyzers. The Sector also agreed that only protein data (corrected to 12% moisture basis) and basic instrument data would be provided. Eliminating the requirement for moisture data will reduce the cost of sample analysis significantly.

C. Code References to be Included in the Near Infrared Grain Analyzers Checklist

The Sector agreed to include the following in the Publication 14 Checklist for Near Infrared Grain Analyzers:

General

Code Reference: -S.1. Identification

Virtually all measuring equipment (except separate parts necessary to the measurement process but not having any metrological effect) must be clearly and permanently marked with the manufacturer's name or trademark, model designation, and serial number. "Permanent" markings addresses two aspects: (1) the printed information will withstand

wear and cleaning, and (2) if the markings are on a plate or badge, then the marking badge must be "permanently" attached to the device. Permanence of attachment of the badge means that the identification information required by G-S. I. is not easily removed, and if removed, then it must be obvious that the badge or plate containing this information has been removed. All markings must be clear and easily readable. The following test procedure shall be used to determine the permanence of the identification markings.

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

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

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

2. Clean the marking or badge with the following cleaners presumed to be "readily available."
   a. Disinfecting cleaning liquid and a damp cloth
   b. "Soft" household cleaning powder and a damp cloth.
   c. Window cleaning fluids and a damp cloth.

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

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

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

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

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

1.1. The name, initials or trademark of the manufacturer. A remote display is required to have the manufacturer’s name or trademark and model designation.

1.2. The manufacturer's model designation that positively identifies the type or design.

1.3. A unique serial number. The serial number shall be prefaced by words, an abbreviation, or a symbol that identifies the number as the required serial number.

1.4 If the information specified in the first three points is placed on a badge or plate, the badge or plate permanently attached to the device.

1.5. Identifying information shall be visible without disassembly requiring the use of a tool separate from the device.

1.6. All markings must be clear and easily readable

1.7. The lettering for all markings must be permanent. Record the grade for the permanence of markings:

1.8. If the markings for other than device identification (i.e., the first three points) is placed on a badge or decal the badge or decal must be durable (difficult to remove at all temperatures).

Code Reference: G-S.2. Facilitation of Fraud

The construction and assembly of an instrument shall not facilitate fraud.

Code Reference: G-S.3. Permanence

Equipment shall be of such materials, design, and construction that, under normal service conditions:

1. Accuracy will be maintained

2. Operating parts will continue to function as intended.

3. Adjustment will remain reasonably permanent.

Code Reference: G-S.4. Interchange or Reversal of Parts

If an instrument has parts that may be interchanged or reversed in normal field assembly, the system shall either be constructed so that reversal will not affect the accuracy of the system or the parts must be marked to indicate their proper position. For most instruments, this applies only to the reversal of cables to peripheral devices.

If an instrument has any parts that may be interchanged or reversed in normal field assembly, the parts must either be:

1. Constructed so that reversal will not affect performance, or

2. Marked or keyed to indicate the proper position

Code Reference: G-S.5.1. Indicating and Recording Elements

Several requirements of a general nature facilitate the reading and interpretation of displayed values. Each display for quantity must be appropriate in design and have sufficient capacity for particular applications in order to be suitable for the application. Devices must be capable of indicating the maximum quantity that can normally be expected in a particular application.

1. The maximum quantity indications are appropriate for the intended use.

2. The indications must be clear, definite, and accurate.

3. The indications must be easily read under normal operating conditions.

4. Symbols for decimal points shall clearly identify the decimal position. (Generally accepted are dots, small commas, or x.)

5. If provided, the zero indication must consist of at least the following minimum indications

    5.1. One digit to the left and all digits to the right of the decimal point.

    5.2. If a decimal point is not used, at least one active decade plus any constant zeros.

    5.3. A fixed or constant zero cannot appear after a decimal point; i.e., all decades to decimal point must be active.

Code Reference: G-S.5.2.2. Digital Indication and Representation

Digital elements shall be designed such that:

I . Digital values agree with printed values.

2. A digital value "rounds off' to the nearest minimum unit that can be indicated or recorded.

Code Reference: G-S.5.2.3. Size and Character

Digits used for comparable values must be uniform in size and character, but subordinate values may be displayed in different and less prominent digits than more significant values. In digital indications, the digits are usually of uniform size throughout a particular display.

Subordinate indications and recorded representations shall be appropriately portrayed or designated.

Code Reference: G-S.5.2.4. Values Defined

Values shall be adequately defined by a sufficient number of figures, words, symbols, or combinations thereof, and uniformly placed, so that they do not interfere with the accuracy of the reading.

Code Reference: G-S.5.2.5. Permanence

Indications or recorded representations and their defining figures, words, and symbols shall be of such character that they will not tend easily to become obliterated or illegible.

Code Reference: G-S.5.3.1. On Devices that Indicate or Record in more than One Unit

Quantity values shall be identified by the specific unit of measure in use with an appropriate word, symbol or abbreviation.

Code Reference: G-S.5.6. Recorded Representations

All recorded values shall be digital. (See also G-UR.3.3.)

Code Reference: G-S.6 Marking, Operational Controls, Indications, and Features

All operational controls, indications, and features including switches, lights, displays, and push buttons shall be clearly and definitely identified. Keys visible only to the operator need only be marked to the extent that a trained operator can understand the function of each key.

Code Reference: G-S. Lettering, Readability

Required markings and instructions shall be permanent and easily read.

Code Reference: G-UR. 1. 1. Suitability of Equipment

A device must be properly designed and have sufficient capacity to be suitable for use in a particular application. A device must measure the appropriate characteristics of a commodity to accurately determine the quantity, have the necessary components to eliminate factors that may cause measurement errors during normal use, and have sufficient capacity to indicate the quantity measured. The device must have a quantity division appropriate for the application. Some specific requirements for device characteristics are given in the specific codes for particular devices.

The equipment is suitable for its intended application.

Code Reference: UR.1.2. Environment

Equipment shall be suitable for use in the environment in which it will be used. Suitability with respect to environment includes the effects of temperature and humidity variations. A device must work and remain accurate under its actual conditions for use.

Indicating Elements, Recording Elements and Recorded Representations

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

I . The analyzer shall be equipped with a digital indicating element

2. The minimum height for digits used to display constituent values is 10 mm.

3. The analyzer is equipped with a communication interface and can transmit the date, grain type or class, constituent values, and calibration version identification.

4. A digital indicating element shall not display, and recording element shall not record, any constituent value before the end of the measurement cycle.

5. Wheat protein content shall be recorded and displayed as percent protein reported on a constant moisture basis of 12 percent wet basis.

6. Digital and recording elements shall not display or record any constituent values beyond the operating range of the device unless the constituent value representation includes a clear error indication (and recorded error message with the recorded representation).

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

The means to select and display the grain type or class and constituent(s) shall be readily visible and the type or class of grain and constituents selected shall be clearly and definitely identified in letters (such as HRWW HRSW, SWW, etc., or PROT, etc.) or with symbols clearly defined adjacent to the display. The device shall be capable of indicating grain type using a minimum of four characters.

Code Reference: S.1.3 Operating Range

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

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

2. The constituent range is specified for each grain or seed for which the analyzer is to be used and an error message is displayed when the constituent range has been exceeded.

3. For whole grain analyzers only (this item is not applicable to ground grain instruments). The temperature range is specified for each grain or seed for which the analyzer is to be used. The specified range covers a range no less than 10 °C to 30 °C. An appropriate error message is displayed when the temperature of the grain sample exceeds the range for the grain.

4. For whole grain analyzers only (this item is not applicable to ground grain instruments). The maximum allowable difference in temperature between the instrument environment (ambient temperature) and the sample for which

an accurate constituent determination can be made is specified. For temperature differences outside this range, constituent values are not displayed and an appropriate error message is displayed.

Code Reference: S.1.4.1 Operating Temperature

(a) An analyzer shall not display or record any usable values until the operating temperature necessary for accurate determination has been attained, or

the analyzer shall bear a conspicuous statement adjacent to the indication stating that the analyzer shall be turned on for a time period specified by the manufacturer prior to use.

(b) If the analyzer will not meet tolerance requirements because there is an upper internal operating temperature limit that could be exceeded when operating within the ambient temperature range specified by the manufacturer, a means of sensing and indicating an over-temperature condition shall be provided.

Design of NIR Analyzers

Code Reference: S.2.1 Minimum Sample Size

The analyzer uses a sample size of no less than 20 g.

Code Reference: S.2.2.1. Power Supply, Voltage and Frequency

An analyzer that uses alternating current must perform within applicable tolerances:

over the voltage range 100- 130 volts
over the frequency range of 59.5 to 60.5 Hz

Code Reference S.2.2.2. Power Interruption.

A power interruption shall not cause an indicating or recording element to display or record any values outside the applicable tolerance limits.

Code Reference S.2.3. Level Indicating Means.

An analyzer shall be equipped with a level indicator and leveling adjustments if its performance is changed by an amount greater than the applicable tolerance when the analyzer is moved from a level position to a position that is out of level in any upright direction by up to 5 percent (approximately 3 degrees).

Code Reference: S.2.4. Environmental Conditions

Instrument optics and electronics are protected from exposure to air-borne dust by either sealing these areas or by providing an adequate dust filtration system.

Code Reference: S.2.5.1. Calibration Transfer

Calibrations can be mathematically transferred between instruments of like models.

Code Reference: S.2.5.2. Calibration Version

The analyzer is capable of displaying either calibration constants, a unique calibration name, or a unique calibration version number.

Code Reference: S. 2.5.3. Calibration Corruption

If calibrations are digitally stored in an electronically alterable form, the analyzer makes automatic checks to detect calibration corruption and displays an error message if calibration constants have been electronically altered.

Code Reference: S.2.6. Provision for Sealing

Provision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., audit trail available at the time of inspection before any change that affects the metrological integrity of the device can be made to any mechanism).

a) I . The manufacturer has provided information on how the device should be sealed.

2. All calibration and metrological adjustments can be sealed, or other means of providing security such as audit trails are provided.

b) If the means of providing security is an audit trail:

I . The audit trail includes:

an event counter (000 to 999)

the parameter ID

the date and time of change

the new value of the parameter the calibration number for calibration changes consisting of multiple calibration constants

2. A printed copy of the audit trail information is available through the device or through an auxiliary device or printer.

3. The event logger has the capacity to retain records equal to twenty-five (25) time the number of sealable parameters in the device up to a maximum of 1000 total records.

Code Reference: S.3. Accessory Equipment.

If accessory equipment separate from and external to the analyzer is required for proper operation of the analyzer, such equipment shall be appropriate and complete.

The necessary equipment is specified.

It is appropriate and complete.

Code Reference: S.3.1. Grinders.

Operating instructions for ground grain analyzers specify the make and model of grinder required as accessory equipment for each type of grain to be measured.

Code Reference: SA. Operating Instructions

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

In addition, operating instructions shall include the following information:

a) name and address or trademark of the manufacturer

b) the type or design of the device for which the operating instructions are intended to be used

c) date of issue

d) the kind of classes of grain or seed for which the device is designed to measure constituent values

e) the limitations of use, including but not limited to constituent range, grain or seed temperature, kind or class of grain or seed, instrument temperature, voltage and frequency ranges, electromagnetic interference, and necessary accessory equipment.

D. National Type Evaluation Testing Schedule

Rich Pierce reported that the FGIS application for approval as a participating NTEP laboratory was pending. He anticipated that NIST would be sending out application letters to known NIR manufacturers the first week or two of November and that actual testing could begin some time in January. Rich stressed that there were economies in running the instruments as a group. Manufacturers were urged to plan accordingly.

Meeting Attendees

Name	Affiliation	Grain Moisture	Grain Analyzer
Jack Barber	JB Associates (for NIST)	x	x
Jeff Martin	Steinlite Corp.	x	
Connie Brown	DICKEY-john Corp.	x	x
Cassie Eigerimann	DICKEY-john Corp.	x	x
Hugh Shown	DICKEY-john Corp.	x	x
Richard Wotthlie	Maryland Weights and Measures	x	
Hiro Yamaha	Kett Electric	x	
Fred Seeber	Shore Sales / GEAPS	x	
Robert C. Smigelski	National Grain & Feed Association	x	
Duane Staats	GEAPS / Countrymark Co-op Inc.	x	
Allison Pflug	CSC Scientific Co., Inc.	x	
Michael van der Matten	Sinar Agritec Ltd.	x	
Pontus Nobreus	Perstorp Analytical, Inc	x	x
Joseph Rothleder	California Dept. of Food & Agriculture	x	x
Lowell Hill	University of Illinois	x	x
Martin T. Wagner	DICKEY-john Corp.	x	
Rich Flaugh	GSF Inc.	x	x partial
Randy Bums	Arkansas Bureau of Standards	x	x
Cheryl Tew	North Carolina Dept. of Agriculture	x	x
Charles R. Hurburgh	Iowa State University	x	x
Tom Runyon	Seedburo Equipment Co.	x	
Darryl L. Brown	Iowa Dept. of Agriculture	x	x
Sid Colbrook	Illinois Dept. of Agriculture	x	
Don Onwiler	Nebraska Public Service Commission	x	
Clifford A. Watson	Consultant	x	x
Don Muller	Bran+Luebbe	x	x
Richard Pierce	Federal Grain Inspection Service	x	x
Doug Pond	Indiana Commissioner of Agriculture	x	x
Chuck Lowden	Foss Food Technology	x	x
David Miller	American Farm Bureau Federation	x	
Jim Truex	Ohio Dept. of Agriculture / Chairman NCWM	x	
Carroll Brickenkamp	National Institute of Standards and Technology	x	x partial
Tom O'Connor	National Grain & Feed Association	x	x

National Type Evaluation Technical Committee
Grain Moisture Meter Sector
Meeting Summary
March 27 – 28, 1995, Baltimore, MD

Agenda Items

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1. Report on NCWM Interim Meeting

The NCWM Interim Meeting was held January 8-12, 1995 in Costa Mesa, CA. Tina Butcher, NIST, reported on the following actions taken by the Specifications and Tolerances (S&T) Committee at that meeting on issues relating to Grain Moisture Meters:

356-1 Elimination of Retroactive Dates from the Grain Moisture Meters Code. The S&T Committee has recommended that this issue be brought for vote at the 80th Annual Meeting of the NCWM to be held July 16- 20, 1995 in Portland, ME. (This item was proposed by the Central Weights and Measures Association and was reviewed at the September 1994 meeting of the Grain Moisture Meter Sector. Based on concerns raised by the grain industry and some members of the weights and measures community, the Sector also agreed to recommend that retroactive dates be dropped. A more complete discussion of this issue can be found in the NCWM Interim Meeting Agenda.)

356-2 S.1.2.2.(g) Digital indications and Recording Elements (new paragraph). The S&T Committee supports the Sector's recommendation which requires mufti-constituent meters to display and record constituent labels. It will be brought for vote at the Annual Meeting.

356-3 S.2.3. Provision for Sealing. At its March 1994 meeting, The Grain Moisture Meter Sector suggested adding wording to this paragraph to address audit trail requirements. This item was inadvertently omitted from the S&T Committee's Published 1995 Interim Agenda, but the S&T Committee agreed that the item was of sufficient importance that it should be brought for vote at the Annual Meeting. Rich Pierce pointed out that the NTEP Laboratory was already type evaluating to these criteria.

A. Discussion on Audit Trails

The previous agenda item sparked further discussion on the subject of audit trails. Tina Butcher pointed out that with other devices, audit trails can be viewed on the device. The present wording of H44 for Grain Moisture Meters, however, requires only that the audit trail be capable of being printed out. It was suggested that the Sector might want to require that Grain Moisture Meters be capable of displaying audit trail information directly. The Sector, however, agreed that a printout was preferable to a display because of the complex nature of the information contained in Grain Moisture Meter audit trails. A further advantage of a printout is that it can be stored as a permanent record with the field inspection papers, and, in questionable situations, can be compared readily to the previous year's printout. In the interest of making its original intent clear, the Sector recommended that the proposed wording of S.2.3. be modified slightly to explicitly state that the device is not required to display audit trail information. The Sector recommends that this slightly modified wording be considered an "editorial" change so that it can appear on the Annual Meeting Agenda in the following form:

S.2.3. Provision for Sealing

(a) Provision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., audit trail available at the time of inspection as defined in part (b)), before any change that affects the metrological integrity of the device can be made to any mechanism.

(b) If the operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc.) in normal operation, the device shall use an audit trail. The minimum form of the audit trail shall be an event logger and shall include:

- An event counter (000 to 999)
- the parameter ID,
- the date and time of the change, and
- the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number is to be used rather than the calibration constants.)

<u>The device is not required to display this information, but</u> a printed copy of the information must be available through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)

2. NTEP Policy: NTEP Name and Logo Usage

Now that Certificates of Conformance are being issued for Grain Moisture Meters, manufacturers have requested information on acceptable use of the NTEP logo and proper reference to the NTEP Certificate of Conformance. Sector members were referred to *Publication 14, Section S. References to NTEP* and were advised that the NTEP Board of Governors at the recent NCWM Interim Meeting agreed to incorporate the following text in *Publication 14, Section S. References to NTEP* after Items 2.a.(1) and 2.a.(2):

The NTEP statement or logo shall only be used in conjunction with products which have been certified in accordance with this publication and Handbook 44. The statement or logo shall never be used in any manner that could suggest or imply that certification extends to a product which is not NTEP certified.

Where reference is made to NTEP or NTEP Certificate of Conformance, it is essential to clearly identify which products are NTEP certified if the copy also includes products which are not certified. Reference to NTEP must always be located in close proximity to any reference to a certified product when uncertified products are shown on the same page.

A question was raised concerning proper use of the NTEP logo and references to NTEP approval in each of the following cases:

(1) a device which has been approved for less than the full set of 16 NTEP grains
(2) a device on which calibrations for non-NTEP grains or commodities have been installed

The situation for NTEP approved Grain Moisture Testers differs significantly from NTEP approval on other device types. Although 16 grains are included in the on-going calibration review program for NTEP meters, NTEP meters are not required to provide calibrations for all 16 NTEP grains.

Furthermore, calibrations for non-NTEP grains or commodities may be installed on NTEP meters at the discretion of cognizant regulatory agencies in individual states. The responsibility for monitoring the accuracy of a calibration for a non-NTEP grain and enforcing its use within the state falls to the agency authorizing its use. By way of example, the Missouri Department of Agriculture, Division of Weights & Measures, intends to allow NTEP meters to use calibrations for Fescue, a crop of significant economic importance in Missouri. Accuracy will be checked by field inspection using actual Fescue samples.

The Sector suggests that the Board of Governors may want to recommend standard wording for manufacturers to use to explain what is implied by an NTEP approval of a Grain Moisture Tester, perhaps requiring a phrase similar to: “NTEP approved for use on the following grains (list grains for which meter is approved)."

3. NTEP Policy: Remanufactured and Repaired Equipment

The Board of Governors has proposed the following for adoption as NTEP Policy:

(a) If a company or individual makes changes to a device to the extent that the metrological characteristics are changed, that specific device is no longer traceable to the NTEP Certificate of Conformance.

(b) If a company or individual repairs or remanufactures a device, they are obligated to repair or remanufacture it consistent with the manufacturer's original design; otherwise, that specific device is no longer traceable to the NTEP Certificate of Conformance.

This issue was brought before the Grain Moisture Meter Sector to alert members that these items will be considered further at the NCWM Annual Meeting; to notify members of the recommendations made by the Board of Governors; and to provide an opportunity for Grain Sector members to discuss and make recommendations relative to policy for repaired or remanufactured Grain Moisture Meters.

In the ensuing discussion, one manufacturer asked if it would be appropriate to add wording to the policy to require that all repairs be made by a registered repair person authorized by the original manufacturer. It was pointed out that the Board of Governors had to be careful to avoid taking any action which could be considered in restraint of trade, and that restricting licenses to those approved by the original manufacturer might be considered such a restraint.

Another manufacturer related that he had seen instances where a non-authorized repair service had adjusted a meter to pass field inspection by inappropriately modifying the meter's temperature calibration. As a result, under actual service conditions the meter gave erroneous results on grain measured at temperatures differing from normal room temperature.

Tin Butcher reported that although some states have programs for registering or licensing repair personnel, requirements for licensing vary widely. In some states, the licensing of repair personnel is simply a revenue item requiring no evidence of competence and offering little or no means of oversight or enforcement. Where an effective licensing program is in place, manufacturers can lodge a complaint with the licensing agency when a pattern of inappropriate repairs or adjustment of meters is suspected. Licenses can be revoked if the alleged misbehavior is verified.

The use of physical seals in connection with a licensing program was suggest as one way to monitor repairs. In such a program, licensed repair persons are required to re-seal a repaired meter. Serial numbered seals are traceable to the repair agency which purchases the seals from the state. Although detection of an improperly repaired meter is after the fact, this type program gives positive identification of the repair agency involved and gives positive controls over who is authorized to purchase the necessary seals. In their annual inspection, weights and measures can reject any meter inappropriately sealed and require that it be returned to an authorized repair agency.

The Sector concluded that although the problem of inappropriate repairs was real, if there was no way to assure that repairs had been accomplished by properly trained and qualified individuals, then this was an unenforceable issue, and the proposed wording was acceptable as it was. The Sector agreed that additional language specific to grain moisture testers would not be needed.

4. Update on Type Evaluation and Phase 11 Testing

Rich Pierce of the Grain Inspection, Processors and Stockyards Administration (GIPSA, formerly FGIS), the NTEP laboratory for Grain Moisture Meters, reported on the progress of Type Evaluations. As of early March 1995, type evaluation testing (Phase I of the Grain Moisture Meter Program) had been completed on four models and test reports with recommendations had been submitted to NIST. Testing on an additional model was in process. Of the four models for which recommendations had been submitted to NIST, Manufacturer Calibration Data had been reviewed on three models, Certificate of Conformance (CC) numbers had been assigned to two, and Draft CCs had been prepared for two (see attachments 1 and 2). No additional applications had been received. Although it was originally anticipated that the first devices would be type approved during the Spring of 1994, several models required retesting. In addition, refining test protocols consumed more time than originally anticipated. As a result, high moisture samples collected from the 1994 harvest for Phase 11 testing (the National Calibration Program) are now of questionable quality. The start of Phase 11 testing will be delayed until samples are available from 1995 harvest. Grain moisture meter manufacturers have been informed of the delay in calibration start-up.

An Interagency Agreement between the U.S. Department of Agriculture Federal Grain Inspection Service (now the Grain Inspection, Packers, and Stockyards Administration - GIPSA) and NIST has been signed to fund the National Calibration Program for 5 years. This program will begin June 1995. (Manufacturers with type approved meters will pay $3,500 per year per model during that period and will receive calibration data in return).

Although Phase I Accuracy Testing uses samples of fairly limited moisture range (e.g. 12-18% for corn), Manufacturers were allowed to present data to support wider moisture ranges for initial certification of the three "basic" grains (corn, soybeans, hard red winter wheat). Dr. Pierce pointed out that manufacturers were riot allowed to extrapolate more than 0.5% moisture beyond the mass of data submitted for supporting the claimed wider moisture ranges. For CCs, the range actually tested by the NTEP laboratory is listed as 'Approved'. The extended range, based on manufacturer's data, is listed as "Pending'. As additional data is accumulated in Phase 11 testing, the "Approved* range can be extended when statistically indicated. Also listed as 'Pending' were calibrations for any of the additional grains, from the NTEP list of 16, which were accepted based on the manufacturer's data subject only to a bias check (and adjustment if required).

The Sector agreed that wording should appear on the CC to make it clear to field inspection (and users) that calibrations for non-NTEP grains could be installed on the meter at the discretion of the cognizant regulatory authority. The following wording was proposed:

> Calibrations for commodities not listed on pages nn through nn of this Certificate may be used on this device at the discretion of the regulatory body having authority over the device.

[Note: Additional discussion on the use of non-NTEP calibrations can be found under agenda item 2 of this summary.]

In further discussion, one manufacturer asked if calibrations which had been developed with samples up to 18% moisture but validated with samples up to 23% could be extended to 23%. Although no formal vote was taken on this question, no objections were voiced to allowing the calibration to be approved to the higher limit it verified by Phase 11 testing.

Dr. Charles Hurburgh questioned the need for listing all the calibration constants on the CC. Weights and Measures representatives favored listing calibration constants as an aid to field inspection for verifying that the correct calibration has been installed, even in cases where listing all coefficients for multi-variant instruments might result in a list of 100 or more terms for each grain. The Sector agreed that all calibration constants should be listed on the CC.

The matter of timing for submission of instruments to the lab for type evaluation was also discussed. In order to obtain meaningful comparative performance data and to provide the same data base for calibration adjustments, it is essential that meters participate in Phase 11 for the full season of data collection. The Sector had previously agreed that meters would not be introduced into Phase 11 in mid-season. With this in mind, manufacturers had requested the NTEP lab to establish deadlines, for the submission of instruments, which would allow the type evaluation process to be completed in sufficient time to permit the device to participate in Phase 11 for the following harvest season. The following deadlines were agreed upon:

Submission of Applications	no later than January 1
Delivery of Instruments to the NTEP lab	no later than February 1
Successful completion of Testing	no later than April 30

5. Certificate of Compliance Renewals - Timing

The Sector had previously decided that Certificates of Conformance (CC) for Grain Moisture Meters would have to be re-issued each year following completion of Phase 11 Testing (National Calibration Review). The timing and manner in which the re-issuing would take place were discussed. Tom O'Connor, National Grain and Feed Association, expressed concern over the potential economic impact of calibration changes on the value of grain stocks. From the grain industry's view point, changes should be made just before harvest, when stocks are minimized. It was pointed out that changes in moisture calibrations, unlike changes in protein calibrations, would be subtle (in the range of a few tenths of a percent moisture) and that the overall economic impact of moisture calibration changes would be negligible. The Sector discussed the desirability of simultaneously changing both moisture and protein callibrations and agreed that CCs for Moisture Meters and Protein Analyzers should be re-issued simultaneously. For instruments which have been NTEP approved for both moisture and protein, simultaneous changes of these calibrations will be less confusing to users and will simplify field inspection.

The issue was raised of how to communicate calibration changes to users. Manufacturer's records of sales may riot represent the present owners of those meters. Meters are sometimes sold through channels which isolate the manufacturer from the ultimate purchaser. In addition, changes in ownership or consolidation of grain elevators may result in meters being transferred to other locations. Don Onwiler, Nebraska Public Service Commission (NPSC), reported that NPSC knew all the moisture meter users in Nebraska and had assumed the responsibility of notifying users when new calibrations were to be installed in their instruments. NPSC sends the user a new seal with a card which the user is to return when the new calibration has been installed. Although meters in Nebraska are field inspected annually, because of the large number of meters involved, inspection of some meters may not take place until after harvest.

The Sector -agreed that the responsibility ultimately lies with the owner to see that his instrument is updated when required. It was suggested that announcing calibration changes on the same date each year would accustom users to expect to receive the information by that date and would lead them to take action to find the information if they had not received it. A fixed date for announcement would also facilitate publicizing, through grain trade magazines, the need for owners to be aware of potential changes and to contact their manufacturer or sales agent for details. Additional details could be announced through various grain industry newsletters which have shorter lead times for publication. It was also suggested that a notice could be published in the NCWM newsletter *Weights and Measures Today" to remind users and the Weights and Measures community that calibrations must be updated by a certain date.

A date of May 1 was proposed as a target date for announcing changes. One Sector member asked if this date could be pushed earlier by two weeks to allow more time to get calibration data out to states in the south where wheat harvest can start as early as mid-May. Tina Butcher, NIST, mentioned that NIST would need at least two weeks to re-issue CCs once the information for new calibrations was in NIST's hands. It was suggested that once new calibration information was verified by the NTEP laboratory, manufacturers could make a preliminary release of the information to States and interested parties. The effective date of all changes would be May 1. Enforcement could be based on the manufacturers' preliminary release until CCs could be formally re-issued. This is not significantly different from the way states now receive information from manufacturers for enforcement. Rich Pierce, speaking for the NTEP lab, suggested that a desirable goal would be to distribute data to the manufacturers prior to the Sector's late March meeting. This would allow the Sector to take action on any questionable calibration issues, and would give manufacturers time to submit revised calibrations to the NTEP lab for release as soon as possible prior to the May 1 effective date. Rich Pierce cautioned that achievement of this goal was contingent upon the GIPSA Moisture Lab being able to complete their compilation of the data earlier than has been done in the past.

Tina Butcher, NIST, reviewed the costs to manufacturers for NTEP certificate preparation, Processing, and distribution. Cost breakdowns vary somewhat depending on whether the draft CC is prepared by the NTEP Lab or by NIST. In most Cases (except for company name changes, addition of a new feature or model not requiring testing) moisture meter Draft CCs will be prepared by the Participating Lab. A typical fee for NIST preparation of the-draft CC is $250. Fees charged by Participating Labs (other than NIST) will vary. Added to the draft preparation fee is NIST's fee for processing and distribution which is $300. For other devices, manufacturers pay an annual maintenance fee of $100 per CC to keep the CC in "Active" status. This fee is assessed in the Fall of each year. If a manufacturer discontinues a model, the maintenance

fee is no longer paid and the CC becomes "Inactive.' This re-classification does not affect devices already in use, but it does indicate that the manufacturer will no longer make that model for commercial use. It does not seem appropriate for moisture meter manufacturers to pay the $100 annual maintenance fee since they will be paying $550 to have certificates re-issued each year. The NTEP Board of Governors will be asked to rule on this matter. A complicating factor is the fact that under present policy the $100 maintenance fee goes to NCWM for use in promoting and supporting NCWM programs while the $550 re-issuing fee goes to NIST to recover actual costs of re-issuing CCs. (NCWM anticipates an income of $105,000 from maintenance fees for FY95.)

6. Update on Establishment of Pivot Labs for Oven Moisture Standardization

Under the NTEP program for grain moisture meters, calibrations will be based on FGIS air ovens and field inspection will be 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 FGIS air oven which is considered the standard. The air oven method is an empirical test which may have to be adjusted to account for differences of altitude or other differences between laboratories. Tina Butcher reported that NIST presently did not have the resources to set up and monitor a network of state regional "pivot" laboratories for interlaboratory comparisons of oven moistures. The Sector discussed several alternatives. One alternative proposed that individual labs independently send samples to GIPSA (FGIS) for oven analysis. Data could be compiled to show how individual lab results differed from GIPSA (FGIS) results. A second alternative was a more structured collaborative study where every lab, including GIPSA WGIS) would measure the same sample. Cassie Eigenmann, DICKEY-john Corp., suggested that if states could provide the samples, manufacturers might be willing to contribute a nominal annual fee to cover administrative costs associated with compiling the data for the collaborative study. A subcommittee was formed to develop a structured program for interlaboratory comparisons. Dr Charles Hurburgh (Iowa State University) will chair the subcommittee which will develop detailed plans for review by the Sector within the next 3 or 4 months. Other subcommittee members include: Cassie Eigenmann (DICKEY-john Corp.), Joe Rothleder (California Department of Food and Agriculture, Division of Measurement Standards), Cheryl Tew (North Carolina Dept. of Agriculture, Standards Division), and Cliff Watson (Consultant).

7. Collection of Objective Evidence of Grain Moisture Program's Benefits

At the Sector's September 1994 meeting, Joe Rothleder suggested that 'selling the program in the future would be easier if objective evidence of the program's benefits could be provided. Toward that end, he suggested that states collect data, on a formal basis, comparing results of different meter models on the same samples. This data would provide a measure of uniformity which would indicate over time if the program is improving the situation. Although not based on direct comparison of different meter models using the same samples, field test data has been collected on different meter models in North Carolina using carefully controlled grain samples. Cheryl Tew, described the manner in which grain samples were prepared, tested, and used in field-testing meters in North Carolina and presented a sample of the data collected (see attachment 3). The Sector considered the methods used in North Carolina as a possible basis for collecting similar data to provide a measure of the NTEP grain program's effectiveness over time. Don Onwiler remarked that each state administered its moisture meter program in a different way, preparing samples and collecting data differently. He suggested that states focus on getting oven results in closer agreement and monitor their own envelope of meter to meter differences as the program evolves. Chairman Lowell Hill pointed out that the objective of the NTEP Moisture Meter Program was to bring interstate and intermeter comparisons closer together. A baseline would be needed to see if these objectives were being realized. The task of defining a program to compile data to describe the overall accuracy and precision of U.S. moisture measurements before and after the institution of the NTEP program was assigned to the subcommittee already formed to develop an oven moisture collaborative study (see agenda item 6).

8. Update on Publication 14

Tina Butcher reported that changes to the Liquid Measuring Devices section had delayed release of the 1995 edition of NCWM Publication 14. It is now expected to be sent to the printer by late May. After publication, copies of the complete publication will be available to NCWM members at a cost of $15-00 each ($32.00 each to non-members). Individual check lists will be available a lesser cost.

9. Addition of Test Procedure Details to Publication 14

The Grain Moisture Meter Check List in Publication 14 outlines test requirements but does not spell out step-by-step procedures nor list equipment required for each test. Experience gained by the NTEP Laboratory indicates that test protocol can affect test results. To provide manufacturers with this information the Sector agreed to add detailed test procedures to Publication 14 for the following tests:

Power Supply
Storage Temperature
Leveling
  for Models without Level Indicators
  for Models with Level Indicators
Warm-up Time
Humidity

Instrument Stability
Instrument Temperature Sensitivity
Sample Temperature Sensitivity
Accuracy, Precision and Reproducibility

These test procedures (see attachment 4) , will be added as a separate section at the end of the Grain Moisture Meter Check List. The Sector recommended that the section be prefaced by the note:

> Note: Although the following test procedures are the preferred procedures, the Participating NTEP Laboratory may at its discretion modify the order and sequence of the these tests when specific circumstances or device performance indicate.

A discrepancy was noted between the test procedure for Storage Temperature and the Checklist paragraph headed **Storage Temperature**. During NTEP testing it was determined that the maximum practical rate of temperature change was less than 40 *C per hour. The Sector agreed that the first paragraph under **Storage Temperature** should be modified accordingly. The changes are shown below:

> A single HRW wheat sample (1 2-14% moisture content) is analyzed 10 times at room temperature prior to temperature cycling. The instrument is then powered down and placed in the environmental chamber. The chamber temperature is then increased to 55 °C over a 1 hour period, and maintained at that temperature for 3 hours. Chamber temperature is then decreased to -20 °C over a + 2 hour period, and maintained at that temperature for 3 hours. Repeat the temperature cycle allowing 2 hours for the transitions from -20 °C to 55 °C and from 55 °C to -20 °C, Soak time. at temperature extremes. is 3 hours. Allow 1 hour for the final transition from -20 °C to room temperature. After letting the instrument equilibrate to room temperature for at least 12 hours, the instrument is turned on for the specified warm-up period and the test sample analyzed 10 more times.

10. Operating Temperature Range and Temperature Range Marking on Devices

Discussion At the Sector meeting in September, questions were raised regarding the requirement for marking the operating range on the device (if other than 10 °C to 30 °C) as specified by Code Paragraph S.1.10.(c). The requirement for marking does not appear in the NIR Code. Some have suggested that the Sector did not intend to require marking of the temperature range on the device if the device did not display of record any usable values until the operating temperature necessary for accurate determination had been obtained. The necessity for marking the operating range on the device would seem to be superfluous if the meter cannot display a moisture value and must display an error message when the temperature of the meter is outside its specified operating range.

Changes had been proposed to modify paragraph **S.1.10 Operating Temperature** to eliminate the requirement for marking the operating range on the device and to clarify that sub paragraph (a) applied to the warm-up period. Because no action could be taken on this issue at the up-coming Annual Meeting of the Conference, the Sector decided that action on this item could be deferred until the Sector's September meeting at which time additional changes might have to be considered if the Conference should take action to delete retroactive dates from the Moisture Meter Code.

Relating to the issue of maximum permissible temperature difference between meter and grain, Chairman Hill presented a letter which he had received from Sid Colbrook, Illinois Weights and Measures. Mr. Colbrook expressed concern that

the temperature differences for which some meters were NTEP approved would lead to occasions when a moisture determination could not be made before the producer left the buying facility. He proposed several remedies, including increasing the accuracy tolerance for wider temperature differences between grain and the device. (See attachment 5 for Mr. Colbrook's letter and Chairman Hill's reply.)

The H44 Code applicable to NTEP meters states:

> The maximum allowable difference in temperature between the meter and the sample for which an accurate moisture determination can be made shall be specified. The minimum temperature difference shall be 10 °C. No moisture value may be displayed when the maximum allowable temperature difference is exceeded. An appropriate error message shall be displayed when the difference in temperature between the meter and the sample exceeds the specified difference.

At least two manufacturers have submitted meters for NTEP evaluation specifying a minimum required temperature difference of 10 °C. [Another manufacturer has submitted a meter specifying an 18 °C temperature difference.) The grain trade is now saying that a 10 °C difference is too restrictive and will result in delays at the receiving elevator. A minimum range of 20 °C was proposed.

It was suggested that the Sector might consider one of the following options to address this concern:

1) reconsider the requirement for blanking the display when the maximum allowable temperature difference is exceeded

or 2) increase the accuracy tolerance for temperature differences greater than 10 °C

Rich Pierce pointed out that the code did not restrict devices to a 10 °C difference. This was merely a minimum requirement. He presented data (see attachment 6), for hot and cold samples, showing the average (for five instruments tested) of the absolute magnitude of moisture errors. The data seemed to indicate the potential for increasing the temperature difference within the present accuracy tolerance. He opposed any increase in the accuracy tolerance.

Several Sector members expressed the opinion that the market would settle this matter. If the demand for a wider temperature difference capability was real, potential buyers would seek out the meter offering the widest range, Once apprised of this demand, manufacturers would make every effort to qualify to the widest range possible.

If a manufacturer has been approved for the 10 °C range, this will be listed on the CC. Manufacturers have the option of re-submitting their meters for re-testing for sample temperature sensitivity. Additional tests may be required if calibrations have been modified to meet tolerances over the expanded range. The amount of additional testing required will depend on the nature of any changes made by the manufacturer since the initial approval.

Although the data presented by the NTEP laboratory seemed to indicate that some meters may be capable of meeting the present accuracy limits for temperature differences greater than 10 °C, manufacturers were reluctant to agree to wider limits without the benefit of further testing of their instruments. Since any proposed changes in H44 could not be considered until 1996, the Sector decided to postpone further action on this item until the September meeting. This subject will be an agenda item for the Sector's September meeting at which time manufacturers are expected to have accumulated sufficient information to make specific recommendations.

11. Devices Withdrawn from Phase II Testing

The Sector has previously agreed that participation in an on-going calibration review and maintenance program (Phase 11 Testing) would be mandatory for maintaining a valid CC for a type approved model. For the first five years of Phase 11 Testing, manufacturers are required to pay $3500 per model per year to remain in the program. Concern has been expressed over what happens should a manufacturer, for any reason, withdraw a meter from Phase 11 Testing and allow a CC to lapse.

Manufacturers agreed that the likelihood was very remote that they would withdraw from Phase 11 during the first five years of the program. The cost to a manufacturer for remaining in the program for that period was small in comparison to

the cost of developing an NTEP meter and obtaining an NTEP CC. It was the general belief of the Sector that the program will demonstrate its benefits, and that once benefits are demonstrated, funding will be found to continue the program.

Manufacturers were unanimous in objecting to the proposal that manufacturers be required to post a performance bond to guarantee that they will support Phase 11 testing for a given period of time. It was pointed out that with the purchase of any product there was a risk that the manufacturer will discontinue the product.

12. Outliers In Type Evaluation Data

Grain Moisture Meters provide a moisture measurement by indirect means. That is to say, moisture is not measured directly. Rather, some other properties of the grain mass are measured and the moisture value is predicted by an assumed functional relationship between moisture and the properties measured. For instruments which measure indirectly, it is not unusual to see an occasional 'outlier' data point when comparing instrument results against the standard method. An ‘outlier' is a data point that does not represent the population of data the instrument is likely to see in operating practice. Although Publication 14 lists three criteria for screening samples and removing outliers for the accuracy and reproducibility test, Dr. Charles R. Hurburgh, Jr., Iowa State University, suggested that the NTEP program would best be served by general rules for outlier identification with judgment interpretation allowed based on knowledge of the samples and procedures. The Sector reviewed the guidelines (shown below) which Dr. Hurburgh had proposed for addition to the Grain Moisture Meter Check List for identification of 'outliers' in a regulatory setting.

(a) A complete background (origin, variety, general condition, U.S. grade) of every sample used in the Type Approval process should be known.
(b) Where the specification is applied to the results of 20 samples or less (e.g. tolerances within a 2% moisture interval), all residuals (difference from reference) that are more than one SDD from their closest neighbor should be examined as possible outliers. If removal of one sample causes the SDD to fall by more than 25%, examine the sample as a possible outlier.
(d) Data should be monitored as it is being taken so that suspect samples can be repeated. A true outlier will be repeatable in its performance.
(e) For every test sequence, data on the Official meter should be taken so that the reference data error can be checked. Presumably, if two different devices agree there is a greater chance that the reference value is in error.
M Any sample (within a 2% moisture interval) not within three SDD of the mean (after exclusion of the sample form the calculation of SDD) for the test meter should be examined for possible exclusion from the results.
(g) Automatic deletions based on the Official meter result should not occur.
(h) The outlier guidelines should apply to all but the Basic Instrument Tests.

Rich Pierce pointed out that any test which causes an instrument to fail an NTEP test is cause for the lab to examine the results. If other instruments are not having problems with that same sample, the lab is not inclined to throw out the result. The dilemma with discarding results is that if enough results are thrown out, all instruments will pass. The NTEP lab attempts to determine if outliers are related to instrument problems, to calibration problems, or to 'bad" samples. In the recent round of testing performed by the NTEP lab, only 2 samples were considered as possible outliers, and one of these samples was thrown out. Most of the other problems which might have been considered due to outliers have been addressable by calibration changes.

The Sector decided that although Dr. Hurburgh's guidelines might be useful in helping the NTEP lab evaluate test results, these guidelines should not be added to the Grain Moisture Meter Check List.

13. Promotion of NTEP

Discussion: In earlier meetings, several Sector members have expressed concern that several grain producing states do not have a viable field inspection program for grain moisture meters and have not become NTEP states. At least one national grain organization and a producer organization have suggested they might be willing to urge their state or local chapters to lobby legislatures in non-NTEP states to promote the benefits of NTEP and field inspection of moisture meters. It has been suggested that these efforts would be more effective if an information packet were available which pointed out the

benefits of becoming an NTEP state, and which further explained the benefits of state regulatory programs for grain moisture meters.

The Sector agreed that a brochure and a detailed information packet which promoted the programs benefits would be useful in promoting the NTEP Grain Moisture Meter Program. Don Onwiler, Nebraska Public Service Commission, expressed the opinion that peer influence within the Weights and Measures community was also effective in enlisting acceptance of state moisture programs.

Tina Butcher informed the Sector that NIST did not have personnel who could be assigned the task of preparing an informational packet or brochure. She agreed to look into three alternatives for the development of a brochure:

1 . The availability of NIST funds to engage the services of an outside contractor
2. Possible use of NCWM funds for preparation or printing of a brochure
3. Possible use of a portion of NTEP maintenance fees which have been earmarked for a promotion"

It was also suggested that after each meeting, press releases might be sent out to grain trade magazines summarizing the important decisions made by the Sector.

Jack Barber, Sector Technical Advisor, and Cliff Watson, consultant, agreed to meet with Tina Butcher following the Sector meeting to discuss what kind of information should be presented in a detailed information packet and a brochure. Jack agreed to shepherd the collection of already existing information which might be useful in preparing the packet and the brochure. Sector members having such information are asked to mail it to:

Jack Barber
FIR 1, Box 309
Glenarm, IL 62536

Of special interest is information which addresses the following questions:

what benefits have resulted from your state's grain moisture meter program?
what data is available to show the effectiveness of the program in your state? (e.g. what % of meters were rejected the first year you had a program? What is the present % of meters rejected annually?)
What is the annual net cost of your moisture meter field inspection program (gross costs less fees collected)
what is the annual fee charged users for meter inspection? for re-inspection if the meter fails the first time?
what are the questions most frequently asked by your weights and measures peers in states not field inspecting meters at the present?
can you suggest the names (addresses and phone numbers) of users who will give a testimonial of the benefits of your field inspection program to them? (or can you furnish user testimonials you have heard?)
how have you promoted your state's moisture meter program?

14. Software Issue

Note: This issue is also of interest to the Near Infrared Grain Analyzer Sector and was discussed in joint session of the two Sectors.

Background: Most electronic weighing and measuring devices utilize software as the means for performing basic device functions. NTEP has seen a wide range of capabilities in software-based equipment including devices which use software programmed by the manufacturer and which is not intended to be modified by the user; devices which offer a menu of options from which the user can select (user-configurable software); and devices using software which can be modified by the user to meet their specific needs (user-programmable software).

At one time, NTEP only issued Certificates of Conformance for complete devices. However, manufacturers wanted the flexibility of 'mixing and matching" components of systems such as indicating elements and weighing elements or

indicating elements and meters with their and other manufacturer's components. A similar approach was taken with software used in electronic equipment. For example, NTEP initially evaluated electronic cash registers as complete systems and issued CCs to cover both the hardware and the software used in the system, but manufacturers eventually requested separate CCs for the software used in these systems. This gives the manufacturer the flexibility to offer software which can be installed on compatible hardware already owned by the device user. These CCs may be issued to the manufacturer of the hardware on which the software is typically installed or to a company which simply writes the software (sometimes referred to as *third party software") and offers it for use on compatible hardware. For personal computer-based systems, the approach of issuing CCs for the software gives the user the flexibility of using existing equipment (which may already be used in other business functions) to interface with and control weighing and measuring equipment.

How Software is Evaluated: Questions have been raised about the criteria that should be applied to evaluations of software during an NTEP evaluation. In the past, NTETC has discussed whether or not a separate checklist is needed to evaluate software. NTETC determined that a separate set of criteria is not needed; evaluation of the software is intended to determine whether or not a device using the software would operationally comply with the applicable requirements of Handbook 44. Software controls the functioning of an electronic device; whether evaluating a complete device or evaluating software alone, the operation of the software is evaluated to determine if the device can operate as specified by Handbook 44. NTEP uses the same checklist to evaluate software used to control or operate a device as it uses to evaluate a complete device of the same type.

At the NCWM Interim Meeting, the BOG agreed to the following:

a. NTEP will continue to evaluate stand-alone software following the same procedures used to evaluate software which is part of a measuring or weighing system. NTEP will generally evaluate equipment to the first indicated or recorded representation of the final quantity on which the transaction is based.

b. The Board of Governors endorses the establishment of a software work group, composed or volunteers from weighing, measuring, grain, and other sectors as well as participants from the NTEP Participating Laboratories, the S&T Committee, and Canada.

Both Grain Sectors discussed the relevance of this issue to Grain Moisture Testers and Near Infrared Grain Analyzers and decided that anything beyond the RS-232 port of a grain device is beyond the scope of the Sectors. The Sectors did not foresee the need to address this issue further at this time.

15. Choosing a Date and Site for the Next Meeting

The Sectors agreed to a two-day meeting (one day for the Grain Moisture Meter Sector and one day for the NIR Protein Sector) to be held September 13 and 14 in Des Moines, IA.

National Type Evaluation Technical Committee
Near Infrared Grain Analyzer Sector
Meeting Summary
March 28 – 29, 1995, Baltimore, MD

Agenda Items

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1. Software Issue

Note: This issue was discussed by both the Grain Moisture Meter Sector and the Near Infrared Grain Analyzer Sector in joint session. See Grain Moisture Meter Sector Meeting Summary, Agenda Item 14 for details.

2. Report on NCWM Interim Meeting

The NCWM Interim Meeting was held January 8-12. 1995 in Costa Mesa, CA. Tina Butcher, NIST, reported on action taken on issues relating to NIR Grain Analyzers by the Specifications and Tolerances (S&T) Committee at that meeting:

357-1 **UR.2.8 Calibration Adjustments and 8.2.5.1. Calibration Transfer.** The S&T Committee supports the Sector's recommended changes to these paragraphs which eliminate references to user slope adjustments and more explicitly describe the information which the user must keep to justify calibration adjustments. This item will be put forth for vote at the Annual Meeting.

3. Update on National Type Evaluation Testing Schedule

The certification of the Grain Inspection, Processors and Stockyards Administration (GIPSA, formerly FGIS) as the NTEP laboratory for Near Infrared Grain Analyzers has been delayed. Tina Butcher reported that NIST expected to have the Lab Criteria document ready for distribution by mid April. Once the criteria document has been distributed, the prospective lab must prepare and submit an application (which must address the criteria) before it can be certified. Given these requirements, Dr. Richard Pierce, GIPSA, estimated that testing would not begin before July 1. In the event of conflicts between NIR testing and the grain moisture meter programs, he stated that priority would be given to moisture meter programs.

Dr. Pierce requested that NIST send manufacturers a questionnaire to ascertain how many instrument models of each type (whole grain ground grain) might be submitted for testing for the coming season, so the proposed lab could estimate the anticipated work load.

He is also interested in learning how many manufacturers might be interested in up front (prior to type evaluation) calibration development services which would involve collecting data on approximately 100 samples per wheat class plus an additional 50 sample validation set. The cost of this service would depend on the number of replicates used for the standard method and on the number of instrument models submitted simultaneously. A ball park worst case estimate of total cost for this service is $10,050.

One Sector member asked if some of the samples from Phase 11 of the moisture program could also be analyzed for protein and used to check the robustness of a calibration. Dr. Pierce pointed out that the calibration and validation samples were a known quantity representing a five year period of crop history. One manufacturer asked if manufacturers could submit samples to supplement those in the GIPSA calibration and validation set. Dr. Pierce indicated that manufacturers could submit their own samples for analysis as part of the up front calibration/standardization effort. Additional questions were raised regarding collection of optical data on samples conditioned to specified temperatures. At that point, the Sector agreed that the Sector meeting was not the place to discuss the specific calibration requirements of individual manufacturers. Dr. Pierce offered to develop a form on which manufacturers could indicate specific calibration requirements, including submitting their own selected sample set and getting temperature data on some samples. He proposed that the form should be an attachment to the application for NTEP testing. Details of any calibration/standardization activities would be handled as proprietary information. Data on manufacturer supplied samples would be provided only to the manufacturer submitting the samples.

4. Update on Publication 14

The Publication 14 Checklist for Near Infrared Grain Analyzers is still in draft form and will not be included in the 1995 edition of NCWM Publication 14 which should be submitted for printing by the end of May. A draft copy of the NIR Checklist was distributed to Sector members. Jack Barber, Sector Technical Advisor, requested that Sector members review the draft and forward comments to him no later than August 1 so they could be included in the agenda for the September meeting.

5. Certificates of Conformance Issued while Code is Tentative

The Handbook 44 Code for Near-infrared Grain Analyzers has been adopted by NCWM as Tentative Code with only trial or experimental status. It is not intended to be enforced. Manufacturers, however, may submit instruments for type evaluation as soon as an NTEP laboratory is certified. CCs would state the criteria used for type evaluation (e.g. NIST Handbook H-44, 1995). Some retesting or modifications to the device might be required should the code be changed subsequent to the issuing of a CC.

The question was raised as to how long the code could be expected to remain tentative. It was noted that a period of three to five years was typical. One member asked if it would be possible for manufacturers to request adoption on an accelerated basis. It was pointed out that any NCWM member could present an issue to the S&T Committee for consideration at the next Interim meeting. Even then, the earliest the Conference could take action would be at the 1996 Annual Meeting.

One of the purposes of the period of tentative code is to allow the Weights and Measures (W&M) community to develop enforcement procedures and to train personnel. It was suggested that it would be helpful to all Sector members if manufacturers, at some future meeting, could demonstrate their instruments, explain how they work, and show how they have addressed the code requirements for security sealing. Dr. Charles Hurburgh, Iowa State University, asked if W&M Officials would be interested in a 1-1 /2 to 2 training seminar on NIR. There was general agreement among those W&M members present that such a seminar would be welcomed if travel funds were available.

6. Publication 14 Change - Warm-up rime Test

Discussion: The present Publication 14 test procedure for Warm-up Time calls for 10 replicate analyses at the end of the specified warm-up interval, followed by another 10 analyses of the same sample one hour later. The NTEP laboratory has pointed out that analyzing a sample 10 times may take 20 to 30 minutes on some instruments. The intent of this test is to verify that an instrument will produce stable measurements after waiting the manufacturer's specified warm-up time. The NTEP laboratory believes that establishing a reference baseline based on measurements taken over a 20 to 30 minute period defeats the intended purpose of the test. The Warm-up Test for Grain Moisture Meters has already been modified to require only 5 replicates each time.

The Sector accepted the proposal to change the NIR Checklist to reduce the number of replicate analyses required in the Warm-up Test from 10 to 5 for each of the two test times. (The maximum allowable bias shift will remain at 0. 10 for the average of 5 readings.)

7. Availability of Standard Slope Samples (SSS) and Standard Reference Samples (SRS)

At a previous Sector meeting, manufacturing representatives asked Dr. Pierce to check into the possibility of GIPSA (formerly FGIS) making SSS available to manufacturers seeking NTEP approval. It has been determined that SSS will not

be available outside GIPSA. Dr. Pierce explained that GIPSA had very limited quantities of SSS and that their concern f or maintaining the integrity of SSS sets precluded supplying them to manufacturers, even on a loan basis. With regard to SRS, Dr. Pierce said that it was probably unworkable for GIPSA to provide SRS nationally. He suggested that reference readings for customer supplied SRS might be provided by a GIPSA field office or other GIPSA licensed inspection station. The question of traceability to the master instruments in Kansas City was raised. Dr. Pierce offered to consult with NIST on the issue of traceability. Another Sector member suggested that the traceability issue would be moot if GIPSA would agree to test (for a fee) customer provided SRS on the master instruments.

8. Phase 11 Testing - On-going Calibration Review

It is likely that the full cost of any on-going calibration review and maintenance program for NIR protein analyzers will have to be underwritten by manufacturers. To give manufacturers an idea of what such a program might cost, Dr. Pierce presented the following estimate of costs associated with the collection of data on approximately 100 wheat samples per class per year for six classes of wheat.

Sample Source:	GIPSA Protein Monitoring. Program (80 per class)	
	GIPSA Moisture Survey (20 per class)	
Shared Costs:	(100 samples per class)	
	Sample selection and preparation	$3,000
	Option 1 - Single CNA protein analysis	4,400
	Option 2 - (protein analysis on 3 CNA analyzers)	8,800
Instrument Analyses:	(600 samples, 1 scan on each of 2 instruments, +data analysis)	
	Whole grain instrument	$1,250
	Ground grain instrument (Udy grinder)	1,250
	Ground grain instrument (other grinder)	2,250

Estimated Total Costs:

	CNA option 1	CNA option 2
2 models in the program	$4,950	$7,150
4 models in the program	3,100	4,200
6 models in the program	2,500	3,200
8 models in the program	2,175	2,725

(note: CNA = combustion nitrogen analysis method of protein determination)

After reviewing the above costs, manufacturers questioned why they should be charged for CNA analyses if GIPSA is already collecting CNA data on a pool of samples in connection with their own monitoring program. Dr. Pierce explained that GIPSA has not collected data on 100 samples per class per year on a regular basis. The GIPSA procedures for monitoring NIR calibrations and selecting calibration samples are undergoing continuous improvement, and he could not say that GIPSA will continue to monitor on this basis for the next five years.

Several suggestions were put forth regarding what might constitute an adequate sample set for calibration review or monitoring purposes. It was generally agreed that no more than 100 samples per year per class would be required. The difficulty of obtaining 100 acceptable samples for some of the minor classes was recognized. Cliff Watson, consultant, suggested that data be collected on the two major classes of wheat (Hard Red Winter and Hard Red Spring wheat) twice each year with half the samples of each class representing new crop obtained as close as possible to harvest so potential new crop problems could be detected. Some questioned whether sufficient new crop samples could be measured and analyzed in time to detect calibration problems with the new crop, especially if the problems were local in nature. Most agreed that the grain trade would let manufacturers know immediately if there were any problems. The Sector decided that the problem of capturing new crop problems in local areas would be up to the manufacturer to address.

In the absence of definitive GIPSA guidelines for determining when they will change calibrations on an official instrument, the Sector decided that the accuracy limits used for NTEP approval should also apply to the annual review of NTEP calibrations. This would not preclude manufacturers making annual adjustments to NTEP calibrations if they could demonstrate that the changes reduced the difference between their instrument and the GIPSA master instruments. The

Sector also recommended that should GIPSA decide to issue a now calibration for their official instruments, data on the same set of samples used to calibrate the GIPSA instruments should be collected on the NTEP instruments and made available to manufacturers (along with CNA data on those same samples).

Grain Moisture Meter Sector and Near Infrared Grain Analyzer Sector Meetings
March 27-29, 1995 Baltimore, MID

Meeting Attendees

Name	**Affiliation**	**Moisture Meter Sector**	**NIR Analyzer Sector**
Jack Barber	JB Associates	x	x
Lowell Hill	University. of Illinois	x	x
Pontus Nobreus	Perstorp Analytical	x	x
Allison Pflug	CSC Scientific Co.	x	
Michael van der Matten	Perstorp Analytical	x	
Jeff Martin	Steinlite Corporation	x	
Don Onwiler	Nebraska Public Service Commission	x	x
Randy Burns	Arkansas Bureau of Standards	x	x
Cheryl Tew	NC Dept. of Agriculture-Standards Div	x	x
Ole Rasmussen	Foss Food Technology	x	x
Rich Flaugh	GSF Inc	x	x
Cassie Eigenmann	DICKEY-john Corp.	x	x
Connie Brown	DICKEY-john Corp.	x	x
Tom Runyon	Seedburo Corporation	x	
Cliff Watson	Consultant	x	x
Mark Harms	Bran + Luebbe	x	x
Mehran "Ron" Alemi	Maryland Weights & Measures	x	x
Tina Butcher	Nat'l Institute of Stcls & Technology	x	x
Richard Pierce	Federal Grain Inspection Service	x	x
Tom O'Connor	National Grain & Feed Association	(Monday)	
Joe Rothleder	Calif. Dept. of Food & Agriculture	x	x
Charles R. Hurburgh, Jr.	Iowa State University	x	x
Richard W. Wotthlie	State of Maryland-Weights & Measures	(Tuesday)	(Tuesday)
Don Muller	Bran + Luebbe		x
Stuart Wrenn	Zeltex, Inc.		x
Chuck Lowden	Foss Food Technology		x
Allen Butler	Perten Instruments		x

National Type Evaluation Technical Committee
Grain Moisture Meter Sector
Meeting Summary
September 13 – 14, 1995 Des Moines, IA

Agenda Items

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1. Report on NCWM Annual Meeting

The NCWM Annual Meeting was held July 16-20, 1995 in Portland, ME. The conference adopted the following proposals by majority vote of both the House of State Representatives and the House of Delegates:

356-1 **Elimination of Retroactive Dates from the Grain Moisture Meters Code.** This item had been proposed by the Central Weights and Measures Association and endorsed by the Sector at its September 1994 meeting. (A more complete discussion of this issue can be found in Publication 16, NCWM Annual Meeting Program & Committee Reports.)

Note: The Sector notes that with retroactive dates removed, the Code is very hard to interpret and seems to contain contradictory requirements in many areas. It was generally agreed that even with editorial "patches" to these areas, the resulting code would be very confusing and difficult to interpret properly. The Sector suggests that the code be re-organized into two sections, one applicable to Meters placed in service before January 1, 1998 (other than those certified as meeting NTEP requirements), and another applicable to NTEP meters and to all other meters placed in service after January 1, 1998. The Sector requests the S&T Committee to consider approving such re-organization as an editorial change not requiring action by the Conference. The Sector further requests that a draft of the re-organized code be submitted to the Sector for review before it is published.

356-2 **S.1.2.2.(g) Digital Indications and Recording Elements (new paragraph).** This item was the Sector's recommendation which requires multi-constituent meters to display and record constituent labels.

356-3 **S.2.3. Provision for Sealing**. This item was first proposed by the Sector at its March 1994 meeting and subsequently modified by the Sector at its March 1995 meeting to explicitly state that the device is not required to display audit trail information. The Standards and Tolerances Committee accepted the modified wording as an "editorial" change allowing the proposal to be presented to the Conference for vote in the following form:

S.2.3. Provision for Sealing

(a) Provision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., audit trail available at the time of inspection as defined in part (b)), before any change that affects the metrological integrity of the device can be made to any mechanism.

(b) If the operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc.) in normal operation, the device shall use an audit trail. The minimum form of the audit trail shall be an event logger and shall include:

- An event counter (000 to 999)
- the parameter ID,
- the date and time of the change, and
- the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number is to be used rather than the calibration constants.)

The device is not required to display this information, but a printed copy of the information must be available through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)

2. NTEP Policy: Examples of Appropriate Use of the NTEP Logo

Policy for the use of the NTEP name and logo is needed to protect the integrity of NTEP and to eliminate false or misleading advertising that implies NTEP certification. Mettler-Toledo had proposed specific wording for descriptive text to accompany the logo in advertising for Truck Scales, Floor Scales, Weight Indicating Elements, and Load Cells. At the recent Annual Meeting, the NTEP Board of Governors (BOG) presented this issue as an "informational" item, not requiring formal action by the Conference, with the recommendation that the examples be printed as an appendix to Part I (Administrative Policies and Procedures) of Publication 14.

The Grain Moisture Meter Sector and the Gas Pump Manufacturers Association (GPMA) suggested that similar examples of appropriate wording are needed to accompany the logo in advertising for Grain Moisture Meters and Gas Pumps. The BOG announced its intention to make this issue a voting item next year and said it would consider the concerns raised by GPMA and the Grain Moisture Sector.

The Sector endorsed the following wording for Grain Moisture Meter advertising noting the comment of one member who expressed concern that there might not be sufficient room in a small advertisement for all the suggested wording and a list of approved grains.

<u>Grain Moisture Meter</u>
The [Model XXXX] meets or exceeds the accuracy and performance requirements for Grain Moisture Meters as detailed in National Institute of Standards and Technology (NIST) Handbook 44. A Certificate of Conformance, Number XX-XXX, was issued under the National Type Evaluation Program (NTEP) of the National Conference on Weights and Measures, approving this model for commercial use on the following grains: (append list of grains for which NTEP approval has been granted for this model.)

Additional concerns were raised regarding advertising claiming, "designed to meet NTEP requirements," for devices which had not been submitted for NTEP testing. Several members also questioned the use of the phrase "Currently registered in the NTEP National Type Evaluation Program" in advertising a device which had been submitted for testing but which had not yet been tested. The Sector decided to forward these concerns to the BOG. Rich Pierce, of the Grain Inspection, Packers and Stockyards Administration/Federal Grain Inspection Service (GIPSA/FGIS), reported that he had seen literature which stated that a meter used "approved NTEP/FGIS calibrations." He pointed out that although GIPSA/FGIS was the NTEP laboratory for Grain Moisture Meters, it was inappropriate to infer that NTEP calibrations have FGIS approval or that the instruments have FGIS approval.

3. Update on Type Evaluation and Phase II Testing

An update of the progress on type evaluation activity was provided by Rich Pierce of GIPSA. As of mid-September, type evaluation testing had been completed on five grain moisture meter models and Phase II calibration data was being collected on these five models. Certificate of Conformance (CC) numbers had been issued for four of the five models tested. A test report was being prepared for the fifth instrument. A CC number will be assigned to that unit after NIST has reviewed the test report. Draft CCs have been sent to California for editorial review for two of the five models. Preparation of CCs for two of the remaining models is being held pending review and clarification of calibration names, calibration constants, calibration ranges, and individual instrument biases. A sixth instrument model had been received for NTEP testing late in May,

Sample temperature tests had been conducted to extend the allowable temperature difference between instrument and grain sample for three models. There are now two models certified with allowable temperature differences of 16 EC and two models with temperature differences of 20 EC.

On Phase II testing, Jim Rampton of GIPSA reported that as of September 12, 280 samples had been tested on each of the five NTEP meters and the Motomco 919. Nine grain types were included in these samples: two classes of barley, medium and long grain rice, sorghum, durum, soft white wheat, hard red winter wheat, and soft red winter wheat. A total of 3500 samples have been requested from GIPSA field offices and state agencies. These will be supplemented by high moisture corn samples collected by the Technical Services Division of GIPSA on field trips. Sector Chairman Lowell Hill pointed out that commercial field trials would be a good way to obtain high moisture corn samples of known variety and background. Will Wotthlie, Maryland Weights and Measures, reported that Maryland has received high moisture samples which could be made available for Phase II testing. These are sound samples which, because of their moisture content, are impractical to hold in storage for use in Maryland's moisture meter field testing program. The matter of state participation was discussed. It was noted that state participation in sample collection left something to be desired. Not all states have been supplying the number of samples requested. Diane Lee, NIST/OWM, offered to work with Jim Rampton to draft a letter which could be sent to these states by NIST to encourage the submission of samples.

Charles Hurburgh, Iowa State University, raised the question of proper sample identification. He pointed out that it was important that information regarding a sample's geographic origin and variety be available to assure that calibration sample sets exhibit the diversity necessary to be representative of the full population. Jim Rampton noted that the vast majority of samples were simply collected from marketing channels and that variety and source were not identified. In further discussions on this subject, it was decided that, as a minimum, information regarding the Field Office of origin and sample test weight would be identified for each corn sample. Test Weight, in combination with the location of the Field Office submitting the sample was thought to be a good proxy for variety and growing conditions as far as selecting samples for calibration was concerned. Manufacturers expressed the desire to have this information and any additional information which might be available on the sample.

4. Update on Publication 14

Sample copies of the new edition of NCWM Publication 14 were shown at the NCWM Annual Meeting. The new edition has been sent to the printer for volume reproduction. Diane Lee, NIST OWM, reported that copies of the complete publication are expected to be available for purchase sometime in October. She told the Sector that the

price to NCWM members has now been set at $40.00 each ($60.00 each to non-members). Individual check lists will be available to members at no charge (probably limited to a maximum of three copies per member).

5. Addition of Audit Trail Requirements to the Grain Moisture Meters Checklist in Publication 14

The Sector considered additions to the Grain Moisture Meter Checklist of Publication 14 which had been proposed to reflect the H44 changes approved by the Conference (see Agenda item 1, Section S.2.3. Provision for Sealing). In addition, the Sector considered the addition of several paragraphs to the checklist to address problems discovered by NTEP laboratories while evaluating devices incorporating event loggers (paragraphs 4.1.5, 4.1.8, and 4.1.10. below).

During the discussion of the proposed changes and additions, one Sector member raised the question of the relationship of mechanical and electronic security to the audit trail, pointing out that light sources in NIR instruments were not sealed and that circuit boards could be removed and changed with no record of these actions appearing in the audit trail. It was suggested that these actions were repair actions, and that a mechanical seal of the areas containing replaceable parts would be an appropriate means to alert field inspection to unauthorized tampering with the instrument. Another Sector Member noted that the DRIE (formerly the SIM) in France requires, in addition to a physical seal, that a log book be maintained on-site to record any physical changes which could affect the metrological integrity of the device. Logbook entries must show the registration number of the authorized service technician making the change or repair.

It was suggested that a similar logbook should be required for U.S. grain moisture meters. Don Onwiler, Nebraska Public Service Commission, questioned how enforcement officials would make use of such a log and the motivation of users to keep a log. If users or service personnel neglected making entries, there would be no way of detecting this. The Sector set aside further consideration of repair logs and decided to confine the remainder of the audit trail discussion to matters associated with actions which could be performed by a user in the normal operation of the device. Accordingly, the requirement that an event counter be non-resettable was modified to specify that it be non-resettable by the operator.

It was noted that the checklist for Liquid Measuring Devices did not require that date and time be sealable parameters. The necessity for requiring date and time to be sealable, in Grain Moisture Meters incorporating an audit trail, was questioned. In the ensuing discussion it was pointed out that even with an event counter, a user could continue to use an old calibration well past the date at which a new calibration was to become effective; then, by altering the date, could change the calibration and make it appear that the change had been made at the proper time. With date and time not sealable, there would be no record of the date alterations on the audit trail. The Sector subsequently agreed that date and time should be considered sealable parameters and requested the Technical Advisor to add wording to that effect to the checklist either as a note to item 4.1.6. or as a new item 4.1.11. [Editor's note: the wording appears as an explanatory note in 4.1.6. and in Appendix B, Item 3 under "Event Loggers: Acceptable Form of Audit Trail"]

Also discussed was the matter of whether the 30 day minimum requirement for audit trail power-out memory retention (Paragraph 4.1.8) would be sufficient for moisture meters which may see only seasonal use, and which may be disconnected from power for periods of six months or more. Although it was generally agreed that 30 days was not sufficient, there were no suggestions forthcoming on how a longer time period might be verified by the Type Evaluation Laboratory. Having to wait up to six months to verify conformance with a period of that length seemed neither practical nor desirable. Unable to arrive at a better suggestion, the Sector decided to accept the original proposal of 30 days minimum with the hope that new devices would not rely on battery backed memory for the audit trail.

The following paragraphs which replace all of the September, 1995 version of 4.1 and its sub-paragraphs, incorporate the changes agreed to by the Sector (including the additions which the Technical Advisor was asked to make):

Code Reference S.2.3 Provision for Sealing

1.1 Provision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., audit trail available at the time of inspection) before any change that affects the metrological integrity of the device can be made to any mechanism.

1.1.1 The manufacturer has provided information on how the device should be sealed. Yes ☐ No ☐ NA ☐

0.0.1 All calibration and metrological adjustments can be sealed, or other means of providing security such as audit trails, are provided. Yes ☐ No ☐ NA ☐

0.0.2 If the operator is able to make changes that affect the metrological integrity of the device (e.g, slope, bias, etc.) in normal operation, the device creates an audit trail incorporating an event logger. Yes ☐ No ☐ NA ☐

If equipped with an event logger:

0.0.3 The event counter is nonresettable by the operator and has a capacity of at least 000 to 999. Yes ☐ No ☐ NA ☐

0.0.4 The event counter increments appropriately.

Yes ☐ No ☐ NA ☐ 0.0.5 The event logger automatically retains the identification of the parameter changed, the date and time of the change, and the new value of the parameter (for calibration changes consisting of multiple calibration constants, the calibration version number is to be used rather than the calibration constants.) Note: For devices incorporating an event logger, date and time are considered sealable parameters, and changes to date or time must be logged the same as any other sealable parameter. Yes ☐ No ☐ NA ☐

0.0.6 The system is designed to attach a printer which can print the contents of the audit trail. Yes ☐ No ☐ NA ☐

0.0.7 The audit trail information is capable of being retained in memory for at least 30 days while the device is without power. Yes ☐ No ☐ NA ☐

0.0.8 The event logger has the capacity to retain records equal to twenty-five times the number of sealable parameters in the device, but not more than 1000 records are required. Yes ☐ No ☐ NA ☐

0.0.9 The event logger drops the oldest event when the memory capacity is full and a new entry is saved. Yes ☐ No ☐ NA ☐

Describe the method used to seal the device or access the audit trail information. _____

_____

_____

When audit trail requirements were added to other device codes, only essential audit trail information was distilled for inclusion in Handbook 44. Background information and detailed information to clarify how the sealing requirements of H44 Code would be interpreted during type evaluation were then added to Publication 14. Similar

modifications had been proposed for the Grain Moisture Meter Check List. The Sector reviewed a draft of the proposed background information, Philosophy for Sealing / Typical Features to be Sealed, and subsequently approved it for addition to the Grain Moisture Meter Check List in Publication 14 as Appendix B (See Attachment 1).

6. Temperature Range Marking on Devices

At earlier Sector meetings, questions had been raised regarding the requirement for marking the operating range on the device (if other than 10ºC to 30ºC) as specified by Code Paragraph S.1.10.(c). The requirement for marking does not appear in the NIR Code. Some had suggested that the Sector did not intend to require marking of the temperature range on the device if the device did not display or record any usable values until the operating temperature necessary for accurate determination had been obtained. The necessity for marking the operating range on the device would seem to be superfluous if the meter cannot display a moisture value and must display an error message when the temperature of the meter is outside its specified operating range. The Sector considered this matter again and agreed that marking should not be required under these conditions. The Sector also approved changes to S.1.10.(a) to clarify that this paragraph applies to the device's warm-up period. The agreed to changes are shown below:

S.1.10. Operating Temperature

(a) Warm-up Period: When a meter has first been turned on, it ~~A meter~~ shall not display or record any usable values until the operating temperature necessary for accurate determination has been attained, or the meter shall bear a conspicuous statement adjacent to the indication stating that the meter shall be turned on for a time period specified by the manufacturer prior to use.

(b) A meter shall meet the requirements of T.2. - Tolerance Values when operated in the temperature range of 10 EC to 30 EC (50 EF to 86 EF) or within the range specified by the meter manufacturer.

(c) If the manufacturer specifies a temperature range, the range shall be at least 20 EC (36 EF) ~~and shall be marked on the device~~.

7. Maximum Allowable Temperature Difference Between Meter and Grain

H44 Code applicable to NTEP meters states:

> The maximum allowable difference in temperature between the meter and the sample for which an accurate moisture determination can be made shall be specified. The minimum temperature difference shall be 10 ºC. No moisture value may be displayed when the maximum allowable temperature difference is exceeded. An appropriate error message shall be displayed when the difference in temperature between the meter and the sample exceeds the specified difference.

At its March meeting, the Sector reviewed a letter received from Sid Colbrook, Illinois Weights and Measures, in which he expressed concern that the temperature differences for which some meters were NTEP approved would lead to occasions when a moisture determination could not be made before the producer left the buying facility. He proposed several remedies, including increasing the accuracy tolerance for wider temperature differences between grain and the device.

At that time, at least two manufacturers had submitted meters for NTEP evaluation specifying a minimum required temperature difference of 10 ºC. [Another manufacturer has submitted a meter specifying an 18 ºC temperature difference.]

Grain trade representatives were of the opinion that a 10 ºC difference was too restrictive and would result in unacceptable delays at a receiving elevator. A minimum range of 20 ºC was proposed.

Several Sector members expressed the opinion that the market would settle this matter. If the demand for a wider temperature difference capability was real, potential buyers would seek out the meter offering the widest range. Once apprised of this demand, manufacturers would make every effort to qualify to the widest range possible.

Although the data presented by the NTEP laboratory seemed to indicate that some meters might be capable of meeting the present accuracy limits for temperature differences greater than 10 ºC, manufacturers were reluctant to agree to wider limits without the benefit of further testing of their instruments. Because any proposed changes in H44 could not be considered until 1996, the Sector decided to postpone further action on this item until its September 1995 meeting.

In the months following the March 1995 Sector meeting, several manufacturers have submitted meters for re-testing to extend the allowable temperature difference between meter and grain. Meters have subsequently been approved for temperature differences ranging from 16 to 20 ºC.

In the light of these new approvals and the availability of at least two meter models with 20 ºC temperature difference capability, the Sector considered this question a moot point with no further action required.

8. Sample Temperature Tests

The NTEP Laboratory has pointed out that testing for a meter-grain difference of 20 ºC results in samples being at 42 ºC for at least 36 hours. There is concern that extended exposure to high temperatures may affect test results. The Lab questions if it makes sense to test for a 30 ºC difference which would require holding samples at 52 ºC for 36 hours. As an alternative to testing at temperature differences which are symmetrical with respect to room temperature, the NTEP Laboratory had questioned if it would be acceptable to test and certify for a wider "cold" range than "hot" range? For example, a "hot" grain temperature of room plus 20 ºC and a "cold" grain temperature of room minus of 40 ºC.

The Sector agreed that meter-grain temperature differences do not need to be specified symmetrically with respect to room temperature (22 ºC). It was pointed out that, because of grain stability considerations, it was not practical to perform tests with grain above 45 ºC. The Sector agreed that 45 ºC should be an upper limit for grain temperature and that testing (and certification) should not be done with grain above that temperature. It was suggested that these decisions be added to the appropriate sections of Publication 14.

[Editor's note: The changed portions of Publication 14, resulting from the implementation of the Sector's suggestion, are shown below.]

> Instrument Temperature Sensitivity. Instrument temperature sensitivity tests will be run using three HRW wheat samples . . . at each temperature level.
>
> > The "hot" temperature is defined as the upper operating limit claimed by the manufacturer (Note: The maximum "hot" temperature claimed cannot exceed 45 EC.) The "cold" temperature is defined as the lower operating limit claimed by the manufacturer. A relative humidity of 65% will be maintained for all temperature settings below 22 EC. Above 22 EC, a humidity ratio of 0.011 kg of water per kg of dry air will be maintained. To facilitate testing of instrument temperature sensitivity, manufacturers shall provide a means of disabling the instrument feature for suppressing the display of moisture results when temperature ranges are exceeded.
> >
> > .
> > .
> > .
>
> II. Sample Temperature Sensitivity:

Additional testing is required to verify that accurate results are provided when the sample and instrument are at different temperatures. This will be referred to as the sample temperature sensitivity test. The purpose of this test is to verify that the instrument provides accurate results when the difference in temperature between the sample and the instrument is at the manufacturer specified, difference (a minimum [a] of 10 EC is required). The sample temperature sensitivity test will be conducted using corn, HRW wheat, and soybean samples. Tests will be conducted with the instrument at room temperature and the sample temperature varying from room temperature + $\in$~~T~~$\in T_H$ to room temperature - $\in$~~T.~~$\in T_C$ (where $\in T_H$ is the manufacturer specified difference for grain above room temperature and $\in T_C$ is the manufacturer specified difference for grain below room temperature. In no case will $\in$[a]T_H be allowed to exceed 32 °C, but the two differences need not be equal.)

9. Organization of Sample Exchange for Oven Moisture Standardization

Under the NTEP program for grain moisture meters, calibrations will be based on GIPSA air ovens and field inspection will be 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 GIPSA air oven which is considered the standard. The air oven method is an empirical test which may have to be adjusted to account for differences of altitude or other differences between laboratories. The subcommittee chaired by Dr. Charles Hurburgh (Iowa State University) developed a structured program for interlaboratory comparisons of oven moistures, and, if available, moisture results on various moisture meters. Sector members reviewed the subcommittee's proposal and suggested the following changes:

- Increase sample size from 1 pint to 1 quart to provide sufficient sample for testing on all moisture meter models
- Add provisions for recording calibration version information to data sheets.
- Expand program to include all meter models a lab may have (not just NTEP meters).

(Attachment 2, dated 9/29/95, incorporates the above changes.)

With the exception of GIPSA, lab identities and meter model identities would be coded. Each participating lab and each meter manufacturer would know only their own codes. Rich Pierce, representing the NTEP Laboratory, said that, even though meter identities would be coded in the collaborative study, he would require a letter from each manufacturer granting permission to release collaborative study results.

The initial interlab exchange is expected to be initiated after this year's harvest. Originating laboratories for the initial exchange will be: Iowa State (corn and soybeans) and the Arkansas Department of Standards (soft red winter wheat).

Rich Pierce, GIPSA, pointed out that although GIPSA will be participating in the collaborative study, they may not be able to accommodate every request for testing individually submitted samples. He suggested that any lab wishing to submit samples independently to the GIPSA contact Bill Burden before sending samples.

10. Collection of Objective Evidence of Grain Moisture Program's Benefits

The objective of the NTEP Moisture Meter Program is to bring interstate and intermeter comparisons closer together. To determine if this objective is being met, it will be necessary to describe the accuracy and precision of U.S. moisture measurements before and after the implementation of the NTEP program. The task of defining a program to compile the necessary data to make this comparison was assigned to the subcommittee already formed to develop an oven moisture collaborative study (see agenda item 9). Sector members reviewed and endorsed the subcommittee's proposal. (See Attachment 2, "Objective 2") Manufacturers have pledged $300 each to help defray the costs associated with collecting and compiling the initial data. The balance of funding will come from

Agricultural Extension. The Sector will review the results of the initial effort before deciding whether to repeat the study in 2 to 5 years.

11. Phase II - Data Collection and Calibration Maintenance Issues

The NTEP Laboratory has begun the collection of data associated with Phase II of the NTEP Grain Moisture Program. Jim Rampton, GIPSA Moisture Calibration Laboratory, outlined the Quality Assurance steps being taken to minimize errors and to assure that data was being collected and recorded accurately. He cited a number of potential problems posed by different approaches taken by various manufacturers to data file management. He suggested that more consideration needs to be given to the possibility for data loss and data corruption when designing data collection software. The safest approach appears to be in systems which save an entire season's data in one file. New data is simply appended to the file without overwriting previous data. Least desirable is a system which overwrites any existing file for a given grain with the data most recently collected, effectively deleting any information previously collected. Manufacturers considering re-designing their data collection software are urged to contact Jim Rampton for suggestions before proceeding.

For dielectric meters, monthly installments of data collected can now be sent to manufacturers for review. Manufacturers were asked to contact Jim Rampton with answers to the following :

1. Regarding File Names - are the GIPSA names acceptable?
2. Separate files are now created for each day's data -- would it be acceptable to merge these into a single file?
3. What format is most desirable (ASCII, Lotus, Excel, other)?
4. Can headers (column headings) be eliminated from the files?

If a calibration change is made, manufacturers will be required to "re-predict" moistures from raw data collected during the past 3 to 5 years. This data in turn, must be supplied to the NTEP Laboratory in a standard format which is compatible with GIPSA's analysis software (See Attachment 3, "Data Flow Diagram") to allow the NTEP lab to review and approve the change before a CC can be renewed. Manufacturers were presented with a suggested standard format for submitting NTEP meter data for calibration review, and reports from GIPSA's 1994 Moisture Meter Calibration Study were presented as examples of what reports might be made available for NTEP Calibration Review. Manufacturers were asked to review the suggested data format and reports and respond to Rich Pierce by September 30 with their suggestions and comments.

The NTEP Laboratory had raised another question pertaining to calibration changes. In some instruments, temperature compensation is accomplished by including, in the calibration set, data obtained on samples at various temperatures. For these instruments, calibration updates may affect the temperature compensation and thus affect performance over temperature. The NTEP Laboratory asked whether manufacturers should be required to demonstrate that calibration changes do not adversely affect performance over a temperature range, and if so, how might this be accomplished?

The Sector was in general agreement that some form of verification was needed to assure that temperature performance had not been compromised by a calibration change. It was noted that in dielectric meters, the temperature correction coefficients are independent of other calibration changes. Thus, temperature performance of those meters would not be affected by calibration changes. It was suggested that "raw" data (spectral data in the case of NIR instruments) collected during type evaluation could be used to re-predict temperature performance of new calibrations. The NTEP Lab reported that, unfortunately, spectral data had not been collected during temperature testing in type evaluation. It was also suggested that annual temperature tests should be conducted on NTEP instruments in conjunction with the temperature studies GIPSA had been performing on the Official Meter. Rich Pierce reported that in anticipation of replacing the Motomco with an NTEP meter in the future, GIPSA was no longer performing temperature studies on the Motomco. He also reminded the Sector that temperature studies were not included in Phase II of the NTEP moisture program and that no temperature testing had been performed on the "other 13" NTEP grains [i.e., grains other than corn, soybeans, and hard red winter wheat].

Some Sector members felt that a program should be established to check the temperature performance of the "other 13" grains. Manufacturers were concerned about the cost of additional testing. There was also concern that because some of the "other 13" grains generate a very small portion of moisture meter sales, manufacturers might drop these grains from their list of supported calibrations if the cost of maintaining the calibrations exceed the revenue generated by sales to markets using the calibrations. Charles Hurburgh, Iowa State, was of the opinion that manufacturers had two choices: 1) supply data to prove that temperature performance is O.K.; or 2) pay GIPSA to collect the data. Ole Rasmussen, Foss Food Technology, observed that of the 16 NTEP grains, 7 were wheat (counting durum), 2 were rice, and 2 were barley. He suggested that it might be possible to combine the wheats into a single set which could be used for temperature testing, and that similar sets might be made for rice and for barley. This would cut the number of grain temperature tests from 16 to 8, or in terms of the "other 13" to 6. The Sector was unable to reach a consensus on what should be done with regard to obtaining objective evidence that temperature performance was acceptable for calibrations for the "other 13" grains. Further discussion on this issue was tabled until the Sector meeting scheduled for March 1996. Manufacturers were asked to review the issue and be prepared to suggest alternatives or options for providing this data. Other Sector members, particularly those representing the grain trade and grain processors, were asked to poll their members and be prepared to indicate which grains were important enough economically to justify testing for temperature performance. The NIST representative was asked to find out how comfortable NIST was with not having temperature data available for the "other 13" grains.

12. Certificate of Conformance - Listing of Calibration Constants

For multi-variant instruments, a calibration may consist of 100 or more coefficients for a single grain. At an earlier meeting the Sector decided that all calibration constants should be listed on the CC as an aid to field inspection in verifying that correct calibrations had been installed. The NTEP laboratory has questioned whether calibration constants need be listed on the CC if they cannot be displayed on the device or recorded on the device's printer. It would seem that there is no advantage to field enforcement knowing the calibration constants if there is no way to access them on-site. Handbook 44, Paragraph S.5.1. provides for two alternate methods of verifying calibrations: 1) display of calibration constants, or 2) display of a unique identifier (calibration name or calibration version number). After considering the matter the Sector rescinded its previous decision and agreed to the following:

If a meter can neither display nor print calibration constants, calibration constants need not be listed on the CC. Only the unique calibration name, or a unique calibration version number which can be used by field inspection to verify that the correct calibration has been installed, will be listed.

13. Communication of Calibration Changes to Users

This issue had been discussed at the Sector's Meeting in March 1995. At that time, the Sector agreed that the responsibility ultimately lies with the owner to see that his instrument is updated when required. It was suggested that announcing calibration changes on the same date each year would accustom users to expect to receive the information by that date and would lead them to take action to find the information if they had not received it. A fixed date for announcement would also facilitate publicizing, through grain trade magazines, the need for owners to be aware of potential changes and to contact their manufacturer or sales agent for details. Additional details could be announced through various grain industry newsletters which have shorter lead times for publication. To speed the dissemination of detailed calibration information, it was suggested that once new calibration information was verified by the NTEP laboratory, manufacturers could make a preliminary release of the information to States and interested parties.

Randy Allman, Executive Director of the Agribusiness Association, has since suggested that state and regional grain and feed associations can play a key role in the dissemination of calibration updates. He expressed the belief, however, that it is most appropriate for this information to come to these organizations via the state weights and measures officials.

Sector Members considered Mr. Allman's suggestion, but concluded that most States don't want to assume the responsibility for disseminating this information. They agreed, however, that they would be willing, if contacted by

a regional association, to verify that the information which the association had received from manufacturers was, indeed, the latest calibration. One Weights and Measures member said that his agency could provide each manufacturer with a list of owners of its meters, . Such lists could be used by manufacturers to notify individual users. At least one manufacturer, however, expressed the desire to use a more economical method to disseminate the information, favoring grain industry publications and grain association newsletters.

14. Promotion of NTEP

In earlier meetings, Sector members had expressed concern that several grain producing states do not have a viable field inspection program for grain moisture meters and have not become NTEP states. It was agreed that a brochure and a detailed information packet which promoted the program's benefits would be useful in promoting the NTEP Grain Moisture Meter Program. Cliff Watson, Consultant, circulated the draft text of a brochure describing the National Grain Moisture Meter Program for review and comment. Rich Pierce, GIPSA, noting that this program is not an FGIS program, objected strongly to a cited benefit which stated: "Adoption by GIPSA/FGIS of the new technology NTEP Certified meters in early 1997." Grain Trade representatives were equally strong in their opinion that unless GIPSA/FGIS endorsed the program [as evidenced by choosing one or more NTEP meters as the Official Meter], then the program wasn't good enough for Grain Handlers. One Sector Member expressed the belief that GIPSA/FGIS had already publicly committed to adopting an NTEP meter by 1997. The Sector decided to leave this statement in the next draft. Among other comments received were: 1) suggestions to replace the phrase "..specific high performance standards" with "..established design and performance criteria"; 2)objections to the phrase "less potential for "fraud", which was thought to be inflammatory; 3)suggestions that it would be more appropriate to refer to the program as "a cooperative program, coordinated and supported by NCWM, NIST and GIPSA" rather than "Administered by NCWM, NIST, and GIPSA"; 4) recommendations to delete references to printed "tickets", using instead wording which states that printed results will be provided to the customer; and, 5) concerns that NCWM would object to referring to NTEP certified meters as "approved meters." This will be changed to "type approved meters" or "certified meters." It was also suggested that the appeal of the brochure needed to be broadened and that the regulatory aspects of the program should be mentioned. Those present were asked to take the draft back to their organizations for further review and comment. Comments were to be submitted to Cliff Watson by September 30, 1995 so a final draft could be circulated to Sector Members by mid-October with the goal of printing the brochure early November.

15. Choosing a Date and Site for the Next Meeting

Anticipating the need for extended discussion of Phase II test results and the reorganization of the Moisture Meter Code, the Sectors agreed to a two and one-half day meeting (one or one and one-half or two days for the Grain Moisture Meter Sector with the remainder for the NIR Protein Sector) to be held in St. Louis, MO during the week of March 25-29. The exact dates will depend on availability of hotel accommodations and will be announced when arrangements have been made.

National Type Evaluation Technical Committee
Near Infrared Grain Analyzer Meter Sector
Meeting Summary
September 14, 1995 Des Moines, IA

Agenda Items

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1. Report on NCWM Annual Meeting

The NCWM Annual Meeting was held July 16-20, 1995 in Portland, ME. The conference adopted the following proposal by majority vote of both the House of State Representatives and the House of Delegates:

357-1 UR.2.8 Calibration Adjustments and S.2.5.1. Calibration Transfer. This item was the Sector's recommendation to eliminate references to user slope adjustments and to more explicitly describe the information which the user must keep to justify calibration adjustments.

2. Update on National Type Evaluation Testing Schedule

Rich Pierce, Grain Inspection, Packers and Stockyards Administration / Federal Grain Inspection Service (GIPSA/FGIS) reported that he had just received from NIST the form to apply for certification as the NTEP Participating Laboratory for Near Infrared Grain Analyzers. To become certified, the lab must submit evidence that: 1) adequate trained personnel are available to perform the tests; 2) they have an understanding of the test procedures; 3) the necessary reference methods and samples are available; and, 4) that they have adequate facilities to do the testing. With regard to these four items, Rich noted that 1) Two new technicians had joined his group to replace two who had been transferred to another group. Training will be required to acquaint the new technicians with the requirements of NIR type evaluation testing; 2) Detailed test plans will have to be developed; 3) Samples have been in underground storage. These will have to be retrieved and sorted out; 4) The facilities at Kansas City are being remodeled and the type evaluation lab is being re-located to another space in the building. With lab certification in process, applications can be accepted for testing. Present plans call for sending out type evaluation application forms to NIR instrument manufacturers (along with a questionnaire regarding the need for calibration assistance) around October 1, 1995 with completed applications due October 15 and instruments due on site November 1, 1995.

Rich reviewed the availability of samples for calibration assistance. They include the 100 calibration samples and 50 validation samples per wheat class from '92 and '93 crop years used in developing FGIS's calibrations. Unfortunately, many of these are limited in quantity (somewhat less than 100 g), and the moisture range of these samples is somewhat limited. This set of samples might have to be supplemented with samples from crop years '93 through '95 which have been used for monitoring. Samples from '93 through '95 crop years will also be used for Type Evaluation Testing. Combustion Nitrogen Analyzer (CNA) protein data (12% moisture basis) is available for the calibration assistance samples. The CNA tests will not be repeated on those samples.

Charles Hurburgh, Iowa State University, asked how temperature compensation would be handled if calibration assistance was provided. Rich Pierce reported that this had not been determined. The lab will have to consider each case separately. Costs will depend on what additional testing the manufacturer will required to collect sufficient data for temperature compensation. Ole Rasmussen, Foss Food Technology, asked if manufacturers could arrange to bring samples into the lab and run them themselves on their "standard instruments." Rich Pierce saw no objections

to this provided it didn't conflict with the NTEP Lab's need to collect Phase II or other data. He was not certain what arrangements could be made if CNA analysis was required.

3. Update on Publication 14

See Grain Moisture Meter Agenda Item 4 for general information on availability and cost of the 1995 edition of Publication 14. The Checklist for Near Infrared Grain Analyzers has also been included in the 1995 edition of Publication 14.

4. Adding Philosophy of Sealing & Typical Features to be Sealed to Publication 14

When audit trail requirements were added to other device codes, only essential audit trail information was distilled for inclusion in Handbook 44. Background information and detailed information to clarify how the sealing requirements of H44 Code would be interpreted during type evaluation were then added to Publication 14. Similar modifications had been proposed for the Near Infrared Grain Analyzer Check List. The Sector reviewed a draft of the proposed background information, Philosophy for Sealing / Typical Features to be Sealed, and subsequently approved it for addition to the Grain Moisture Meter Check List in Publication 14 as Appendix A (See Near Infrared Grain Analyzer Attachment 1).

5. Addition of Audit Trail Requirement Details to Publication 14

The Sector considered the addition of several paragraphs to the checklist to address problems discovered by NTEP laboratories while evaluating devices incorporating event loggers (paragraphs 3.9.3, 3.9.5, 3.9.8, 3.9.10 below.) This item was discussed thoroughly during the Grain Moisture Meter Sector Meeting immediately preceding the NIR Grain Analyzer Sector Meeting. The NIR Sector approved the proposed additions (subject to incorporation of changes corresponding to those made by the Moisture Meter Sector) without further discussion. A summary of the Grain Moisture Meter Sector's discussion on this issue is reproduced below. [Note: In the discussion reproduced below, paragraph references have been changed to the corresponding NIR Check List paragraph numbers.]

During the discussion of the proposed changes and additions, one Sector member raised the question of the relationship of mechanical and electronic security to the audit trail, pointing out that light sources in NIR instruments were not sealed and that circuit boards could be removed and changed with no record of these actions appearing in the audit trail. It was suggested that these actions were repair actions, and that a mechanical seal of the areas containing replaceable parts would be an appropriate means to alert field inspection to unauthorized tampering with the instrument. Another Sector Member noted that the DRIE (formerly the SIM) in France requires, in addition to a physical seal, that a log book be maintained on-site to record any physical changes which could affect the metrological integrity of the device. Log book entries must show the registration number of the authorized service technician making the change or repair.

It was suggested that a similar log book should be required for U.S. grain moisture meters. Don Onwiler, Nebraska Public Service Commission, questioned how enforcement officials would make use of such a log and the motivation of users to keep a log. If users or service personnel neglected making entries, there would be no way of detecting this. The Sector set aside further consideration of repair logs and decided to confine the remainder of the audit trail discussion to matters associated with actions which could be performed by a user in the normal operation of the device. Accordingly, the requirement that an event counter be non-resettable was modified to specify that it be non-resettable by the operator.

It was noted that the check list for Liquid Measuring Devices did not require that date and time be sealable parameters. The necessity for requiring date and time to be sealable, in Grain Moisture Meters incorporating an audit trail, was questioned. In the ensuing discussion it was pointed out that even with an event counter, a user could continue to use an old calibration well past the date at which a new calibration was to become effective; then, by altering the date, could change the calibration and make it appear that the change had been made at the proper time. With date and time not sealable, there would be no record of the date alterations on the audit trail. The Sector subsequently agreed that date and time should be considered sealable parameters and requested the Technical Advisor to add wording to that effect to the checklist in the appropriate section(s). [Note: the wording appears as an explanatory note in 3.9.6. and in Appendix A, Item 3 under "Event Loggers: Acceptable Form of Audit Trail"]

Also discussed was the matter of whether the 30 day minimum requirement for audit trail power-out memory retention (Paragraph 3.9.8) would be sufficient for near infrared grain analyzers which may see only seasonal use, and which may be disconnected from power for periods of six months or more. Although it was generally agreed that 30 days was not sufficient, there were no suggestions forthcoming on how a longer time period might be verified by the Type Evaluation Laboratory. Having to wait up to six months to verify conformance with a period of that length seemed neither practical nor desirable. Unable to arrive at a better suggestion, the Sector decided to accept the original proposal of 30 days minimum with the hope that new devices would not rely on battery backed memory for the audit trail.

The following paragraphs which replace all of the September, 1995 version of 3.9 and its sub-paragraphs, incorporate the changes agreed to by the Sector (including the additions which the Technical Advisor was asked to make):

[Note: Paragraph numbers shown below do not correspond exactly with paragraph numbers in Publication 14. Some items have been combined and paragraph levels have been changed for clarity.]

Code Reference: S.2.6. Provision for Sealing

Provision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., audit trail available at the time of inspection) before any change that affects the metrological integrity of the device can be made to any mechanism.

The manufacturer has provided information on how the device should be sealed.	Yes ☐ No ☐ NA ☐
All calibration and metrological adjustments can be sealed, or other means of providing security such as audit trails are provided.	Yes ☐ No ☐ NA ☐
If the operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc.) in normal operation, the device creates an audit trail incorporating an event logger.	Yes ☐ No ☐ NA ☐
If equipped with an event logger:	
The event counter is nonresettable and has a capacity of at least 000 to 999.	Yes ☐ No ☐ NA ☐
The event counter increments appropriately.	
Yes ☐ No ☐ NA ☐ 0.0.10 The event logger automatically retains the identification of the parameter changed, the date and time of the change, and the new value of the parameter (for calibration changes consisting of multiple calibration constants, the calibration version number is to be used rather than the calibration constants.) Note: For devices incorporating an event logger, date and time are considered sealable parameters, and changes to date or time must be logged the same as any other sealable parameter.	Yes ☐ No ☐ NA ☐
The system is designed to attach a printer which can print the contents of the audit trail.	Yes ☐ No ☐ NA ☐
The audit trail information is capable of being retained in memory for at least 30 days while the device is without power.	Yes ☐ No ☐ NA ☐

The event logger has the capacity to retain records equal to twenty-five times the number of sealable parameters in the device, but not more than 1000 records are required.	Yes ☐ No ☐ NA ☐
The event logger drops the oldest event when the memory capacity is full and a new entry is saved.	Yes ☐ No ☐ NA ☐

Describe the method used to seal the device or access the audit trail information.

_____

_____

6. Calibration Identification on Multi-Constituent Instruments

The NTEP Lab had requested the Sector to consider whether it would be desirable to issue a single (or combined) CC for multi-constituent instruments. This request was based on the concern that a device approved for both moisture and protein may have to use a single common name to enable the results for both constituents to be displayed for a single measurement of the grain sample. If a common identifier is used for both constituents, a change in wheat moisture calibrations will require that the wheat protein CC also be updated. The Sector discussed the matter, noting advantages in enforcement (a single CC number for a given instrument) and in updating (only one certificate maintenance fee.) The only disadvantage seemed to be that it would require the effective date of protein and moisture calibrations to be the same. The Sector had previously decided that May 1 should be the target date for re-issuing CCs and that it would be desirable to make protein and moisture changes simultaneously. The Sector recommended that multi-constituent instruments be issued by a single CC.

In connection with this subject, several Sector members asked how CC's would be renewed each year and what numbering system would be used. A uniform, easily understood system is needed so field enforcement can determine if calibrations are the most recent. The NIST representative was asked to find out how NIST proposed to handle the yearly re-issuing of CCs and to report to the Sector at its next meeting. (Note: Under the Grain Moisture Meter and Near Infrared Grain Analyzer Program, CCs for these devices are valid only for a single season. They must be renewed each year with calibrations changed where necessary. A CC must be renewed even if no calibration changes are required.)

7. Phase II Testing - On-going Calibration Review

This item first appeared on the Sector's agenda for its September, 1994 meeting. It was discussed again in detail at their meeting in March, 1995. In the course of these discussions, the Sector has agreed that:

- participation in a monitoring program of some sort should be mandatory for NTEP instruments.
- data should be collected (and made available to manufacturers) annually by the NTEP laboratory on instruments in the on-going calibration review and maintenance program for NIR grain analyzers.
- only reference method protein data (corrected to 12% moisture basis) and basic instrument data would be provided (i.e., no moisture data would be provided).
- no more than 100 samples per year per class would be required for calibration review or monitoring purposes.
- the problem of capturing new crop problems in local areas would be up to the manufacturer to address [and need not be part of the monitoring program].

- the accuracy limits used for NTEP approval should also apply to the annual review of NTEP calibrations.

The Sector had also recommended earlier that should GIPSA/FGIS decide to issue a new calibration for their official instruments, data on the same set of samples used to calibrate the GIPSA instruments (in addition to data on GIPSA/FGIS's validation sample set) should be collected on the NTEP instruments and should be made available to manufacturers (along with CNA data on those same samples).

For purposes of discussion, the Sector agreed to the following definitions for the two main elements of Phase II of the NTEP NIR Grain Analyzer Program:

1. Monitoring - verification that an existing calibration continues to meet accuracy requirements over time, or, viewed another way, determining when recalibration is required.

2. Calibration Development & Maintenance - recalibration of NTEP instruments using (as a minimum) data obtained on samples selected from the same sample pool from which GIPSA/FGIS selected samples for calibrating the Official instrument. It is recognized that manufacturers may wish to supplement GIPSA data with data from additional manufacturer-provided samples. Validation of new calibrations would be done using the same validation set used by GIPSA/FGIS.

[Note: As used above, "monitoring" applies to tests performed on the instruments in the NTEP lab and not to devices in the field. "Recalibration" means derivation of a new set of calibration coefficients.]

When an estimate of program costs was presented at the Sector's March 1995 meeting, manufacturers questioned why they should have to pay for CNA analyses when GIPSA was already analyzing samples in connection with their own monitoring program. Manufacturers felt that they should bear only the incremental costs associated with a monitoring program. This concern was addressed by Rich Pierce, GIPSA/FGIS, at the Sector's most recent meeting (September 1995). He stated that as long as GIPSA/FGIS had appropriated funds for collecting reference data (CNA analyses) on monitoring samples (or some portion thereof), there would be no charge to manufacturers for the analyses on these samples. He also pointed out that, at present , optical data was not being collected routinely on monitoring samples. Each year some 10,000 monitoring samples are run through the "Master" instruments at Kansas City. Only protein is predicted on these samples. Approximately 10% of the monitoring samples are set aside for later compositional analysis by reference methods. He cautioned that the GIPSA/FGIS monitoring program was subject to change as it was still under development and suggested the following for an NTEP monitoring program:

> During the first week in January, run 100 samples of each variety on each NTEP instrument. Of these 100 samples, 80 would be chosen from the wheat monitoring program. The remaining 20 would come from the moisture monitoring program (to verify the robustness of the protein calibration over a wider range of sample moistures).

Charles Hurburgh, Iowa State University, expressed concern that if calibration validation is performed using stored samples, which are typically drier than samples seen at the first point of purchase, we are not really checking performance under conditions which will be seen in the field. He recommended that performance be monitored over time using samples collected on a flow of time basis to verify that a calibration is robust and gives accurate results for all varieties, regions, growing conditions, etc. Manufacturers generally agreed that testing over time was preferable to a "one time" test each year.

Considering that one of the goals of the program is uniformity and closer agreement with Official measurements, it was suggested that a useful monitoring program might be an on-going stream of results on each NTEP instrument compared to the GIPSA/FGIS "Master" unit. Under this proposal, the standard reference method (CNA) would still be the basis for validation of calibrations.

Dr. Pierce was requested to develop, for presentation to the Sector in March, 1996, a proposal (including budgetary costs) for an on-going monitoring program which addresses the concerns expressed above. He was requested to

structure the program, as far as practical, to take advantage of GIPSA/FGIS's current procedures for monitoring system performance over time.

Attendance List - Sector Meetings September 13 & 14, 1995 - Des Moines, IA

Name	Affiliation	GMM	NIR
Jack Barber	JB Associates	x	x
Connie Brown	DICKEY-john Corp.	x	x
Darryl Brown	Iowa Department of Agriculture	x	x
Randy Burns	Arkansas Bureau of Standards	x	x
Allen Butler	Perten Instruments NA	x	x
Bob Davis	Illinois Department of Agriculture	x	
Cassie Eigenmann	DICKEY-john Corp.	x	x
Arnold Eilert	Bran+Luebbe	x	x
Rich Flaugh	GSF Inc.	x	x
Lowell Hill	University of Illinois	x	x
David Hopkin	Perstorp Analytical	x	
Charles Hurburgh, Jr.	Iowa State University	x	x
Diane Lee	NIST/Office of Weights and Measures	x	x
Keith Locklin	ConAgra Corn Processing (representing GEAPS)	x	x
Jeff Martin	Steinlite Corporation	x	x
Chris Morris	DICKEY-john Corp.	x	
Don Muller	Bran+Luebbe	x	x
Pontus Nobreus	Perstorp Analytical	x	x
Don Onwiler	Nebraska Public Service Commission	x	x
Allison Pflug	CSC Scientific	x	
Richard Pierce	Grain Inspection, Packers and Stockyards Admin.	x	x
James Rampton	Grain Inspection, Packers and Stockyards Admin.	x	x
Ole Rasmussen	Foss Food Technology	x	x
Joe Rothleder	California Dept. of Food & Agriculture	x	x
Tom Runyon	Seedburo Equipment Co.	x	x
Cheryl Tew	North Carolina Dept. Of Agriculture	x	x
Cliff Watson	Consultant	x	x
Robert Wittenburger	Missouri Dept. of Agriculture	x	x

Name	Affiliation	GMM	NIR
Richard Wotthlie	State of Maryland	x	x

National Type Evaluation Technical Committee
Near Infrared Grain Analyzer Sector
Meeting Summary
September 9, 1996, Kansas City, MO

Agenda Items

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1. Update on National Type Evaluation Testing Schedule

Dr. Richard Pierce, Grain Inspection, Packers and Stockyards Administration (GIPSA), formerly FGIS, reported that the GIPSA Laboratory in Kansas City has not yet been certified as the NTEP participating laboratory for near infrared grain analyzers. The certification process is on hold pending retrieval of all samples required for type evaluation testing from GIPSA's vast sample base. Formal certification is now expected in early 1997. In anticipation of certification, the GIPSA Laboratory sent a letter to NIR instrument manufacturers soliciting interest in a pre-evaluation calibration data collection program Of the five manufacturers responding, three indicated that they might be interested in participating in such a program this fall. Dr. Pierce explained that the main sample base for this program would include samples which GIPSA had used in calibrating the official instruments. These samples would be supplemented with high moisture samples obtained from the moisture meter program. He anticipated that each wheat class would be represented by approximately 100 samples. Manufacturers (not already enrolled in the NTEP moisture meter program) wishing to participate in the pre-evaluation program this fall were urged to submit instruments now so that lab technicians could become familiar with their operation.

2a. Proposed Change to Publication 14 - Sample Temperature Sensitivity

Discussion: The first paragraph under heading II. Sample Temperature Sensitivity of the Near Infrared Grain Analyzer Check List of Publication 14 states that the tests will be conducted using HRW wheat samples. This is in conflict with the second paragraph which calls for testing using two sample sets from each of the six wheat classes representing low (10-11%) and high (13-14%) moisture ranges with each set consisting of three samples, one from each of three protein ranges (the upper third, middle third, and lower third of the protein range for the class). Because sample temperature sensitivity is calibration dependent, this test must be conducted using each class for which certification is being sought.

The necessity for testing using each of up to six wheat classes is not without problems, however. The NTEP Lab applicant has experienced difficulty in obtaining complete sets of high moisture samples for those classes of wheat less frequently traded and those grown in more arid regions. The Lab had asked the Sector to consider if tempered samples might be used for this test. Ole Rasmussen, Foss Food Technology, presented data supporting the use of tempered samples. For the sample temperature sensitivity test this data (see Attachment) showed that biases using tempered samples were 0.1 greater at cold temperatures and 0.09 less at hot temperatures compared to biases measured before the samples were tempered. The Sector discussed concerns raised by Richard Gonzales, Oklahoma Bureau of Standards, in a memo sent to G. Diane Lee, NIST/OWM. Mr. Gonzales had experienced problems with stability and spoilage when using tempered samples for testing devices. The Sector noted that in the case of the Sample Temperature Sensitivity Tests, the maximum moisture required is only 14%, while the dry samples are typically 8-9%. Sector members with experience in tempering were of the opinion that stability and spoilage would not be problems if the samples were properly tempered and properly stored. It was also noted that these samples would be used only for the Sample Temperature Sensitivity type approval test and not for field testing where proper storage of samples could be a problem. The Lab explained that the majority of samples used for this test would

be naturally moistened. Considering that this test is applicable only to differences in NIR protein measurements (cold-room temperature and hot-room temperature), the Sector approved the use of tempered samples where naturally moistened samples were not available. The Sector requested the Lab to document the tempering procedure which would be used. [Note: The Sector does NOT approve the use of tempered samples for field testing.]

Also, as published (May 1996), this test specifies a single value for DT, implying symmetrical differences about room temperature. This issue was addressed by the Grain Moisture Meter Sector in their September 1995 meeting, at which time the corresponding paragraph in the GMM check list was modified to permit non-symmetrical temperature differences. At that same meeting, noting the difficulty in obtaining meaningful test results at temperatures in excess of 45 EC, the GMM Sector agreed that the maximum test temperature involving grain would be 45 EC.

Conclusion: The Sector approved the following changes to the Sample Temperature Sensitivity test of Publication 14, Chapter 7, to address the various issues noted above and to bring the NIR Check List into closer agreement with the GMM Check List.:

II. Sample Temperature Sensitivity

Testing is required to verify that accurate results are provided when the sample and instrument are at different temperatures. This will be referred to as the sample temperature sensitivity test. ~~The sample temperature sensitivity test will be conducted using HRW wheat samples.~~ Tests will be conducted with the instrument at room temperature and the sample temperature varying from room temperature~~+DT~~ $+DT_H$ to room temperature~~!DT~~ $!\ DT_C$ ~~, where DT is the maximum allowable difference between instrument and sample temperatures specified by the manufacturer.~~ where DT_H is the manufacturer specified difference for grain above room temperature, and DT_C is the manufacturer specified difference for grain below room temperature. In no case will room temperature $+DT_H$ be allowed to exceed 45 EC, but DT_H need not equal DT_C .

Testing will be conducted using two sample sets from each of the six wheat classes representing low (10-11%) and high (13-14%) moisture ranges. Each set will consist of three samples, one from each of three protein ranges (the upper third, the middle third, and the lower third of the protein range for the class). Separate bias analyses will be made for the low and high moisture sets. When high moisture samples are not available for any protein range in any class, testing may be conducted using tempered (artificially moistened) samples. Three analyses will be made for each sample at room temperature, the hot temperature extreme, and the cold temperature extreme. The average protein for the 9 observations in each moisture set (1 moisture level x 3 protein levels x 3 replicates) run at each temperature extreme must agree with the average protein obtained for the room temperature runs within " 0.35.

Sample Temperature Sensitivity tests will not be conducted for ground-grain NIR instruments. For whole-grain instruments, sample presentation must be the same as that which will be used in the field. Sealed cells cannot be used for the Sample Temperature Sensitivity tests.

2b. Proposed Change to Publication 14 - Instrument Temperature Sensitivity

Conclusion: The Sector also agreed that the section on Instrument Temperature Sensitivity in Publication 14, Chapter 7, should be modified to reflect the 45 EC limit discussed in agenda item 2a. above. The modification to the affected paragraph is shown below:

The "hot" temperature is defined as the upper operating limit claimed by the manufacturer. (Note: The maximum "hot" temperature claimed cannot exceed 45 EC.) The "cold" temperature is defined as the lower operating limit claimed by the manufacturer. To facilitate testing of instrument temperature sensitivity, manufacturers shall provide a means of disabling the instrument feature for suppressing the display of protein results when temperature ranges are exceeded.

3. Proposed Change to Publication 14 - Power Supply Test

Background: Following a discussion of this issue at its March 1994 meeting, the Sector agreed to change the type evaluation power supply range for NIR grain analyzers of 100V to 130V to the slightly narrower range of 105V to 129V. As a result of this recommendation, Publication 14 was changed to the narrower range, but the NIR Code of Handbook 44 was not changed.

Noting this oversight, the NTEP Laboratory suggested that the Code should be brought into agreement with the Sector's recommendation. This issue was placed on the 1995 Southern Weights and Measures Association S&T Committee agenda. The Southern supported the change and the item was placed on the NCWM S&T Committee agenda for the 81st Annual meeting as item 357-1. Subsequently, the Central Weights and Measures Association requested information about this issue from the Sector's Technical Advisor. His response was that the issue may have arisen from the request of a meter manufacturer who had older ground grain instruments in use in the field that may not meet the 100V to 130V range requirements. He also noted that all NIR instruments which had gone through NTEP evaluation had been submitted as moisture meters which were required to meet the wider voltage range of 100-130V. The Central S&T Committee took the position that NIR grain analyzers are used in the same environment as moisture meters and therefore opposed the change. In light of this opposition by the Central, a mail ballot was sent to Sector members asking if they wished to withdraw their support for the item. By a vote of 13 to 2 (with 2 abstentions) the Sector voted to request the NCWM S&T Committee to remove the item as a voting item from the Annual Meeting Agenda. The S&T Committee acted accordingly, and the issue was removed as a voting item. As a result, the Code now specifies a voltage range of 100-130V while Publication 14 specifies a voltage range of 105-129V.

Conclusion: To bring Publication 14 into agreement with Handbook 44, the Sector approved the following change to the Power Supply Test of Publication 14:

> **Power Supply**. A single HRW wheat sample will be analyzed 10 times with the instrument operating at a nominal voltage of 117 v. The voltage will be adjusted to ~~105~~ 100v, and after 30 minutes, the HRW sample will be analyzed 10 times. The voltage level will then be increased to ~~129~~ 130v, and after 30 minutes, the sample will be analyzed 10 more times.
>
> Changes in bias and precision will be checked. Bias is defined as the change in the average protein for 10 analyses made at both the reference and the respective test voltages.
>
> The maximum allowable bias change from the reference is ± 0.10. The maximum allowable standard deviation of 10 analyses (precision), at any of the three voltage levels, is 0.10.

4. Report on Field Survey

To find out what might be expected when the NIR Code is enforced, Don Onwiler, Nebraska Public Service Commission, field tested 29 devices using three standard reference wheat samples provided by GIPSA/FGIS. Don reported on the results of this survey and the reaction of the participants, all of whom took part on a volunteer basis (see Attachment). Of the 29 devices tested, only 41.4% successfully passed all three required tests (accuracy on individual samples, average for all three samples, and range for five retests on the same sample.) Don attributes most failures to users who have not maintained their instrument, have not monitored its operation with check samples, or have no knowledge of proper calibration procedures.

5a. Phase II Testing - On-going Calibration Review, Proposed Addition to Publication 14

Background: This item first appeared on the Sector's agenda for its September, 1994 meeting. It was discussed again at length at their two meetings in 1995, and again at the March 1996 meeting. Although agreeing that participation in a monitoring program of some sort should be mandatory for NTEP instruments, the Sector has had difficulty in reaching a consensus on the exact details of such a program. The Sector was able to agee that whatever program is finally decided upon, it should be reviewed at the end of each year to assess its value and to determine if it should be continued, modified, or abandoned.

Although originally recommending that recalibration of NTEP instruments be done using (as a minimum) data obtained on samples selected from the same sample pool from which GIPSA/FGIS selected samples for calibrating the Official instrument, it has since been determined that this will not be possible in cases where GIPSA has used "historical" samples which exist only as spectral data (obtained on the GIPSA Official instrument) and not as physical samples.

[Note: As used above, "monitoring" applies to tests performed on the instruments in the NTEP lab and not to devices in the field. "Recalibration" means derivation of a new set of calibration coefficients. Slope and bias adjustments are not considered "recalibration".]

To minimize annual costs to manufacturers, an on-going monitoring program which, to the greatest extent practical, takes advantage of GIPSA/FGIS's current procedures for monitoring the official system's performance over time has been proposed. The cost for collecting and analyzing NTEP calibration performance data for all six classes of wheat has been estimated at approximately $1750 per year per instrument model for whole grain instruments (costs will be higher on instruments requiring grinding of samples).

If manufacturers submit additional samples for CNA analysis (moisture analysis will also be required to report protein on a 12% moisture basis) and collection of optical data on their instruments, Dr. Richard Pierce, GIPSA/FGIS estimated that CNA analysis would run about $15-25 per dual analysis, with the collection of optical data an additional $3.00 per sample. He had no oven-moisture cost figures at the time. He emphasized that the costs he had cited were preliminary estimates as GIPSA was presently developing a fee schedule for these types of tests. Any data paid for by a manufacturer would be proprietary to the manufacturer.

Conclusion: The Sector approved the addition of the following paragraph to Publication 14, Chapter 7, at the end of part IV. Tolerances for Calibration Performance:

> For the on-going review of calibrations, instrument protein results and calibration data will be collected on 100 samples per class each year on each model in the NTEP program. Eighty of these samples will be selected from the 100 calibration verification (C/V) samples on which GIPSA has obtained spectral data. The additional twenty will be selected from moisture survey samples. Existing CNA protein values will be used for the 80 C/V samples. CNA analysis will be obtained for the 20 moisture survey samples. Instruments will be required to simultaneously provide predicted proteins and spectral data. The required data will be collected over time as samples, instruments, and operators become available with the goal of providing optical and chemical data, along with a summary report comparing predicted protein values to the CNA reference analyses, to manufacturers by January 1 of each year.

5b. Phase II Testing - Validation of Calibration Changes

Background: At the Sector's previous meeting in March 1966, some Sector members were of the opinion that if a performance problem is addressed through a calibration change, a common, independent validation set (not part of the calibration set) should be available to verify that the desired objective has been achieved. One Sector member had suggested that manufacturers be allowed to contribute "golden" samples to the validation set. Another suggested that the validation set contain samples which had historically shown poor agreement with the CNA protein values. It was also suggested that it would be useful if validation samples could be identified with the residual values obtained on each model.

Discussion: After considering the practical aspects of obtaining the necessary samples and the cost of a validation program to manufacturers the Sector distilled the issue to the simple question of, "How should the NTEP lab evaluate a calibration change?"

Conclusion: The Sector then agreed that the answer was simply, "The same way they evaluated the calibration initially." The Sector also agreed that spectral and CNA data would be made available to manufacturers for re-predicting the results of calibration changes.

6. Report on NCWM Annual Meeting

The NCWM Annual Meeting was held July 21-25, 1996 in New Orleans, LA. Diane Lee, NIST/OWM, reported on action taken by the Conference on issues of interest to the Sector:

357-1 S.2.2.1 Power Supply, Voltage and Frequency

At the request of the Sector, this proposal to modify the power supply voltage range from 100V-130V to the narrower range of 105V-129V was withdrawn from consideration as a voting item. [Note: for further discussion of this issue see Sector agenda item 3.]

7. Proposed Change to H44 - S.2.6. Provisions for Sealing

Discussion: This became an NIR Analyzer agenda item, because the Grain Moisture Meter Sector was considering changes to the Handbook 44 paragraph dealing with Provisions for Sealing [Note: for additional discussion on this subject, see GMM Sector Agenda Item 2]. Because several of the devices holding Certificates of Compliance (CC's) under the GMM Code will also be submitted for evaluation under the NIR Code, it is desirable to keep corresponding provisions of the two Codes in agreement to the greatest extent possible. The Sector recognized that bias changes were likely to be more frequent during the year with NIR Grain Analyzers than with moisture meters (regardless of technology); thus, it was not reasonable to assume that the sealing requirements for Category 1 and Category 2 devices, as defined by the GMM Sector, would provide adequate security for NIR Grain Analyzers.

Conclusion: The Sector agreed that all NIR Grain Analyzers (measuring constituents other than moisture) should comply with the audit trail requirements for Category 3, 3a, and 3b devices as adopted by the GMM Sector. This decision results in the following changes to the NIR Code in Handbook 44:

S.2.6. Provision for Sealing. -

~~a. Provision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., The device shall incorporate an audit trail available at the time of inspection as defined in part (b)), before any change that affects the metrological integrity of the device can be made to any mechanism.~~

~~b. If the operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc) in normal operation, the device shall use an audit trail. The minimum form of the audit trail shall be an event logger and shall include:~~

- ~~an event counter (000 to 999),~~
- ~~the parameter ID,~~
- ~~the date and time of the change, and~~
- ~~the new value of the parameter (for calibration changes consisting of multiple calibration constants, the calibration version number is to be used rather than the calibration constants).~~

An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change , and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants).

A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)

8. Sector Membership

In January at the Interim NCWM Meeting, members of the NTEP Board of Governors (BOG) addressed questions which had been raised concerning membership and appointment to National Type Evaluation Technical Committee (NTETC) Sectors. They agreed that membership is conferred on individuals, not companies; therefore, the resignation of an individual from a Sector does not automatically entitle the individual's company to continue Sector membership. The company may, however, nominate another individual for consideration by the NCWM Chairman, who makes all appointments to the Sectors. Although membership is conferred on individuals, the BOG reaffirmed that each individual does not necessarily have a separate vote. Only one vote per company or agency is permitted. [Note: for additional discussion on this subject, see Publication 16, April 1966, item 102-6.]

Subsequently, at the recent Annual Meeting, the Conference agreed to the following modification in the rule governing designation of alternate representatives at Sector meetings:

> Although the [NCWM] Chairperson will appoint members [on the advice of the Sector chairman and technical advisor], an appointed representative may designate an alternate with full voting rights for an individual meeting whenever necessary.

It has been brought to the attention of the Sector's NIST member that there have been several changes in representation which have not been appointed officially by the NCWM Chairperson. The membership status of those attending the Sector meeting, as well as those listed officially as members, was reviewed. This time only, Diane Lee will send, to the NCWM Chairperson, a single letter with the names of those desiring appointment to the Sector as voting members (if they have not previously been appointed.) Attendees were reminded that maintaining NCWM membership was a requirement for Sector membership.

The BOG had also solicited comments from the Sectors on the need for establishing criteria for the removal of Sector members who never attend Sector meetings or contribute to the activities of the Sector. The Sector did not agree on a single criteria for removal of inactive Sector members, but did suggest that a letter be sent to those who had not participated actively in Sector activities notifying them that unless they assumed an active role in Sector matters, they would lose their voting status on the Sector. The letter was also to point out that even without voting status as a Sector member, the individual could still remain on the Sector mailing list to receive Meeting Notices, Agendas, and Meeting Summaries and would always be welcome to attend the meetings.

9. Date and Site for Next Meeting

A two-day and one-half day meeting (about three fourths of a day for the NIR Protein Sector with the remaining time for the Grain Moisture Meter Sector) is planned for March 10-12, 1997 in Atlanta, GA.

National Type Evaluation Technical Committee
Grain Moisture Meter Sector
Meeting Summary
September 9 – 11, 1996, Kansas City, MO

Agenda Items

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1. Report on NCWM Annual Meeting

The NCWM Annual Meeting was held July 21-25, 1996 in New Orleans, LA. Diane Lee, NIST/OWM, reported on action taken by the Conference on issues of interest to the Sector [Note: for additional discussion on the issues listed below refer to *NCWM Publication 16, April 1996*; and to "Addendum Sheets to the Interim Report of the Committee on Specifications and Tolerances" for the 81st Annual Meeting] :

356-1 Elimination of Retroactive Dates; Effective for Devices Placed into Service after January 1, 1998
This item was the Sector's recommendation that the code be reorganized into two parts to address: (1) NTEP meters and any meters manufactured or placed into service after January 1, 1998; and (2) all non-NTEP meters manufactured or placed into service prior to January 1, 1998. The conference adopted the Sector's recommendations with one exception. The Sector had recommended changing the wording of the sentence "The minimum temperature difference shall be 10EC (degree Celsius)" to "The minimum temperature difference shall be 10 Celsius degrees." The S&T Committee's decision not to make this change was based on (1) NIST Special Publication 811 "Guide for the Use of the International System of Units (SI)" which recommends the use of degree Celsius (EC) for a temperature interval or a temperature difference; and (2) to remain consistent with the existing NIST HB 44 language. The new two-part code will appear in the 1997 edition of HB 44.

356-2 S.1.10 (New Section S.1.5.) Operating Temperature
The conference adopted the Sector's recommendation to modify S.1.10 to clarify that paragraph (a) applied to the Warm-up Period; and (2) that the temperature range need not be marked on the device. This paragraph will be re-numbered and will appear as S.1.5. in Part (a) of the re-organized code.

102-4 NTEP Policy: Examples of Appropriate Language to Use in Conjunction with the NTEP Name and Logo in Advertising and Brochures
The Conference approved the NTEP Board of Governors recommendation to include examples of Language to Use in Conjunction with the NTEP Name and Logo in Advertising and Brochures in Part I of Publication 14. Included in the examples is the Sector recommendation for Grain Moisture Meters shown below:

> **Grain Moisture Meter**
> The [Model XXXX] meets or exceeds the accuracy and performance requirements for Grain Moisture Meters as detailed in National Institute of Standards and Technology (NIST) Handbook 44. A Certificate of Conformance, Number XX-XXX, was issued under the National Type Evaluation Program (NTEP) of the National Conference on Weights and Measures, approving this model for commercial use on the following grains: (append list of grains for which NTEP approval has been granted for this model.)

2. Proposed Change to H44 Sec. 5.56(a) - S.2.5. Provisions for Sealing:

[Note: Paragraph S.2.3., Provisions for Sealing, of the old Code became Paragraph S.2.5. in Section 5.56(a) of the re-organized Code adopted at the NCWM 81st Annual Meeting.]

Background: When originally considering provisions for sealing grain moisture meters, the Sector concluded that physical seals would not constitute a meaningful security measure if frequent bias adjustments were required (as might be the case with multi-constituent NIR meters) and that event counters alone would not provide meaningful information on the appropriateness of the adjustment. The Sector agreed that sealing requirements for NIR based instruments should equal or exceed those specified for Category 3 devices in the Scales Code. The Sector decided that devices should either be sealed by a physical seal or , if the operator is able to make changes affecting the metrological integrity of the device, should use an audit trail consisting of an event logger which included an event counter, the parameter ID, the date and time of change, and the new value of the parameter (or the new calibration version number if the change consisted of multiple constants). At the 1995 Annual Meeting of the NCWM, H44 paragraph S.2.3., Provision for Sealing, was amended to specify the minimum information which must be contained in the audit trail. As S.2.5. is presently worded, however, the case of a device with remote configuration capability is not covered. At their March 1996 meeting, the Sector was asked to consider a change to S.2.3. *[Now S.2.5. in the revised code]* which would require any device with remote configuration capability to have an audit trail. One manufacturer objected strongly to this proposal on the basis that there was no difference, from an enforcement point of view, from breaking a seal to allow a change to be made via a device's keyboard and breaking a seal to allow a change to be made from a remote site (e.g., via modem or acoustic coupler.) It was also pointed out that there was an economic consideration in choosing a physical seal vs incorporating sufficient memory for an audit trail incorporating an event logger (memory being more expensive than a physical seal.) Several other Sector members favored requiring audit trails for devices with remote configuration capability, whether or not a seal had to be broken to enable the device to be remotely configured. At that time the Sector was unable to reach consensus on the issue.

Discussion: The Scales and Liquid Measuring Devices Codes have categorized devices and methods of sealing. The Sector considered adopting similar categories for grain moisture meters to address the issues raised at the previous Sector meeting. The distinction between a Category 1 device and a Category 2 device (as applied to moisture meters) was not immediately clear. One member suggested that it seemed to be a matter of accountability, with a Category 1 device, the user has direct knowledge of the information being keyed into the device once a seal is broken. With a Category 2 device, however, once the seal is broken the user may only know that "some information was sent to the device by modem (or computer)." There was substantial discussion as to whether a Category 2 device should require ***both*** a physical seal ***and*** event counters or ***either*** a physical seal ***or*** event counters. There were those who felt that event counters were preferable to a physical seal for moisture meters which might be inspected before calibrations were available for the coming harvest. In which case, it would be a full year before that meter was inspected again. With a physical seal as the only security, the meter might go un-sealed for the entire time with no record of what changes may have been made. A poll of W&M members showed that very few jurisdictions were actually applying tamper proof physical seals. The Sector decided to follow the lead of the Scales code and allow ***either*** a physical seal ***or*** event counters for Category 2 devices.

Conclusion: The Sector recommends the following changes to **H44 - Sec. 5.56(a). Grain Moisture Meters** including the addition of Table S.2.5. [Editor's note: To ensure legibility, the text in table S.2.5. has not been underlined to indicate it is an addition. The entire table is to be treated as an "addition".)

S.2.5. Provision for Sealing

~~(a)~~ Provision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., audit trail available at the time of inspection as defined in ~~part b~~ Table S.2.5.), before any change that affects the metrological integrity of the device can be made to any mechanism.

~~(b) If the operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc.) in normal operation, the device shall use an audit trail. The minimum form of the audit trail shall be an event logger and shall include:~~

X ~~An event counter (000 to 999)~~
X ~~the parameter ID,~~
X ~~the date and time of the change, and~~
X ~~the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number is to be used rather than the calibration constants.)~~

~~The device is not required to display this information, but a printed copy of the information must be available through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)~~

[Note: Zero-setting and test point adjustments are considered to affect metrological characteristics and must be sealed.]

Table S.2.5. Categories of Device and Methods of Sealing

Categories of Device	*Method of Sealing*
Category 1: No remote configuration capability	*Seal by physical seal.*
Category 2: Remote configuration capability, but access is controlled by physical hardware *Device shall clearly indicate that it is in the remote configuration mode and shall not be capable of operating in the measure mode while enabled for remote configuration.*	*The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters; one for calibration parameters and one for configuration parameters. If equipped with event counters, the device must be capable of displaying, or printing through another on-site device, the contents of the counters.*
Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password)	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change , and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants). A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) times the number of sealable parameters in the device, but not more than 1000 records are required.* ***(Note: Does not require 1000 changes to be stored for each parameter.)***
Category 3a: No remote capability, but operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc.) in normal operation	*Same as Category 3*
Category 3b: No remote capability, but access to metrological parameters is controlled through a software switch (e.g., password)	*Same as Category 3*

3. Review of Sector Membership

In January at the Interim NCWM Meeting, members of the NTEP Board of Governors (BOG) addressed questions which had been raised concerning membership and appointment to National Type Evaluation Technical Committee (NTETC) Sectors. They agreed that membership is conferred on individuals, not companies; therefore, the resignation of an individual from a Sector does not automatically entitle the individual's company to continue Sector membership. The company may, however, nominate another individual for consideration by the NCWM Chairman, who makes all appointments to the Sectors. Although membership is conferred on individuals, the BOG reaffirmed that each individual does not necessarily have a separate vote. Only one vote per company or agency is permitted. [*Note: for additional discussion on this subject, see Publication 16, April 1966, item 102-6.*]

Subsequently, at the recent Annual Meeting, the Conference agreed to the following modification in the rule governing designation of alternate representatives at Sector meetings:

> Although the [NCWM] Chairperson will appoint members [on the advice of the Sector chairman and technical advisor], an appointed representative may designate an alternate with full voting rights for an individual meeting whenever necessary.

It has been brought to the attention of the Sector's NIST member that there have been several changes in representation which have not been appointed officially by the NCWM Chairperson. The membership status of those attending the Sector meeting, as well as those listed officially as members, was reviewed. This time only, Diane Lee, NIST/OWM will send to the NCWM Chairperson, a single letter with the names of those desiring appointment to the Sector as voting members (if they have not previously been appointed.) Attendees were reminded that maintaining NCWM membership was a requirement for Sector membership.

The BOG had also solicited comments from the Sectors on the need for establishing criteria for the removal of Sector members who never attend Sector meetings or contribute to the activities of the Sector. The Sector did not agree on a single criteria for removal of inactive Sector members, but did suggest that a letter be sent to those who had not participated actively in Sector activities notifying them that unless they assumed an active role in Sector matters, they would lose their voting status on the Sector. The letter was also to point out that even without voting status as a Sector member, the individual could still remain on the Sector mailing list to receive Meeting Notices, Agendas, and Meeting Summaries and would always be welcome to attend the meetings.

4. Time and place for next meeting

A two-day and one-half day meeting (about three fourths of a day for the NIR Protein Sector with the remaining time for the Grain Moisture Meter Sector) is planned for March 10-12, 1997 in Atlanta, GA.

5. Update on Type Evaluation and Phase II Testing

Rich Pierce of the Grain Inspection, Processors and Stockyards Administration (GIPSA, formerly FGIS), the NTEP laboratory for Grain Moisture Meters, reported that a Certificate of Conformance (CC) number had been issued for the Motomco 919E, bringing the total number of instruments in the Phase II Calibration Review program to six. One Sector member complained that CC's had not been printed for devices which had been granted CC numbers some time ago. Dr. Pierce acknowledged that the NTEP lab was overdue in forwarding the necessary final reports to NIST. Several device manufacturers noted that this situation gave a marketing advantage to those companies fortunate enough to have printed CC's available for their devices.

Regarding the collection of Phase II data on 1996 crop, Dr. Pierce reported that a late wheat season with fewer samples than normal had delayed collection of data until well into July. The lab's goal for releasing wheat data to manufacturers is November 30.

6. Proposed Addition to Publication 14 - Criteria for NTEP Calibration Review

Background: In connection with annual review of calibrations, the NTEP laboratory has noted that additional criteria are required to assist in evaluating calibrations when there is an insufficient number of samples in any two-percent range and when manufacturer supplied data is involved. To address these issues, criteria were developed on May 31, 1996 by Rich Pierce, Jim Rampton, and Dave Funk, all of GIPSA. These criteria (except for Case VII.B.) were applied along with criteria listed in Publication 14 to determine "approved" and "pending approval" moisture ranges for the 1996 calibration review and certificate update. The proposed Appendix C defines the "Standard data format" specified in the criteria.

Discussion: Questions were raised regarding Case I-A which would seem to imply that a calibration could be classified as "not approved" based on the results of a single sample. It was pointed out that this criteria applied only to the end 2% intervals. It was further noted that Phase II data: (1) is cumulative from year to year; and (2) for calibrations already classified as "pending" includes manufacturer supplied data (subject to the conditions of Case VII) for that range, and, therefore, is not subject to conditions of Case I-A. The main purpose of Case I-A is to make it clear that moisture ranges will not be extended (even as "pending") based on data obtained on a single sample.

Conclusion: The Sector approved the addition of the following criteria and Appendix C to the Grain Moisture Meter Check List of Publication 14, Chapter 6.

> **V. Criteria for NTEP Moisture Calibration Review**
>
> The following criteria are to be applied along with criteria listed in Part IV, above, to determine "approved" and "pending approval" moisture ranges.

Special Cases Dealing with Inadequately Represented Moisture Intervals:

Case I. A single sample appears in a 2% moisture interval that is at the end of the calibration data range.

A. If the sample bias is outside the approval tolerance, the calibration is "not approved" in that moisture interval.

B. If the sample bias is within the approval tolerance, the calibration is "pending approval" in that moisture interval.

Case II. The samples in a 2% moisture interval at the end of the calibration data range do not represent at least one-fourth of the moisture range. For example, there are no samples with a moisture content greater than or equal to 18.5% in the 18 to 20% moisture interval.

A. If the average bias for the samples is outside the approval tolerance, the calibration is "not approved" in that moisture interval.

B. If the average bias for the samples is within the approval tolerance, the calibration is "pending approval" in that moisture interval.

Case III. There are two or more consecutive 2% moisture intervals at the end of the calibration data range that each contain only one sample. (Similar to Case I.)

A. If the bias for each 2% interval is within the approval tolerance, the calibration is "pending approval" for those moisture ranges.

B. If the bias for any of the inner intervals is within the approval tolerance, apply the criteria for Case I to successive intervals working in from the ends of the calibration range.

C. If the bias for the outer interval is within the approval tolerance but the bias for an inner interval is not, the calibration is "not approved" beyond (and including) the innermost interval that is determined to be "not approved" when applying the criteria for Case I.

Case IV. A 2% moisture interval that contains no data points is bordered by intervals with data points.

A. The calibration approval status for the empty interval is the same as that for the outer bordering interval.

Case V. A 2% moisture interval that contains one data point is bordered by intervals with more than one data point.

A. If the bias for the single point is within the approval tolerance and the bias for samples in the adjoining outer interval is within the approval tolerance, the calibration is "approved" for the interval with the single sample.

B. If the bias for the single point is within the approval tolerance and the bias for samples in the adjoining outer interval is within the pending approval tolerance, the calibration is "pending approval" for the interval with the single sample.

C. If the bias for the single point is within the approval tolerance and the bias for samples in the adjoining outer interval is outside the pending approval tolerance, the calibration is "pending approval" for the interval with the single sample.

D. If the bias for the single point is within the pending approval tolerance and the bias for samples in the adjoining outer interval is within the pending approval tolerance, the calibration is "pending approval" for the interval with the single sample.

E. If the bias for the single point is outside the approval tolerance and the bias for samples in the adjoining outer interval is outside the pending approval tolerance, the calibration is "not approved" for the interval with the single sample.

General Considerations

Case VI. All "approved" and "pending approval" calibration ranges listed on certificates of conformance will begin and end with even numbers.

Case VII. Manufacturers may submit supplementary data to extend calibration "pending approval" ranges beyond available NTEP moisture ranges; however, **beginning with the 1997 calibration review and certificate update, only manufacturer data supplied in the standard data format, as defined in Appendix C, will be considered when determining calibration ranges and pending approval status.**

A. Calibration status for any range can be no better than "pending approval" when based solely on manufacturer data.

B. Manufacturer data supplied earlier in graphical or non-standard format must be re-submitted in standard data format. Failure to supply data in standard format may result in withdrawal of "pending" status if data collected by the NTEP lab is not sufficient to support use of the calibration for the range claimed.

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

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.

3. Instructions for submitting.

Submit as flat ASCII files (see note below) on 3.5" diskettes, one diskette for each instrument, 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. Package the disks in protective mailers and mail to the NTEP Laboratory.

Note: The print files generated by today's popular spreadsheets are flat ASCII text files; that is, the contents are in one continuous string with each field delimited by one space (or a comma) with each record delimited by a carriage return line and a line feed.

File Names for Submitting NTEP Meter Data for Calibration Review	
Grain Type	File Name
Durum	DU
Hard Red Spring Wheat	HRS
Hard White Wheat	HDWH
Soft White Wheat	SWH
Hard Red Winter Wheat	HRW
Soft Red Winter Wheat	SRW
Six-Rowed Barley	SRB
Two-Rowed Barley	TRB
Corn	CORN
Oats	OATS
Long Grain Rough Rice	LGRR
Medium Grain Rough Rice	MGRR
Sorghum	SORG
Soybeans	SOY
Sunflower Seeds (Oil Type)	SFS

7. Proposed Change to Publication 14 - Tolerances for Calibration Performance

Background: The present organization, wording, and a typographical error of this part of the GMM Check List have made it difficult to understand and have led to misinterpretations of the Sector's original intent. Further, the paragraph referring to annual meetings of a committee to assist in making determinations regarding which calibrations need to be updated is no longer representative of the way changes are being administrated.

Conclusion: The Sector approved the changes shown below to address these problems:

IV. Tolerances For Calibration Performance:

Calibration performance must be tested against established criteria at the following stages of the type evaluation process:

1. Evaluation of the calibration data supplied by the manufacturer with the application for type evaluation.

2. Evaluating instrument and calibration performance over the 6% moisture range for corn, HRW wheat and soybeans (accuracy test discussed earlier).

3. Initial calibration approval for grains other than corn, HRW wheat, and soybeans.

4. Review of on-going calibration data collected as part of the national calibration program.

Calibrations for corn, HRW wheat and soybeans will be approved based upon type evaluation testing over a 6% moisture range and manufacturer supplied data over the remainder of the calibration range (See Part V. Criteria for NTEP Moisture Calibration Review.) The bias of all samples in a 2% moisture interval may not exceed one-half of the Handbook 44 acceptance tolerance.

Calibrations for other grains will be approved based upon data collected as part of the on-going national calibration program. Approval tolerances will again be one-half of the Handbook 44 acceptance tolerance, and will be applied in 2% intervals over the range of available data. An overall bias may be applied to the calibration in making approval decisions.

Tolerances used to require a change in ~~"approved"~~ calibrations will include the application of a 95% confidence interval to the maximum tolerance for each 2% moisture interval. The intent of applying the confidence interval is to avoid forcing a calibration change based upon insufficient data. After only one year of data collection, the number of samples in some intervals will be small and the confidence interval may be as large as the tolerance limit. In this instance, the calibration would have to be extremely poor before a calibration change would be mandated. After the instrument has been in the calibration program for several years, the confidence interval should be reduced to approximately 0.05 and recommendations can be made with greater certainty. The latest three years of data will be used to make decisions regarding the need to make a calibration update.

The status of all calibrations will be listed on the certificate of conformance. The categories are (1) approved, (2) pending, and (3) not available. The categories can be described as follows:

Approved: Corn, HRW wheat, and soybean calibrations will be approved based upon performance over the 6% type evaluation moisture range and manufacturer supplied data. Continued approval requires acceptable performance as part of the ongoing national calibration effort.

Calibration data, collected as part of the national calibration program, must indicate that calibration performance meets the tolerances for each 2% moisture interval before additional grains will be approved. Continued approval again requires acceptable performance as part of the national calibration effort, i.e., none of the average differences between predicted and reference values for the respective 2% moisture intervals exceed one-half the Handbook 44 acceptance tolerance plus a 95% confidence interval.

Pending: A new calibration will automatically be placed in this category.

This category also includes calibrations that have not yet met the criteria for approval, but that also have not performed badly enough to be listed as not approved. Such calibrations may be used on NTEP-approved meters.

Not Available: A calibration is not available for this grain included in the national calibration program. A calibration for this grain type shall not be used on NTEP approved meters.

For grains other than corn, soybeans and hard red winter wheat, a calibration ~~should~~ will not be listed on the Certificate of Conformance until it has had its calibration bias checked using a set of 10 to 12 samples referenced to the FGIS air oven laboratory and the FGIS official meter.

For this bias check the maximum allowable overall bias between Meter under test and air oven is: ± 0.4.

During bias testing of such pending ~~provisional~~ calibrations, if biases are detected which exceed the limits shown above ~~below~~, the Type Evaluation Laboratory shall immediately notify the Manufacturer. The Manufacturer shall then make changes or adjustments to the calibration which, in the Manufacturer's best judgement, minimize the differences between the Manufacturer's meter and the official air oven.

In support of such changes, the Manufacturer shall forward to the Type Evaluation Laboratory:

1. Detailed descriptions of the changes,
2. an explanation of how the changes affect the previous test results,
3. the calibration coefficients for the revised calibration, and

4. the unique identifier of the revised calibration.

The Type Evaluation Laboratory shall not forward a recommendation for certification to NIST until the Manufacturer supplies this information or notifies the Type Evaluation Laboratory that it wishes to amend the application for type approval to show the calibration in question as "NOT AVAILABLE." Testing of the revised calibration by the Type Evaluation Laboratory will not be required.

~~The Maximum allowable overall bias between Meter under test and air oven is: " 0.4.~~

~~Not Available: A calibration is not available for this grain included in the national calibration program. A calibration for this grain type shall not be used on NTEP approved meters.~~

~~A committee, perhaps the Moisture Meter Sector, shall meet each year to help make determinations regarding which calibrations need to be updated. This committee will take into consideration unusual growing conditions when making decisions related to calibration adequacy.~~

8. Test Weight per Bushel Indications

Background: The Grain Moisture Meter Code in H44 contains the following field test requirement for Test Weight per Bushel Indications:

> **T.3. For Test Weight Per Bushel Indications or Recorded Representations.** The maintenance and acceptance tolerances on test weight per bushel indications or recorded representations shall be 0.193 kg/hL or 0.15 lb/bu. The test methods used shall be those specified by the USDA FGIS. (Amended 1992)

Some time ago, when the Sector was discussing this requirement, the reasonableness of the tolerance, was questioned, especially as it applied to the test weight of corn. It was pointed out that the tolerance was taken from FGIS (now GIPSA) procedures which used only dockage-free dry hard red winter wheat. The Sector was in general agreement that the test was not realistic for assessing the performance of the various types of devices in commercial use, and that a different tolerance should be considered for each grain type. The Sector considered dropping this section from the Moisture Meter Code, reasoning that it would be more appropriate to include it in a separate chapter of H44 devoted specifically to the requirements for test weight per bushel devices. Several members of the Weights and Measures Community objected, however, stating that deletion of this section, prior to the development of a separate code chapter, would leave them without inspection and enforcement authority over these devices.

There are now at least two NTEP Grain Moisture Meters which have the capability to automatically provide an indication and recorded representation of test weight per bushel. Because of the unrealistic tolerances in the existing Code, however, the test weight capability of these meters was disabled for the NTEP tests. Some State W&M Officials are permitting these devices to display and print the test weight information provided that some disclaimer appears on the printed ticket (e.g. the words "approximate" next to the test weight result) or that a warning against use of the information for commercial purposes is posted prominently on the device.

As early as 1986, the International Organization for Standardization (ISO) had adopted a "reference method," utilizing a complicated apparatus with a 20 liter container, for determining grain bulk density (mass per hectoliter). This reference method is detailed in International Standard ISO 7971. Recently, ISO approved a "routine method" (ISO 7971-2), using a one-liter device (sometimes referred to as a chondrometer). In this method, a pre-measured volume of grain is dropped, under controlled conditions, into a tall cylinder. A blade, manually pushed through a slot in the cylinder, separates one liter of grain from the excess. The one liter portion is then weighed and a kilogram per hectoliter figure is calculated (applying a slope and bias correction for differences between the one-liter device and the reference method). The method specified in ISO 7971-2 has become the recognized international standard for test weight. Because the straight conversion factor of 1.287 used in the U.S. to change pounds per bushel (measured with the quart test kettle) to kilograms per hectoliter considers only the relationship between volume and weight between English and metric systems, and does not take into account packing differences caused by the two different methods, measurements made using the two methods do not agree. GIPSA has been gathering data comparing test weight measurements obtained with GIPSA's one-quart test kettle method and the internationally used one-liter chondrometer to determine what should be done to eliminate problems caused by differences between the two procedures.

To provide the Sector with additional background on this subject, Larry Engebretson, GIPSA Technical Center, briefed the Sector on the differences between the official U.S. procedure for determining test weight for wheat and the method specified in ISO 7971-2 . The official U.S. procedure is described in GIPSA's *Grain Inspection Handbook*, Book II, Chapter 1. Apparatus specifications are contained in GIPSA's *Equipment Handbook*, Chapter 5. At present, there is no standard reference method for the U.S. procedure. New kettles (or kettles producing questionable results) are water volume tested (weight of water in kettle must 1.098.08"1gram.) Complete apparatus is check tested by comparing it with a like "master unit" using samples of hard red winter wheat. Check tests are performed initially and periodically. The apparatus under test must agree with the "master" unit within "0.15 lbs/bu (based on five replicates per sample with the highest and lowest result discarded before calculating an average). Tests using three replicates of some 600 wheat samples show a variability of 0.074 lb/bu for the U.S. method. This compares with an average standard deviation equivalent to 0.089 lb/bu for the ISO routine method. Reproducibility figures were not available for the ISO method. The major source of variability for the U.S. method is an abnormal stroker while the major source of variability for the ISO method is inappropriate pouring rate. Converting lb/bu tests made using the U.S. method to the equivalent Kg/hl result with the ISO method involves adding a bias (ranging from 1.8 kg/hl for durum to 2.6 kg/hl for hard red wheat) to the value obtained by straight units conversion (multiply lb/bu by 1.287).

To acquaint the Sector with various devices being used commercially for test weight measurement, Tom Runyon, Seedburo Equipment Company, demonstrated some of the equipment currently available.

Discussion: This issue was reviewed at the Sector's March 1996 meeting. The Sector was in general agreement that Test Weight per Bushel devices (Grain Bulk Density Apparatus) should be addressed in Code separate from the Grain Moisture Meter Code. At that meeting all Sector members present expressed an interest in working on this new code, noting that the measurement of Test Weight was next in priority behind moisture and protein measurement when the Grain Quality Incentives Act of 1990 authorized GIPSA to work with NIST and NCWM to standardize commercial inspections. Time limitations prevented the Sector from addressing the following questions at the September 1996 meeting. They will be considered at the March 1997 meeting.

1. What is the appropriate Reference Method or National Standard?
2. The characteristics of known test weight measuring devices are tabulated below. Is the Sector aware of any additional types? Should the proposed Code cover all types and variations shown?

   a. **Test Kettle** with manual strike-off
      - Kettle Size: pint, quart, l iter, half-liter
      - Scale Type: Beam balance (calibrated in mass units, chart or calculation required); Electronic scale (calibrated in mass units, chart or calculation required); Electronic scale (calibrated directly in test weight)

   b. **Chondrometer**
      - Volume: one-fourth liter, half liter, liter
      - Scale Type: Beam balance (calibrated in mass units, chart or calculation required); Electronic scale (calibrated in mass units, chart or calculation required); Electronic scale (calibrated directly in test weight for selected grain type)

   c. **Other** (incorporated into grain moisture meters or other grain measuring devices or constructed specifically as a test weight device not classified above)
      - Volume: Various (device dependent)
      - Operation: Fully automatic (with internal weighing device and direct display of test weight for selected grain type); Manual filling and manual volume isolation (with internal weighing device calibrated directly in test weight for selected grain type)

3. Is the chondrometer practical for use with large kernels and seeds such as corn, soybeans, and sunflower seed?

4. Should further action on this item be postponed until GIPSA has decided whether to adopt ISO 7971 as a reference method?

9. Progress Report on Compilation of Baseline Performance Data

The objective of the NTEP Moisture Meter Program is to bring interstate and intermeter comparisons closer together. To determine if this objective is being met, data has been compiled from State Weights and Measures existing field test reports to establish a "pre-NTEP" performance baseline which can be compared to data compiled from field tests made after the NTEP program has been in effect for several years. Dr. Thomas Brumm, Composition Systems division of MBS Incorporated, reported on results compiled by Joy M. Irlbeck and Dr. Charles R. Hurburgh, both of Iowa State University, (See Attachment). It was noted that three of the major grain states (Illinois, Iowa, and Indiana) did not supply the requested field test data. It was also noted that Arkansas had submitted data but was not mentioned in the report. From the data supplied, the report concluded that states are doing a good job of maximizing the performance of existing meters. Estimates of current performance, measured by standard deviation relative to the oven are:

Corn: "0.45% pts
Soybeans: "0.30% pts
Soft Wheat: "0.35% pts

The report recommends: (1) that the earlier oven-meter collaborative study be repeated; (2) that attempts be made to obtain data from additional states; and (3) that Handbook 44 be revised to allow for method-specific tolerance. [*Editor's note:* Handbook 55 already contains the note: "These tolerances do not apply to tests in which grain moisture meters are the transfer standard."] The Sector endorsed the recommendation to repeat the earlier collaborative study. Dr. Hurburgh had sent word that ISU would distribute the samples if the earlier participants would agree to repeat the study. He indicated that participant oven data would be optional as the earlier study had shown good stability of samples for the moisture ranges involved. Some Sector members were of the opinion that some of the earlier results, represented as being obtained on NTEP meters, did not, in fact, use the final NTEP approved calibration or were obtained on older models which did not have characteristics identical the NTEP versions. The Sector urged the organizer to insist that each collaborator provide, along with their meter results, a copy of the calibrations actually used.

10. Proposed Change to Publication 14 - Sample Temperature Sensitivity

[Note: Because of time limitations, action on this item was postponed until the next Sector meeting. The following *Background* and *Proposal* are repeated in full in this Meeting Summary to remind Sector Members that this issue will be on the agenda for the Sector's March 1977 meeting and to allow manufacturers time to assess the impact of this proposal.]

Background: In some instruments, temperature compensation is accomplished by including, in the calibration set, data obtained on samples at various temperatures. For these instruments, calibration updates may affect the temperature compensation and thus affect performance over temperature. At an earlier meeting, the Sector was reminded that temperature studies were not included in Phase II of the NTEP moisture program and that no temperature testing had been performed by the NTEP Laboratory on the "other 13" NTEP grains [i.e., grains other than corn, soybeans, and hard red winter wheat]. One manufacturer expressed the opinion that manufacturers should be required to submit temperature data for the "other 13" grains and also for any grain when a calibration change is made. Another suggested that calibration changes for a given meter model could be evaluated based on spectral or "raw" data if it is available for the moisture and temperature ranges involved. It was also suggested that moisture data be collected on one or two samples at both extremes of temperature in each 2% interval of moisture over the desired moisture range. Though discussed at length, the Sector failed to reach a consensus on detailed rules and procedures for obtaining objective evidence that temperature performance was acceptable for calibrations for the "other 13" grains and for any calibration changes made on any grain subsequent to NTEP testing. The Sector Technical Advisor and the NTEP laboratory representative were asked to propose minimum data requirements and a detailed procedure for collecting temperature data on: 1) the "other 13" grains and 2) the "standard 3" grains for extended moisture ranges.

Proposed: The Sector is asked to approve changes to the first paragraph of the Sample Temperature Sensitivity Test of Publication 14 for Grain Moisture Meters to correct typographical errors and to set the upper test temperature limit to 45 EC to agree with the upper limit of 45 EC in the test on Instrument Temperature Sensitivity. [Note: for additional discussion on this upper temperature limit, see the September 1995 Meeting Summary.] The Sector is also asked to approve the addition of a note to the end of the Sample Temperature Sensitivity test to address the requirement for manufacturers to provide objective evidence of satisfactory performance for grain calibrations not tested by the NTEP laboratory over the range of specified sample temperatures, and to approve the addition of Appendix D which specifies the procedure for conducting the test and defines the requirements for manufacturer provided data.

II. Sample Temperature Sensitivity:

Additional testing is required to verify that accurate results are provided when the sample and instrument are at different temperatures. This will be referred to as the sample temperature sensitivity test. The purpose of this test

is to verify that the instrument provides accurate results when the difference in temperature between the sample and the instrument is at the manufacturer specified, difference (a minimum Δ of 10 °C is required). The sample temperature sensitivity test will be conducted using corn, HRW wheat, and soybean samples. Tests will be conducted with the instrument at room temperature and the sample temperature varying from room temperature ~~+ΔT to room temperature~~ $+\Delta T_H$ to room temperature $-\Delta T_C$. ~~ΔT~~$_C$ (where ΔT_H is the manufacturer specified difference for grain above room temperature, and ~~the~~ ΔT_C is the manufacturer specified difference for grain below room temperature. In no case will room temperature $+\Delta T_H$ be allowed to exceed ~~32~~ 45 °C, but the two differences need not be equal.)

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Note: For any NTEP approved or pending calibration not previously tested by the NTEP Laboratory for Sample Temperature Sensitivity, manufacturers are required to provide objective evidence that those calibrations will perform satisfactorily over the range of temperatures specified by the manufacturer. This includes calibrations for any of the "other 13" NTEP grains [i.e., grains other than corn, soybeans, and hard red winter wheat] as well as any calibrations (including corn, soybeans and hard red winter wheat) which have been changed or modified subsequent to either NTEP testing or submission of manufacturer's data. Performance limits, test methods, and data to be submitted are specified in Appendix D.

Appendix D - Sample Temperature Sensitivity
Manufacturer Provided Data

The sample temperature sensitivity test is required to verify that accurate results will be provided when the sample and instrument are at different temperatures. This Appendix specifies the procedure for conducting the test and defines the requirements for manufacturer provided data. Tests will be conducted with the instrument at room temperature and sample temperature varying from room temperature $+DT_H$ to room temperature !DT_C. (where DT_H is the manufacturer specified difference for grain above room temperature, and DT_C is the manufacturer specified difference for grain below room temperature.)

Two (2) samples are to be selected from each of three 2% moisture intervals for each grain type for which data is to be provided. Two analyses will be made for each grain sample at each of the three test temperatures. The overall bias for the 12 observations (2 samples x 3 moisture intervals x 2 replicates) run at the temperature extremes must agree with the room temperature results within the tolerances listed in the accompanying table.

Test Procedure:

1. Analyze the room temperature samples on the test instrument (Room 1).

2. Condition samples to the cold temperature and run on the instrument under test (Cold).

Note: Each sample is to be checked for temperature before it is analyzed. Samples must be within 0.5℃ of the desired test temperature at time of analysis, and samples are to be reconditioned to the test temperature after each analysis. The sample cell on the instrument under test is to be given a minimum of 10 minutes to equilibrate to room conditions between sample analyses.

3. Bring the samples to room temperature, and run the samples on the instrument under test (Room 2).

4. Condition the samples to the hot temperature and run on the instrument under test (Hot), observing the precautions in the note following step 2.

5. Repeat step 3 to obtain another set of room temperature results (Room 3).

COLD BIAS = Cold! ((Room 1 + Room 2) / 2)
HOT BIAS = Hot! ((Room 2 + Room 3) / 2)

Note: As an alternative to repeating actual temperature tests for calibration changes made after manufacturer data has been provided, subsequent results may be predicted using the new calibration and previously collected spectral or other "raw" data.

Manufacturer (or Applicant) Data to be supplied:

1. Name of applying organization.
2. Manufacturer (if different from Applicant.)
3. Model and serial number
4. Source of moisture results (actual test or predictions using existing spectral or other "raw" data) and date(s) original spectral or "raw" data was obtained.
5. For each grain type, specify type and show moisture results vs air-oven values on each individual sample at each temperature.
6. Calculate and show averages for Hot moistures, Cold moistures, Room 1 moistures, Room 2 moistures and Room 3 moistures.
7. For each grain type calculate and show cold and hot bias.

Moisture Ranges and Tolerances for Sample Temperature Sensitivity Manufacturer Supplied Data		
Grain Type	Moisture Range for Test	Tolerance Limit (Bias at Temperature Extremes)
Corn	12-18%	0.45
Durum Wheat	10-16%	0.35
Eastern White Wheat	10-16%	0.35
Western White Wheat	10-16%	0.35
Hard Red Spring Wheat	10-16%	0.35
Hard Red Winter Wheat	10-16%	0.35
Soft Red Winter Wheat	10-16%	0.35
Hard White Wheat	10-16%	0.35
Sunflower seed (Oil)	6-12%	0.45
Grain Sorghum	10-16%	0.45
Soybeans	10-16%	0.35
Two-rowed Barley	10-16%	0.35
Six-rowed Barley	10-16%	0.35
Oats	10-16%	0.45
Long Grain Rough Rice	10-16%	0.45
Medium Grain Rough Rice	10-16%	0.45

11. Proposed Revision to H44 Sec. 5.56(a) -S.2.4.3. Calibration Transfer

[This item was not included in the Agenda distributed in August. It was added to the agenda at the meeting by consensus of the Sector.]

Background: The requirements for calibration transfer between moisture meters of like model are specified in the Grain Moisture Code of Handbook 44:

> **Calibration Transfer. -** The instrument hardware/software design and calibration procedures shall permit calibration development and the mathematical transfer of calibrations between instruments of like models.
>
> **Note:** Only the manufacturer or the manufacturer's designated service agency may make calibration transfer adjustments on moisture meters and, except for instrument failure and repair, only at a prescribed period of time during the year. This does not preclude the possibility of the operator installing the manufacturer-specified calibration constants or standardization parameters under the instructions of the manufacturer or his designated service agency.

Early in the development of the NTEP program for moisture meters, the suitability of NIR instruments for use in a regulated commercial environment was questioned. When it became clear that the industry was strongly in favor of permitting NIR instruments to be used for commercial moisture measurements, the Sector agreed that any modifications to the Moisture Meter Code to permit the use of NIR instruments should not compromise the enforcement controls then in effect for meters using other technologies. Thus, the requirement for calibration transfer was adopted. The intent was to require identical calibrations in meters of like type so field inspectors could verify that correct calibrations had been installed in the instrument. Calibration adjustments (for moisture) were not expected to require change for at least a 12-month period (except in cases of device repair.)

The Code provision allowing the operator to install manufacturer-specified calibration constants or standardization parameters (under the instructions of the manufacturer or his designated service agency) originally had two objectives:

1. To allow the user to install a new calibration without having to return the instrument to the manufacturer or a service agency.

and 2. To allow the user to install new standardization parameters (calibration transfer adjustments) if required by the field replacement of certain components (provided that the manufacturer has the means to determine the appropriate standardization parameters without having the instrument in the shop.)

Most NIR instruments are "multi-constituent" devices capable of measuring moisture, protein, etc. For commercial use, they must meet the requirements of both the Grain Moisture Meter Code and the Near Infrared Grain Analyzer Code (NIR Code). Early in the development of the NIR Grain Analyzer Code, the NIR Sector recognized that provisions would have to be made for frequent ***user*** adjustments of bias in NIR protein calibrations (user determined slope adjustments are not permitted). To provide the necessary security, the NIR Code stipulates that user bias adjustments can be made only on the basis of tests run on a current set of Standard Reference Samples (SRS) traceable to FGIS Master Instruments, and the user is required to keep a log (Calibration Adjustment Data Sheet) which field inspectors can check against the device's event logger, also required by the NIR Code. The GMM Code presently has the same Calibration Transfer wording as the NIR Code. The GMM Code contains no user requirement regarding bias adjustments because most GMM Sector members had believed that user determined bias adjustments would not be required [Earlier GMM Code had not permitted such adjustments].

Because later versions of the GMM Code did not specifically require the same bias values for a given grain moisture calibration in all instruments of like type, some manufacturers of multi-constituent devices have used bias terms to standardize readings between individual instruments of like type. In these instances, for a given grain, the same calibration constants and the same slope value are used in all instruments, but bias values differ from instrument to instrument. When these instruments were submitted for type evaluation, the NTEP laboratory did not consider bias terms part of the calibration constants. As a result, bias terms do not appear on the CC's for these instruments. Without suitable standards, or a known "good" device to compare against, field inspection has no way of knowing if the bias value installed in an instrument is the correct one. Because moisture bias is a user accessible parameter in currently approved multi-constituent devices, the possibility for fraud exists (even within maintenance tolerance limits).

Proposed: The Sector was asked to consider modifying the Calibration Transfer paragraph (and the Note following) to further restrict the kind of changes which a user may make to grain moisture meters and to clarify the difference between standardization adjustments (or parameters) and grain calibration coefficients. The proposed changes are shown below.

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

Note: Only the manufacturer or the manufacturer's designated service agency may make ~~calibration transfer~~ standardization adjustments on moisture meters. ~~and, except for instrument failure and repair, only at a prescribed period of time during the year~~. This does not preclude the possibility of the operator installing ~~the~~ manufacturer-specified calibration constants ~~or standardization parameters~~ under the instructions of the manufacturer or his designated service agency. Standardization adjustments (not to be confused with grain calibrations) are those physical adjustments or software parameters which make meters of like type respond identically to the grain(s) being measured.

Discussion: The Sector was divided on this issue. NIR multi-constituent device manufacturers objected to the proposed change and were of the opinion that the event logger in the audit trail provided the necessary security. Manufacturers of dielectric moisture meters (in which bias terms are either coded into one of the calibration coefficients or listed explicitly as bias values on CC's) favored the change, supporting those Weights and Measures members who didn't want to see users making adjustments in an un-controlled manner. Some members were concerned that allowing bias adjustments in this manner would ultimately defeat the Sector's goal of uniformity between instruments. One Sector member wondered how field inspection would know the difference between an old NTEP calibration and a new NTEP calibration if the only change required was a bias change which was different in each instrument of that type. Another suggested that a table of manufacturer approved moisture biases be posted on the individual instruments. It was pointed out that this table would have to be revised whenever a calibration change was made. Multi-constituent device manufacturers were asked if it was possible to restrict user bias adjustment on moisture calibrations and still allow user bias adjustment on protein. Manufacturers indicated that this would require a software (or firmware) change.

Conclusion: The Sector was unable to reach a consensus on this issue. Further discussion was postponed to the Sector's March 1997 meeting. To assist the Sector in assessing how adequate an event logger is for providing security in this case, manufacturers were asked to provide copies of sample audit trails illustrating both calibration changes (installation of a new calibration) and several user bias adjustments to an existing calibration for their instruments. [Editor's note: If reproducible copies of the audit trails can be forwarded to Diane Lee at NIST/OWM by February 3, these will be duplicated and distributed with the agenda for the March meeting.]

12. Standardization of Instruments

[This item was not included in the Agenda distributed in August. It was added to the agenda at the meeting by consensus of the Sector.]

Background: Preliminary data compiled by Dr. Hurburgh suggested that instruments in the field (or in State Moisture Labs) are not closely aligned with instruments of like type in the NTEP lab. Thus, Phase II data collected on the NTEP lab instruments may not be truly representative of what can be expected in the field. Manufacturers typically maintain a "standard" instrument (or instruments) against which production units are tested and adjusted to be within the manufacturer's acceptable tolerance limits. At the present time, there are no requirements for the NTEP lab instruments to be periodically compared with manufacturer's standard(s) or adjusted to agree with the manufacturer's "standard(s)". Thus, any change in performance over time in either the NTEP lab units or the manufacturer's "standard" units can result in a corresponding loss of accuracy (compared to air oven) in production units. Procedures are needed to assure that manufacturer's standards and NTEP lab instruments are closely aligned. The Sector was asked to consider the following alternatives for establishing traceability between manufacturer's standards and the NTEP lab instruments:

1. Require NTEP lab instruments to be returned to the manufacturer annually for comparison with the manufacturer's standards. NTEP lab instruments to be re-standardized if comparisons are not within established limits (to be determined). Manufacturer to supply NTEP lab with a certificate of traceability (showing known errors) for each grain type.

2. At a designated time of year, require manufacturer to send a selected group of grain samples to NTEP lab after first running the samples on manufacturer's "standard" unit(s).. NTEP lab then runs submitted samples on manufacturer's NTEP lab unit and returns samples and "raw" data to manufacturer. Manufacturer re-runs samples (to verify that samples have not changed), and uses "raw" data to determine if NTEP lab instruments need adjustment of standardization parameters. Adjustments are transmitted either by modem or disk and the sample exchange is repeated. When a sample exchange indicates that comparisons are within established limits, manufacturer supplies NTEP lab with a certificate of traceability (showing known errors) for each grain type.

3. Like "2" above, except manufacturer brings standard instrument (or pretested samples) to NTEP lab, runs the samples and makes needed adjustments on site. Manufacturer subsequently supplies NTEP lab with a certificate of traceability (showing known errors) for each grain type.

Discussion: Except for one manufacturer, who was concerned about possible shipping damage, alternative 1 was thought to be the most practical approach. Alternative 2 was eliminated from consideration, because differences in environmental conditions (temperature and humidity) between the two locations would add an additional source of possible variance which would not be desirable when attempting to achieve error limits of 0.1% or less. Alternative 3 was discarded because manufacturers were reluctant to have their "master" units leave their lab or factory. The Sector agreed that the specific alignment details (e.g. what instrument parameters to measure, what adjustments to make, etc.) would vary with the technology involved and the manner in which that technology had been implemented . The Sector was in agreement that the NTEP units should be standardized against manufacturers' master units annually (typically between March 1 and April 30). It was suggested that manufacturers should also be required to demonstrate that their methods for standardizing units in production provide reasonable assurance that units "as shipped" will agree with the NTEP units within acceptable tolerances. The Technical Advisor and the NTEP Lab representative were requested to suggest wording and error limits for these requirements which could be considered by the Sector at its next meeting for addition to the GMM Check List in Publication 14.

Attendance List - Sector Meetings September 9-11, 1996 Kansas City, MO

Name	Affiliation	September		
		9	10	11
Jack Barber	JB Associates	x	x	x
Connie Brown	DICKEY-john Corp.	x	x	x
Randy Burns	Arkansas Bureau of Standards	x	x	x
Tom Brumm	MBS, Incorporated (Alt. for C. Hurburgh, ISU)	x	x	
Marty Clements	Steinlite Corporation		x	
Bob Davis	Illinois Department of Agriculture		x	
Cassie Eigenmann	DICKEY-john Corp.	x	x	x
Larry Engebretson	USDA-GIPSA-TSD		2	
David Funk	USDA-GIPSA-TSD	x	x	
David Krejci	GEAPS	x	x	
Diane Lee	NIST/Office of Weights and Measures	x	x	x
Keith Locklin	ConAgra Corn Processing (representing GEAPS)	x	x	x
Don Muller	Bran+Luebbe	x	x	
Pontus Norbreus	Perstorp Analytical		x	x
Ray Oberg	Zeltex, Inc	x	x	
Don Onwiler	Nebraska Public Service Commission	x	x	x
Allison Pflug	CSC Scientific	x	x	
Richard Pierce	USDA-GIPSA-TSD	x	x	x
James Rampton	USDA-GIPSA-TSD		x	
Ole Rasmussen	Foss Food Technology	x	x	x
Joe Rothleder	California Dept. of Food & Agriculture	x	x	x
Tom Runyon	Seedburo Equipment Co.	x	x	x
Fred Seeber	Shore Sales	x	x	x
Cheryl Tew	North Carolina Dept. Of Agriculture	x	x	x
Cliff Watson	Consultant	x	x	x
Diane Wise	Colorado Dept. of Agriculture, Meas. & Stds.	x	x	x
Robert Wittenberger	Missouri Dept. of Agriculture, Div. Weights & Meas.	x	x	x
Richard Wotthlie	State of Maryland	x	x	x

National Type Evaluation Technical Committee
Near Infrared Grain Analyzer Sector
Meeting Summary
March 10, 1997, Atlanta, GA

Agenda Items

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1. Update on National Type Evaluation Testing Schedule

Dr. Richard Pierce, Grain Inspection, Packers and Stockyards Administration/Inspection Systems Engineering (GIPSA), reported that the GIPSA Laboratory in Kansas City had not completed the work necessary to obtain certification as the NTEP participating laboratory for near infrared grain analyzers. With limited resources, priority has been given to tasks related to maintaining the NTEP Grain Moisture Meter Program. Dr. Pierce noted that grain moisture activities peak in the Spring of the year when the data from the previous season becomes available for review. Review of the data must be accomplished in a timely manner so manufacturers have time to develop and issue revised calibrations, if needed, prior to the coming harvest. He indicated that there was no possibility of resuming work on certification and starting work on the pre-evaluation criteria before August, 1997.

2. Publication 14 - Sample Temperature Sensitivity - the Use of Tempered Samples

Background: To check instruments for sensitivity to variations in sample temperature, the NIR Grain Analyzer Check List of Publication 14 calls for testing using two sample sets from each of the six wheat classes representing low (10-11%) and high (13-14%) moisture ranges with each set consisting of three samples, one from each of three protein ranges (the upper third, middle third, and lower third of the protein range for the class). Because sample temperature sensitivity is calibration dependent, this test must be conducted using each class for which certification is being sought. The NTEP Lab applicant anticipated having difficulty obtaining complete sets of high moisture samples for classes of wheat less frequently traded and those classes grown in more arid regions and had requested that the Sector approve the use of tempered samples if necessary. At the Sector's September 1996 meeting, Ole Rasmussen, Foss Food Technology, presented data supporting the use of tempered samples for this test. The Sector subsequently approved the addition of the following sentence to the Sample Temperature Sensitivity Test of Publication 14: "When high moisture samples are not available for any protein range in any class, testing may be conducted using tempered (artificially moistened) samples." In response to the Sector's request for the Lab to document the tempering procedure which would be used, tests were run at GIPSA to determine the minimum acceptable procedure for tempering samples. Rich Pierce, GIPSA, reported that the test involved splitting naturally moist samples into two portions. One portion was dried down by two percentage points, then re-wetted to the original moisture. To re-wet the dried portion, a sufficient amount of water (determined by weight calculation) was added all at one time. The re-wetted sample was mixed until all the added water had been adsorbed, then allowed to stabilize for a period. (This was thought to represent a more extreme case than misting the sample with water over a long period of time until the desired moisture was reached.) The two portions (naturally moist and re-wetted) were then to be submitted to the Sample Temperature Sensitivity Test so results could be compared. Dr. Pierce was unable to report any results because the integrity of the re-wetted samples was questionable (possible spoilage). The experiment will be repeated and results will be reported at a future meeting. [Note: The Sector does NOT approve the use of tempered samples for field testing. Tempered samples will be used ONLY for the Sample Temperature Sensitivity Test.]

3. Report on NCWM Interim Meeting

1997 NTETC Near Infrared Grain Analyzer Sector Summary

Diane Lee, NIST/OWM, reported on actions taken on NIR Grain Analyzer issues by the Specifications and Tolerances (S&T) Committee at the NCWM Interim Meeting held January 12-16, 1997 in Rockville, MD. [Note: The Item number and heading shown below correspond to the item number and heading in the Interim Meeting Agenda, NCWM Publication 15, dated December 1996. Additional discussion of these issues can be found in that publication.]

357-1 S.2.6. Provision for Sealing

Because of the possible need for user bias adjustments for NIR Grain Analyzers (measuring constituents other than moisture) the Sector had agreed that the only sealing category appropriate for NIR Grain Analyzers was one which corresponded to the audit trail requirements for Category 3, 3a, and 3b devices as proposed for Grain Moisture Meters. The Sector had recommended changes to S.2.6. to make the method of sealing for NIR Grain Analyzes correspond as closely as possible to that specified for Grain Moisture Meter Category 3. [See Interim Meeting Agenda item 356-1 for a further discussion of this issue.] The S&T Committee agreed to make the Sector's recommendations a voting issue at the National Conference in July. The Sector's recommendations are shown below:

S.2.6. Provision for Sealing. -

~~*a. Provision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., The device shall incorporate an audit trail available at the time of inspection as defined in part (b)), before any change that affects the metrological integrity of the device can be made to any mechanism.*~~

~~*b. If the operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc) in normal operation, the device shall use an audit trail. The minimum form of the audit trail shall be an event logger and shall include:*~~

- ~~*an event counter (000 to 999),*~~
- ~~*the parameter ID,*~~
- ~~*the date and time of the change, and*~~
- ~~*the new value of the parameter (for calibration changes consisting of multiple calibration constants, the calibration version number is to be used rather than the calibration constants).*~~

An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change , and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants).

A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)

Diane also related that the Scale Manufacturer's Association (SMA) had presented a report, at the Executive Committee Meeting, on the status of States which have adopted or are considering adoption of uniform regulations regarding the use of NTEP devices. Of the Continental U.S. States, only eleven have not adopted regulations regarding the use of NTEP devices. In eight of the eleven, NTEP regulations are under consideration. She noted that the SMA's primary focus is on the States which have adopted NTEP for weighing devices, so the SMA figures do not necessarily indicate the number of States which will apply NTEP regulations to NIR Grain Analyzers (when the tentative code becomes permanent) or the number of States which now apply NTEP regulations to Grain Moisture Meters.

4. Changes in Sector Membership

During the GMM/NIR Sector Meeting in Kansas City, MO September 9-11, 1996, a membership status report was distributed. It was noted that many individuals who have actively participated in Sector activities had not been formally appointed to the Sectors by the NCWM Chairman. (NTEP policy requires that all persons seeking appointment to the NTETC GMM/NIR

Sectors send individual letters on company letterhead to the NCWM Chairman requesting membership on the Sectors.) In early January 1997, Diane Lee, NIST/OWM, sent out a letter urging anyone interested in becoming a voting member of the Sectors to submit the required letter.

Barbara Bloch, the current NCWM Chairman, has received letters from the following individuals. At the recommendation of the Sector Chairman and the Sector Technical Advisor, these individuals have been appointed as Sector members:

Cassie Eigenmann	DICKEY-john Corp.
Keith Lochlin	Conagra Corn Processing (representing GEAPS)
John Miller*	CSC Scientific (replacing Allison Pflug)
Ray Oberg	Zeltex Inc.
Hiro Yamahira	Kett Electric Laboratory (replacing M. Emori)

*Subsequent to his appointment, John Miller left CSC. CSC will request the appointment of Tim Conwell to replace John Miller.

In response to a question about inactive members, Ms. Lee indicated that a letter would be sent to members who have not attended Sector meetings in recent years to determine if they plan to continue their participation in the Sector as voting members. This will be done in sufficient time to allow the membership list to be updated before the Conference's Annual Meeting in July.

5. Date and Site for Next Meeting

A two-day or two and one-half day meeting (one and one-half or two days for the Grain Moisture Meter Sector and one-half day for the NIR Protein Sector) is planned for September 10-12, 1997 in the Chicago area.

National Type Evaluation Technical Committee
Grain Moisture Meter Sector
Meeting Summary
March 10 – 12, 1997, Atlanta, GA

Agenda Items

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1. Report on NCWM Interim Meeting

The National Conference on Weights and Measures (NCWM) Interim Meeting was held January 12-16, 1997 in Rockville, MD. Diane Lee, NIST/OWM, reported on actions taken by the Specifications and Tolerances (S&T)Committee on issues of interest to the Sector. [Note: Item numbers and headings shown below correspond to the item numbers and headings of the Interim Meeting Agenda, NCWM Publication 15 dated December 1996. Additional discussion of these issues can be found in that publication.]

> **356-1 S.2.5. Provision for Sealing**
> At its September 1996 meeting the Sector recommended modifications to S.2.5. to categorize devices and methods of sealing in a manner similar to the categorization of devices in the Scales and Liquid Measuring Devices Code. Further modifications were approved by letter ballot January 2, 1997. A ballot comment from one Sector member suggested that the Category 1 sealing method should also be accompanied by the sentence: "If equipped with event counters, the device must be capable of displaying or printing through another on-site device, the contents of the counters." The S&T Committee agreed to forward the item to the Conference as a voting item but asked the Sector to consider if the added sentence should be included in the recommendation. [See GMM Sector Agenda Item 7 for additional discussion and the Sector's final recommendations.]

Ms. Lee also related that the Scale Manufacturer's Association (SMA) had presented a report, at the Executive Committee Meeting, on the status of States which have adopted or are considering adoption of uniform regulations regarding the use of NTEP devices. Of the Continental U.S. States, only eleven have not adopted regulations regarding the use of NTEP devices. In eight of the eleven, NTEP regulations are under consideration. She noted that the SMA's primary focus is on the States which have adopted NTEP for weighing devices, so the SMA figures do not necessarily indicate the number of States which will apply NTEP regulations to NIR Grain Analyzers (when the tentative code becomes permanent) or the number of States which now apply NTEP regulations to Grain Moisture Meters.

2. Changes in Sector Membership

During the GMM/NIR Sector Meeting in Kansas City, MO September 9-11, 1996, a membership status report was distributed. It was noted that many individuals who have actively participated in Sector activities had not been formally appointed to the Sectors by the NCWM Chairman. (NTEP policy requires that all persons seeking appointment to the NTETC GMM/NIR Sectors send individual letters on company letterhead to the NCWM Chairman requesting membership on the Sectors.) In early January 1997, Diane Lee, NIST/OWM, sent out a letter urging anyone interested in becoming a voting member of the Sectors to submit the required letter.

As of the date of this meeting, Barbara Bloch, the current NCWM Chairman, had received letters from the following individuals. At the recommendation of the Sector Chairman and the Sector Technical Advisor, these individuals have been appointed as Sector members:

Cassie Eigenmann	DICKEY-john Corp.
Keith Lochlin	Conagra Corn Processing (representing GEAPS)
John Miller*	CSC Scientific (replacing Allison Pflug)
Ray Oberg	Zeltex Inc.
Hiro Yamahira	Kett Electric Laboratory (replacing M. Emori)

*Subsequent to his appointment, John Miller left CSC. CSC will request the appointment of Tim Conwell to replace John Miller.

In response to a question about inactive members, Ms. Lee indicated that a letter would be sent to members who have not attended Sector meetings in recent years to determine if they plan to continue their participation in the Sector as voting members. This will be done in sufficient time to allow the membership list to be updated prior to the Conference's Annual Meeting in July.

3. Date and Site for Next Meeting

A two-day or two and one-half day meeting (one and one-half or two days for the Grain Moisture Meter Sector and one-half day for the NIR Protein Sector) is planned for September 10-12, 1997 in the Chicago area.

4. Update on Type Evaluation and Phase II Testing

Rich Pierce of the Grain Inspection, Processors and Stockyards Administration (GIPSA, formerly FGIS), the NTEP Participating Laboratory for Grain Moisture Meters, reported on the progress of Type Evaluations and the collection and analysis of Phase II data on 1996 crop.

As of March 10, two applications for Type Evaluation were open. Testing had been completed on one device, and test results were being reviewed. Testing had not begun on the other device.

Certificate of Conformance (CC) numbers have been issued for six device types:

Device Manufacturer	Model(s)	Years in Phase II
DICKEY-john	GAC 2000NTEP and GAC 2100	2
Sinar	Model 6310 Grain Pro	2
Seedburo	GMA 128	2
Perstorp	Infratec Model 1227	2
Foss	Grainspec A	2
Motomco	919E	1

Certificates have been published for the DICKEY-john and Sinar devices. Final Drafts of CC's for the remaining devices were given to those manufacturers present at the Sector meeting (and mailed to those not present) for final review before publication.

Data for the 1996 crop year has been collected on all NTEP instruments enrolled in Phase II. The data and a summarizing report for all grains except corn and soybeans has been sent to manufacturers. Dr. Pierce noted that procedures were being changed so that data and summarizing reports for any grain or class of grain would be sent to all manufacturers simultaneously. Previously, the data and individual reports were sent out as each was completed, so that manufacturer "A" might receive hard red winter wheat data several weeks before data was sent to manufacturer "B".

Dr. Pierce anticipated that some calibration changes would be required, but at this point did not know how extensive the changes would be. He reminded device manufacturers that a change in calibration requires that moisture data for both 1996

and 1995 crop years be re-predicted using the new calibration. The re-predicted data must be returned to the Lab in standard data format. [See September 9-11, 1996 GMM Sector Meeting Summary for a definition of the standard data format.]

5. Review of NTEP Processes: Phase I and II Application Process and Fees

For the benefit of new members, Diane Lee, NIST, reviewed the process for submitting an application for device type evaluation. She also reviewed the procedures associated with maintaining a current Certificate of Conformance under Phase II of the moisture meter program. These are summarized below:

Phase I (New Device Testing)

1) Manufacturer submits application for Phase I Type Evaluation Testing of a "New" device. The deadline for applications is January 1 if the device is to be included in Phase II for the coming season.

   Note: Applicants for Phase I testing must apply for Phase II testing at the same time. The application fee for new devices is $175. The cost of Phase I testing will vary according to device type and the hourly fee charged by the testing laboratory. Typical Phase I costs have ranged from $6000 to $9000 per device type. Through the 1999 crop year, a fee of $3500 per device type will be levied each year for collection and analysis of Phase II data. The cost to the Manufacturer for Phase II testing after 1999 has not been determined.

2) NIST assigns a control number to the application.

   This allows NIST to track the application until a CC number is assigned.

3) NTEP Lab performs tests.

   A minimum of 2 months are required for testing. If problems are encountered, they must be resolved before Phase II testing begins for the season; otherwise, participation in Phase II (and issuance of a CC) will be delayed to the following season. Partial Season testing is NOT allowed.

4) If testing is successful, CC *number* is assigned by May 1.
5) Certificate is issued by May 31.

Phase II (applicant's second and following years in the program)

1) The deadline for a manufacturer to submit an application for *continuing participation* in Phase II is May 1. (e.g., May 1996)

   Note: To maintain an active or effective CC, manufacturers must participate in the on-going Phase II calibration maintenance program. The manufacturer must submit a new application for Phase II Testing *every year*. Through the 1999 crop year, a fee of $3500 per device type will be levied each year for collection and analysis of Phase II data. The cost to the Manufacturer for Phase II testing after 1999 has not been determined.

2) NIST assigns a control number to the application.
3) Approved application is sent to NTEP Lab.
4) Data collection for current crop year is initiated. (e.g. 1996)
5) NTEP Lab provides manufacturer the last of the summary reports and data by March 1. (e.g. March 1, 1997)
6) Manufacturer makes any required calibration changes and provides NTEP Lab with re-predicted data by April 15. (e.g. April 1997)
7) NTEP Lab reviews manufacturer's data, validates change, and forwards information for revising CC to NIST by May 1. (e.g. May 1997)
8) NIST issues updated CCs by June 1. (e.g. June 1997)

Diane pointed out that the NTEP Application Form for Grain Moisture Meters is available on NIST's 24-hour fax-line (1-800-925-2453, request Document #410).

In the ensuing discussion, several members asked what would happen to NTEP meters already in use if a manufacturer decided to no longer participate in Phase II testing. One Weights and Measures (W&M) representative indicated that once a device's CC has expired, that device can no longer be used commercially in his state. Grain representatives were quick to point out that this was of great concern to their industry. They did not want to risk purchasing a device which could no longer

be used after a few years. It was stated that this was one reason the industry was eager for GIPSA to choose an official meter from the list of NTEP meters. By purchasing the same model as the official meter, they reasoned that they could be assured of continued support. It was suggested that one of the reasons that some states didn't want to adopt NTEP procedures for moisture meters was the because of the politics of the issue; State Department of Agriculture Officials (responsible for Weights and Measures issues) in major grain states didn't want to be placed in the position of having to tell grain elevator operators that they could no longer use a device which had been purchased recently. There was concern that not all states will enforce the program uniformly. In some states, non-NTEP meters will be allowed to be sold. The same thing is likely to happen to NTEP devices of manufacturers who elect not to continue to participate. Manufacturers were in general agreement that the decision whether or not to continue to support a specific model would be an economic one. If sales to the grain industry are important to a company, a company would be foolish to withdraw support of a device, even if newer models are introduced. Some manufacturers have gone to great lengths to ensure that calibrations from newer instruments can be used on discontinued models. There is a marketing advantage to keeping a meter in a program whose purpose is minimizing differences between official and commercial moisture measurements. It was pointed out that non-NTEP meters manufactured or placed in service before January 1, 1998 may continue to be used until they no longer can be repaired to pass field tests. A similar status was suggested for NTEP meters no longer supported by manufacturers. Such meters could continue to be listed in Publication 5, but the status could be shown as "inactive" or "unsupported". The problem, as viewed by W&M member, was one of confidence. When a manufacturer withdraws a meter from the program, confidence is lost in the calibrations and the ability of that device to remain aligned with the official system. Field tests may detect bias differences, but they don't tell you anything about performance at temperature or moisture extremes. After lengthy discussion, the Sector agreed that a subcommittee should be formed to address the concerns of users, manufacturers, and regulators on this issue. The Subcommittee was charged with producing a report, addressing these issues, for presentation to the Sector at its September meeting. The subcommittee is composed of the following members:

Dr. Charles R. Hurburgh, Iowa State University - Organizer
G. Diane Lee, NIST
Tom O'connor, NGFA
Tom Runyon, Seedburo
Cheryl Tew, NC Dept. of Agriculture
Ray Oberg, Zeltex
Randy Burns, AR Dept. of Agriculture
Tim Conwell, CSC Scientific
Don Onwiler, NE Public Service Comm. [if he agrees to serve]
Jack Barber, JB Associates

6. Collaborative Study: Progress Report and Funding Issues

The objective of the NTEP Moisture Meter Program is to bring interstate and intermeter comparisons closer together. Progress toward these objectives has been measured by oven-meter and meter-meter collaborative studies. Results of an earlier study were questionable, seeming to indicate that agreement of devices of like type within those thought to be NTEP meters was not as good as expected. Some Sector members were of the opinion that the earlier results, represented as being obtained on NTEP meters, did not, in fact, use the final NTEP approved calibration or had been obtained on older models which did not have characteristics identical to the NTEP versions. The collaborative study was repeated early this year. Special care was taken to ensure that devices were using the most recent NTEP calibrations. Because the number of true "NTEP" devices in the field is somewhat limited. Some judgement was used on the part of the organizer in classifying instruments as "NTEP" or "non-NTEP". Devices of recent manufacture which were of like design to NTEP meters but not truly "NTEP", were classified as "NTEP" devices. Dr. Charles Hurburgh, Iowa State University (ISU), presented the results of the most recent study in which three corn samples (16 to 18.2% moisture) and three soybean samples (10.2 to 17.8% moisture) from 1996 crop were sent to collaborators. Oven moisture results were provided by 15 laboratories. Meter results were obtained on instruments representing 12 brands (six NTEP and six "other"). A total of 142 meters were tested, 91 NTEP and 51 other. Test results are summarized below:

Oven Results (15 labs)			
Grain Type	Sample	Average	Range

Corn	C1	17.82	17.5-18.0
	C2	18.22	18.1-18.4
	C3	15.98	15.8-16.2
Soybeans	S1	10.20	10.0-10.3
	S2	12.47	12.4-12.6
	S3	17.79	17.3-18.1

Summary for Data Received to 3/7/97			
Grain Type	Group	Range of Averages(1)	Avg. Std. Dev. (Between Like Units)
Corn	NTEP Meters(2)	16.9 - 17.3	0.19
	Other Meters	16.9 - 17.2	0.28
	GIPSA Oven	17.51	
	All Ovens	17.34	
Soybeans	NTEP Meters(2)	13.1 - 13.4	0.18
	Other Meters	13.1 - 13.7	0.20
	GIPSA Oven	13.51	
	All Ovens	13.49	

(1) Average of all readings on all samples for a brand.
(2) Meters using NTEP calibrations.

Although pleased that the data seemed to indicate improvement compared to the previous study, some Sector members were concerned that the data might again be taken out of context by the grain press and used to make widespread conclusions about the relative performance of NTEP meters. It was stressed that the objective of the study was to establish a performance baseline, and that the data collected is not sufficient to draw valid conclusions about manufacturers' products. One member suggested that the Sector (or NIST) should write its own news release describing the study, its objectives, and what the results indicated. That way, industry could be kept informed about what is going on without risking that the information would be used to draw negative conclusions on just a limited amount of information.

The latest collaborative study was partially funded by NIST (with the balance of costs to be absorbed by ISU). On the subject of possible funding sources for future collaborative studies, grain association representatives expressed the belief that their members would not approve an increase in dues for this purpose. Device manufacturers, were reluctant to commit to an additional fee, already faced with significant fees for annual testing. Dr. Hurburgh raised the possibility of a grant from one of USDA's Federal/State Marketing Improvement Programs. He will send information on these programs to Diane Lee. Also mentioned was the possibility of assessing a "registration fee" for Sector meetings. Further discussion on the subject was tabled until the next meeting when the feasibility of obtaining a grant will have been investigated.

7. Proposed Change to H44 Sec. 5.56(a) - S.2.5. Provisions for Sealing:

[Note: Paragraph S.2.3., Provisions for Sealing, of the old Code became Paragraph S.2.5. in Section 5.56(a) of the re-organized Code adopted at the NCWM 81st Annual Meeting.]

Background: At the 1995 Annual Meeting of the NCWM, H44 paragraph S.2.3., Provision for Sealing, (later Section S.2.5 of GMM Code 5.56(a)) was amended to specify the minimum information which must be contained in the audit trail. At that time, however, no provision was made for devices capable of remote configuration. At their March 1996 meeting, the Sector discussed an audit trail requirement for devices capable of remote configuration. The Sector heard comments from one device manufacturer stating that there was no difference, from an enforcement stance between devices which required a seal to be broken at the device to allow changes at the keypad and a device which required a seal to be broken at the device to enable a change to be made from a remote site (e.g., via modem or acoustic coupler.) One consideration noted was the significant cost difference between implementing a physical seal and incorporating sufficient memory to implement an audit trail. At that time the Sector was unable to reach consensus on audit trail requirements for devices with remote configuration capability regardless of the need to break a physical seal prior to remote configuration. Further consideration of the issue was postponed to the Sector's September 1996 meeting.

Discussion: At its September 1996 meeting, the Sector recommended categorizing devices and methods of sealing in a manner similar to the categorization of devices in the Scales and Liquid Measuring Devices Code. Following that meeting, it was discovered that Category 1 of the Scales Code allows either a physical seal ***or*** two event counters: one for calibration parameters and one for configuration parameters. The sealing method originally proposed by the GMM Sector for Category 1 devices allowed ***only*** a physical seal. The Sector had also failed to recommend an effective date for their recommended changes. To remedy these oversights, a letter (fax) ballot was sent to Sector members on January 2, 1997 soliciting their vote on two proposals:

(1) Add "or two event counters: one for calibration parameters and one for configuration parameters" to the proposed Category 1 Method of Sealing for the GMM Code 5.56(a)

and (2) Select a non-retroactive date of January 1, 1999 for the proposed change

Both proposals were approved and were forwarded to the Specifications and Tolerances Committee (S&T) for consideration as a National Conference voting issue. A ballot comment from one Sector member suggested that the Category 1 sealing method should also be accompanied by the sentence: "If equipped with event counters, the device must be capable of displaying or printing through another on-site device, the contents of the counters." The member reasoned that this was an explicit requirement for Category 2 devices, and that it should apply equally to Category 1 devices. If it were to be omitted from the requirements for Category 1 devices, the obvious assumption would be that the requirement did not apply. The S&T requested clarification from the Sector as to whether or not the suggested wording was their intent , noting that other codes *require* display and allow printing in addition.

Conclusion: Noting that the code already required devices to have provisions for providing a print out of measurement results, the Sector had no objection to allowing counter information to be *either* printed *or* displayed, and recommended the addition of the above wording (and a specification of counter sizes for both Category 1 and Category 2 devices) to the changes previously submitted to the S&T Committee . All changes (including those recommended at the September 1996 meeting and by the January 2, 1997 letter ballot) are shown below. [Editor's note: For clarity, in table S.2.5. only the wording considered by the Sector at this meeting has been underlined to indicate added text. The entire table is an "addition" to S.2.5.]

S.2.5. Provision for Sealing

~~*(a)*~~ *Provision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., audit trail available at the time of inspection as defined in ~~part b~~ <u>Table S.2.5.</u>), before any change that affects the metrological integrity of the device can be made to any mechanism.*

~~(b) If the operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc.) in normal operation, the device shall use an audit trail. The minimum form of the audit trail shall be an event logger and shall include:~~

- ~~An event counter (000 to 999)~~
- ~~the parameter ID,~~
- ~~the date and time of the change, and~~
- ~~the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number is to be used rather than the calibration constants.)~~

~~The device is not required to display this information, but a printed copy of the information must be available through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)~~

[Note: Zero-setting and test point adjustments are considered to affect metrological characteristics and must be sealed.]

Table S.2.5. Categories of Device and Methods of Sealing

Categories of Device	*Method of Sealing*
Category 1: No remote configuration capability	*Seal by physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999). If equipped with event counters, the device must be capable of displaying, or printing through another on-site device, the contents of the counters.*
Category 2: Remote configuration capability, but access is controlled by physical hardware *Device shall clearly indicate that it is in the remote configuration mode and shall not be capable of operating in the measure mode while enabled for remote configuration.*	*The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999). If equipped with event counters, the device must be capable of displaying, or printing through another on-site device, the contents of the counters.*
Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password)	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change , and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants). A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) times the number of sealable parameters in the device, but not more than 1000 records are required.* ***(Note: Does not require 1000 changes to be stored for each parameter.)***
Category 3a: No remote capability, but operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc.) in normal operation	*Same as Category 3*
Category 3b: No remote capability, but access to metrological parameters is controlled through a software switch (e.g., password)	*Same as Category 3*

8. Proposed Change to Publication 14 - Sample Temperature Sensitivity

Background: In some instruments, temperature compensation is accomplished by including, in the calibration set, data obtained on samples at various temperatures. For these instruments, calibration updates may affect the temperature compensation and thus affect performance over temperature. At an earlier meeting, the Sector was reminded that temperature studies were not included in Phase II of the NTEP moisture program and that no temperature testing had been performed by the NTEP Laboratory on the "other 13" NTEP grains [i.e., grains other than corn, soybeans, and hard red winter wheat]. One manufacturer expressed the opinion that manufacturers should be required to submit temperature data for the "other 13" grains and also for any grain whenever a calibration change is made. Another suggested that calibration changes for a given meter model could be evaluated based on spectral or "raw" data if it is available for the moisture and temperature ranges involved. It was proposed that moisture data be collected on one or two samples at both extremes of temperature in each 2% interval of moisture over the desired moisture range. Though discussed at length, the Sector failed to reach a consensus on detailed rules and procedures for obtaining objective evidence The Sector Technical Advisor and the NTEP laboratory representative were charged with drafting a proposal for consideration at the March 1977 meeting. This proposal is shown below.

Proposed: The Sector is asked to approve changes to the first paragraph of the Sample Temperature Sensitivity Test of Publication 14 for Grain Moisture Meters to correct typographical errors and the addition of a note to the end of the Sample Temperature Sensitivity test to address the requirement for manufacturers to provide objective evidence of satisfactory performance for grain calibrations not tested by the NTEP laboratory over the range of specified sample temperatures. The Sector is also asked to approve the addition of Appendix D which specifies the procedure for conducting the test and defines the requirements for manufacturer provided data.

II. Sample Temperature Sensitivity:

Additional testing is required to verify that accurate results are provided when the sample and instrument are at different temperatures. This will be referred to as the sample temperature sensitivity test. The purpose of this test is to verify that the instrument provides accurate results when the difference in temperature between the sample and the instrument is at the manufacturer specified, difference (a minimum Δ of 10 °C is required). The sample temperature sensitivity test will be conducted using corn, HRW wheat, and soybean samples. Tests will be conducted with the instrument at room temperature and the sample temperature varying from room temperature ~~+ΔT to room temperature~~ $+\Delta T_H$ to room temperature $-\Delta T_C$. Δ~~T~~$_C$ (where ΔT_H is the manufacturer specified difference for grain above room temperature, and ~~the~~ ΔT_C is the manufacturer specified difference for grain below room temperature. In no case will ΔT_H be allowed to exceed 32 °C, but the two differences need not be equal.)

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Note: For any NTEP approved or pending calibration not previously tested by the NTEP Laboratory for Sample Temperature Sensitivity, manufacturers are required to provide objective evidence that those calibrations will perform satisfactorily over the range of temperatures specified by the manufacturer. This includes calibrations for any of the "other 13" NTEP grains [i.e., grains other than corn, soybeans, and hard red winter wheat] as well as any calibrations (including corn, soybeans and hard red winter wheat) which have been changed or modified subsequent to either NTEP testing or

submission of manufacturer's data. Performance limits, test methods, and data to be submitted are specified in Appendix D.

Appendix D - Sample Temperature Sensitivity
Manufacturer Provided Data

The sample temperature sensitivity test is required to verify that accurate results will be provided when the sample and instrument are at different temperatures. This Appendix specifies the procedure for conducting the test and defines the requirements for manufacturer provided data. Tests will be conducted with the instrument at room temperature and sample temperature varying from room temperature $+\Delta T_H$ to room temperature $-\Delta T_C$. (where ΔT_H is the manufacturer specified difference for grain above room temperature, and ΔT_C is the manufacturer specified difference for grain below room temperature.)

Two (2) samples are to be selected from each of three 2% moisture intervals for each grain type for which data is to be provided. Two analyses will be made for each grain sample at each of the three test temperatures. The overall bias for the 12 observations (2 samples x 3 moisture intervals x 2 replicates) run at the temperature extremes must agree with the room temperature results within the tolerances listed in the accompanying table.

Test Procedure:

1. Analyze the room temperature samples on the test instrument (Room 1).

2. Condition samples to the cold temperature and run them on the instrument under test (Cold).

Note: Each sample is to be checked for temperature before it is analyzed. Samples must be within 0.5°C *of the desired test temperature at time of analysis, and samples are to be reconditioned to the test temperature after each analysis. The sample cell on the instrument under test is to be given a minimum of 10 minutes to equilibrate to room conditions between sample analyses.*

3. Bring the samples to room temperature, and run the samples on the instrument under test (Room 2).

4. Condition the samples to the hot temperature and run them on the instrument under test (Hot), observing the precautions in the note following step 2.

5. Repeat step 3 to obtain another set of room temperature results (Room 3).

COLD BIAS = Cold! ((Room 1 + Room 2) / 2)
HOT BIAS = Hot! ((Room 2 + Room 3) / 2)

Note: As an alternative to repeating actual temperature tests for calibration changes made after manufacturer data has been provided, subsequent results may be predicted using the new calibration and previously collected spectral or other "raw" data.

Moisture Ranges and Tolerances for Sample Temperature Sensitivity
Manufacturer Supplied Data

Grain Type	Moisture Range for Test	Tolerance Limit (Bias at Temperature Extremes)
Corn	12-18%	0.45
Durum Wheat	10-16%	0.35

Eastern White Wheat	10-16%	0.35
Western White Wheat	10-16%	0.35
Hard Red Spring Wheat	10-16%	0.35
Hard Red Winter Wheat	10-16%	0.35
Soft Red Winter Wheat	10-16%	0.35
Hard White Wheat	10-16%	0.35
Sunflower seed (Oil)	6-12%	0.45
Grain Sorghum	10-16%	0.45
Soybeans	10-16%	0.35
Two-rowed Barley	10-16%	0.35
Six-rowed Barley	10-16%	0.35
Oats	10-16%	0.45
Long Grain Rough Rice	10-16%	0.45
Medium Grain Rough Rice	10-16%	0.45

Manufacturer (or Applicant) Data to be supplied:

1. Name of applying organization.
2. Manufacturer (if different from Applicant.)
3. Model and serial number
4. Source of moisture results (actual test or predictions using existing spectral or other "raw" data) and date(s) original spectral or "raw" data was obtained.
5. For each grain type, specify type and show moisture results vs. air-oven values on each individual sample at room temperature.
6. Calculate and show averages for Hot moistures, Cold moistures, Room 1 moistures, Room 2 moistures and Room 3 moistures.
7. For each grain type calculate and show cold and hot bias.

Conclusion: By a vote of 11 to 4, the Sector rejected the proposed changes citing several reasons: 1) the data which manufacturers of dielectric type instruments used to determine coefficients for temperature correction and to validate performance over a range of sample temperatures had been recorded on now-obsolete media (e.g. tape cassettes for HP 9815 Computers) and was no longer retrievable; 2) the cost of Temperature Sensitivity Testing (even in the proposed "abbreviated" form) 13 grains is prohibitive and might result in manufacturers deciding to drop those grains from their CC's; 3) it is very difficult to obtain samples for some of the less widely grown grains.

To provide a method for selectively verifying temperature performance on a grain by grain basis, and to supply potential purchasers and W&M officials with information regarding the integrity of calibrations for each of "the other 13 grains", the Sector unanimously agreed that the CC shall indicate those grains for which temperature performance has not been verified by the NTEP process.

The Sector was unable to reach a consensus on the motion: "A manufacturer may submit data for other grain types to demonstrate compliance with temperature sensitivity requirements; the NTEP lab may ask for additional tests." Several members thought that some minimal amount of testing should be performed by the NTEP lab on any grain, believing that

without NTEP lab testing, the whole NTEP process would be compromised. The NTEP lab representative indicated that even with the "abbreviated" tests originally proposed, the lab would not be able to respond to requests for tests this Spring. The Sector Technical Advisor was directed to consult with the NTEP lab representative and propose a revised "minimal" test procedure taking into account the difficulty of obtaining a range of moistures for some samples. The revised procedure will be submitted to the Sector for a vote at the September meeting or for letter ballot if available earlier.

One member asked if the grain temperature differences (ΔT_H and ΔT_C, above and below room temperature) for the "other 13" grains had to be the same as the differences the manufacturer had specified for corn, soybeans, and hard red winter wheat. Although there didn't seem to be objections to allowing a different ΔT_H and ΔT_C to be specified for each grain, the Sector did not formally decide on this issue. CC's list a single ambient temperature operating range, a single grain temperature operating range, and a single ΔT_H and ΔT_C. The NTEP lab representative indicated that , until the Sector agreed otherwise, sample temperature sensitivity tests would be performed using the same temperature differences (ΔT_H and ΔT_C) which the manufacturer had previously specified.

9. Proposed Revision to H44 Sec. 5.56(a) -S.2.4.3. Calibration Transfer

Background: The requirements for calibration transfer between moisture meters of like model are specified in the Grain Moisture Code of Handbook 44:

> **Calibration Transfer. -** The instrument hardware/software design and calibration procedures shall permit calibration development and the mathematical transfer of calibrations between instruments of like models.
>
> **Note:** Only the manufacturer or the manufacturer's designated service agency may make calibration transfer adjustments on moisture meters and, except for instrument failure and repair, only at a prescribed period of time during the year. This does not preclude the possibility of the operator installing the manufacturer-specified calibration constants or standardization parameters under the instructions of the manufacturer or his designated service agency.

Early in the development of the NTEP program for moisture meters, the suitability of NIR instruments for use in a regulated commercial environment was questioned. When it became clear that the industry was strongly in favor of permitting NIR instruments to be used for commercial moisture measurements, the Sector agreed that any modifications to the Moisture Meter Code to permit the use of NIR instruments should not compromise the enforcement controls then in effect for meters using other technologies. Thus, the requirement for calibration transfer was adopted. The intent was to require identical calibrations in meters of like type so field inspectors could verify that correct calibrations had been installed in the instrument. Calibration adjustments (for moisture) were not expected to require change for at least a 12-month period (except in cases of device repair.)

The Code provision allowing the operator to install manufacturer-specified calibration constants or standardization parameters (under the instructions of the manufacturer or his designated service agency) originally had two objectives:

1. To allow the user to install a new calibration without having to return the instrument to the manufacturer or a service agency.

and 2. To allow the user to install new standardization parameters (calibration transfer adjustments) if required by the field replacement of certain components (provided that the manufacturer has the means to determine the appropriate standardization parameters without having the instrument in the shop.)

Most NIR instruments are "multi-constituent" devices capable of measuring moisture, protein, etc. For commercial use, they must meet the requirements of both the Grain Moisture Meter Code and the Near Infrared Grain Analyzer Code (NIR Code). Early in the development of the NIR Grain Analyzer Code, the NIR Sector recognized that provisions would have to be made for frequent ***user*** adjustments of bias in NIR ***protein*** calibrations (user determined slope adjustments are not permitted). To provide the necessary security, the NIR Code stipulates that user bias adjustments can be made only on the basis of tests run on a current set of Standard Reference Samples (SRS) traceable to GIPSA Master Instruments, and the user is required to keep a log (Calibration Adjustment Data Sheet) which field inspectors can check against the device's event logger, also

required by the NIR Code. The GMM Code presently has the same Calibration Transfer wording as the NIR Code. The GMM Code, however, contains no user requirement regarding bias adjustments, because most GMM Sector members had believed that user determined bias adjustments would not be required for moisture calibrations. [Earlier GMM Code had not permitted such adjustments].

Because later versions of the GMM Code did not specifically require the same bias values for a given grain moisture calibration in all instruments of like type, some manufacturers of multi-constituent devices have used a bias term for each grain calibration to standardize readings among individual instruments. In these instances, for a given grain, the same calibration constants and the same slope value are used in all instruments, but bias values differ from instrument to instrument. This has led to several problems:

1. Bias terms for these instruments do not appear on the CC's, so field enforcement personnel are unable to determine if the moisture bias term used in an individual grain calibration is correct.
2. Instrument standardization must be repeated each time a calibration is changed. Without traceable standards to determine new bias values, there can be no traceability of the device to the NTEP standard units unless this standardization is performed "side-by-side" with the manufacturer's master instruments.
3. When the only difference between calibrations for two successive years is a bias change (which is different in every device of like type), Weights and Measures (W&M) officials cannot differentiate between a legitimate bias change and one made arbitrarily by the user.

In either case, because moisture bias is a user accessible parameter in currently approved multi-constituent devices, the possibility for fraud exists (even within maintenance tolerance limits).

Discussion: At their September 1996 meeting, the Sector was divided on this issue. NIR multi-constituent device manufacturers objected to a proposal which would have prohibited user adjustments of bias on moisture calibrations, arguing that the audit trail event logger provided the necessary security. Manufacturers of dielectric moisture meters (in which bias terms have been identical for any given grain calibration in devices of like type) favored the proposed change, supporting those Weights and Measures members who didn't want to see users making adjustments in an uncontrolled manner (even within maintenance tolerance limits). Some members were concerned that allowing bias adjustments in this manner would ultimately defeat the Sector's goal of uniformity between instruments. Multi-constituent device manufacturers were asked if it would be possible to restrict user bias adjustment on moisture calibrations and still allow user bias adjustment on protein. Manufacturers indicated that this was possible but would require a software (or firmware) change. Further discussion was postponed to the Sector's March 1997 meeting. To assist the Sector in assessing how adequate an event logger might be for providing security in this case, several manufacturers provided sample copies of audit trails illustrating both calibration changes (installation of a new calibration) and several user bias adjustments to an existing calibration for their instruments.)

Conclusion: The Sector agreed that, although informative, audit trails did not fully eliminate the problems cited in the above *Background*. The Sector adopted by consensus the following revisions to the H44 Calibration Transfer paragraph (and the Note following) to further restrict the kind of changes which a user may make to grain moisture meters, and to clarify the difference between standardization adjustments (or parameters) and grain calibration coefficients. The Sector agreed to a nonretroactive and effective date of January 1, 1999 for these changes:

> ***S.2.4.3. Calibration Transfer. -*** *The instrument hardware/software design and calibration procedures shall permit calibration development and the ~~mathematical~~ transfer of calibrations between instruments of like models <u>without requiring user slope or bias adjustments.</u>.*
>
> ***Note:*** *Only the manufacturer or the manufacturer's designated service agency may make ~~calibration transfer~~ <u>standardization</u> adjustments on moisture meters. ~~and, except for instrument failure and repair, only at a prescribed period of time during the year~~. This does not preclude the possibility of the operator installing ~~the~~ manufacturer-specified calibration constants ~~or standardization parameters~~ under the instructions of the manufacturer or its designated service agency. <u>Standardization adjustments (not to be confused with grain calibrations) are those physical adjustments or software parameters which make meters of like type respond identically to the grain(s) being measured</u>.*

(nonretroactive and effective as of January 1, 1999)

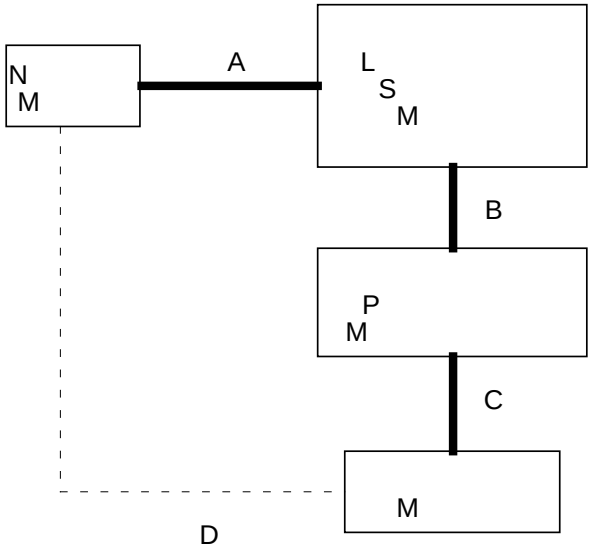
10. Proposed Addition to Publication 14 - V. Standardization of Instruments

Discussion: Earlier data compiled by Dr. Hurburgh suggested that instruments in the field (or in State Moisture Labs) may not be closely aligned with instruments of like type in the NTEP lab. The NTEP Laboratory has also seen unexplained differences between moisture results (using the same calibration and correcting for air oven differences) obtained on the same set of samples at 12-month intervals. In such cases, Phase II data collected on the NTEP lab instruments may not be useful in maintaining calibrations and may not be representative of what can be expected with devices in the field. Manufacturers typically maintain a "standard" instrument (or instruments) against which production units are tested and adjusted to be within the manufacturer's acceptable tolerance limits. At the present time, there are no requirements for the NTEP lab instruments to be periodically compared with manufacturer's standard(s) or adjusted to agree with the manufacturer's "standard(s)". Thus, any change in performance over time in either the NTEP lab units or the manufacturer's "standard" units can result in a corresponding loss of accuracy (compared to air oven) in production units. The Sector has agreed that the NTEP units should be standardized against manufacturers' master units annually (typically between March 1 and May 30). The Sector has also agreed that the specific alignment details (e.g. what instrument parameters to measure, what adjustments to make, etc.) would vary with the technology involved and the manner in which that technology had been implemented, and that manufacturers should also be required to demonstrate that their methods for standardizing production units provide assurance that units "as shipped" will agree with the NTEP units within acceptable tolerances.

Conclusion: The Sector was in general agreement that Publication 14 should contain a section dealing with instrument standardization (such as the draft shown below); however, device manufacturers requested that a vote on adoption of the draft be delayed until the Sector's September 1997 meeting so they would have additional time to review the proposed tolerance limits.

V. Standardization of Instruments

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



11. Test Weight per Bushel Indications

Background: The Grain Moisture Meter Code in H44 contains the following field test requirement for Test Weight per Bushel Indications:

> **T.3. For Test Weight Per Bushel Indications or Recorded Representations.** The maintenance and acceptance tolerances on test weight per bushel indications or recorded representations shall be 0.193 kg/hL or 0.15 lb/bu. The test methods used shall be those specified by the USDA FGIS. (Amended 1992)

Some time ago, when the Sector was discussing this requirement, the reasonableness of the tolerance, was questioned, especially as it applied to the test weight of corn. It was pointed out that the tolerance was taken from FGIS (now GIPSA) procedures using three samples of dockage-free dry hard red winter wheat and comparing the average of five replicate measurements (with the highest and lowest results discarded before averaging) on each sample using the "standard" quart container to a like average obtained with the container under test. The Sector agreed that the test was not realistic for assessing the performance of the various types of devices in commercial use and that a different tolerance should be considered for each grain type. The Sector considered dropping this section from the Moisture Meter Code, reasoning that it would be more appropriate to include it in a separate chapter of H44 devoted specifically to the requirements for test weight per bushel devices. Several members of the Weights and Measures Community objected, however, stating that deletion of this section, prior to the development of a separate code chapter, would leave them without inspection and enforcement authority over test weight devices.

There are now at least two NTEP Grain Moisture Meters which have the capability to automatically provide an indication and recorded representation of test weight per bushel. Because of the unrealistic tolerances in the existing Code, however, the test weight capability of these meters was disabled for the NTEP tests. Some State W&M Officials are permitting these devices to display and print the test weight information provided that some disclaimer appears on the printed ticket (e.g. the words "approximate" next to the test weight result) or that a warning against use of the information for commercial purposes is posted prominently on the device.

The issue was reviewed again at the Sector's March 1996 and September 1996 meetings. The Sector was in general agreement that Test Weight per Bushel devices (Grain Bulk Density Apparatus) should be addressed in Code separate from the Grain Moisture Meter Code (even for those grain moisture meters which were capable of providing a bulk density measurement.)

Discussion: Grain industry representatives were concerned that the Sector might be "trying to invent a new method". They stressed the importance of achieving and maintaining uniformity with the official system. Toward that end, they wanted assurance that the reference method should be whatever GIPSA was using. GIPSA's volume reference is a "standard" one-quart kettle with loading- funnel, stand and hard maple strike-off stick. "Working" kettles are compared against the "standard" with a grain test (described above) and a water test. Suitably accurate scales determine the weight.

One grain industry member suggested that the Sector develop a mission statement on Test Weight. Other Sector members thought this was unnecessary as the Sector had already been charged with developing NTEP test procedures and recommending changes to H44 with the objective of aligning commercial devices with those used in the official system. Citing the wide range of devices now in commercial use (some of which are of questionable accuracy and permanence), one device manufacturer felt that development of H44 Code (and a corresponding Publication 14 check list) for Test Weight apparatus was needed to show what apparatus should be disallowed for commercial use. This view was supported by W&M members. One Sector member suggested that an "environmental scan" be conducted to determine what devices are actually in use in the field. The Sector Technical Advisor was of the belief that the list of devices characterized in the Sector's agenda (and reproduced below) was a good representation of the range of device types now in use (or under consideration for use) in the commercial system. Sector W&M representatives were asked to review this list and to be prepared to report, at the next Sector meeting, which of the device types listed are in commercial use in their respective jurisdictions. Lack of time prevented the Sector from discussing whether the proposed Code should cover all types and variations shown. This will be an agenda item for the next meeting.

a. **Test Kettle** with manual strike-off
   - Kettle Size: pint
     quart
     liter
     half-liter
   - Scale Type: Beam balance (calibrated in mass units, chart or calculation required)
     Electronic scale (calibrated in mass units, chart or calculation required)
     Electronic scale (calibrated directly in test weight)

b. **Chondrometer**
   - Volume: one-fourth liter
     half liter
     liter
   - Scale Type: Beam balance (calibrated in mass units, chart or calculation required)
     Electronic scale (calibrated in mass units, chart or calculation required)
     Electronic scale (calibrated directly in test weight for selected grain type)

c. **Other** (incorporated into grain moisture meters or other grain measuring devices or constructed specifically as a test weight device not classified above)
   - Volume: Various (device dependent)
   - Operation: Fully automatic (with internal weighing device and direct display of test weight for selected grain type)
     Manual filling and manual volume isolation (with internal weighing device calibrated directly in test weight for selected grain type)

12. Phase II Funding

Under a five year agreement, funding for Phase II (Calibration Maintenance) testing comes from cooperative agreements between NIST, GIPSA, and participating device manufacturers. NIST and GIPSA contribute $36,000 per year, and each participating manufacturer contributes $3,500 per meter type per year. With three years remaining under this agreement, Tina Butcher, NIST, suggested that the Sector might want to locate alternate funding sources before the agreement expires. Sector members were pessimistic about obtaining funds from the obvious sources. With GIPSA and NIST being asked to cut expenses, the likelihood that they will be able to continue to support the program at current levels is slim. From previous attempts to obtain funding, it appears highly unlikely that Congress would appropriate anything for this program as a separate item. Although the most equitable way to obtain funds seems to be a "tax" or annual fee assessed against each commercial

moisture tester in use commercially, administrative problems (as well as the problems of obtaining participation from every state) rule out this approach. Grower check-off programs fall into the same category. At the present time, there are only six devices holding CC's. If device manufacturers were asked to bear the full cost of Phase II (for Grain Moisture Meters only), each manufacturer would have to pay about $15,000 to $17,000 annually. Grain Moisture Meters are not sold in huge quantities. If the manufacturer were to recover this amount on current sales of 300 units/year, this would translate into a price increase of $50 to $56 per meter. It is doubtful that anyone selling less than 100 units per year would want to remain in the program. The situation becomes worse if the number of manufacturers participating drops from its present number. One member questioned the benefit of continuing to participate in the program for more than five years. At that point, he suggested, the meters should be well aligned and further changes should only be incremental. Recalling that commercial meters were poorly aligned in 1980 until meter manufacturers re-adjusted calibrations based on data collected Iowa State University and the University of Illinois, another member pointed out that the Sector wouldn't be having this discussion if those one-time adjustments had kept meters aligned. He maintained that without an on-going monitoring program, meters would eventually drift apart again.

A three-pronged approach to funding was suggested:

1) Prepare a report to the House Agriculture Committee which: a) outlines our goals; b) explains what has been accomplished; c) makes a strong case for continuing the on-going calibration maintenance program, stressing the economic value to producers and grain trade alike; and d) shows the potential loss to producers and the grain trade when meters within the commercial system drift apart from each other.
2) Prepare a report for presentation to the NTEP Board of Governors (BOG) which shows: a) the benefits of the on-going calibration maintenance program; b) what sources have been considered for funding; and c) why these sources don't work.
3) Ask the BOG and the NCWM to petition NIST for funds.

Cliff Watson, Consultant, offered to assist in the preparation of these reports, with the goal of having a draft report available for approval by Sector voting members prior to the NCWM Annual Meeting in July. Although the discussion had focused on funding for the Grain Moisture Meter program, it was suggested that the reports should also include reference to the NIR program which will also need funding for an on-going monitoring program.

13. Mission of the Sector

Cliff Watson, Independent Consultant, reported that the GEAPS Grades and Weights Committee had discussed the NTEP moisture meter program at the annual GEAPS (Grain Elevator and Processor Society) meeting in Minneapolis. At this meeting, some members of the committee expressed the belief that the NTEP Grain Moisture Meter Sector had lost sight of its mission and that it was more concerned about regulations and reduction of fraud than achieving uniformity in grain inspection. As a result of the discussion, the Grades and Weights chairman stated that he would contact NGFA and others to see about having this matter included in the Grain Quality Workshop agenda for discussion and action.

Cliff recommended that the Sector give assurance to all concerned that uniformity of grain moisture measurements between official and commercial systems and within the commercial system is the primary mission and objective of the Sector. The regulations recommended by the Sector are the means by which uniformity will be achieved and maintained.

In the discussion which followed, one Grain Industry representative commented that the Sector spent a lot of time on Publication 14 and Handbook 44 rather than talking about the strategic direction their programs should take and how these programs might work in the field; especially in states like Illinois. He believed that some of the Handbook 44 requirements were a disincentive for states to adopt an NTEP program for moisture meters. For the program to succeed, he stressed that it must be as regulatory simple as possible. Another Grain Industry representative cited the needs of the industry: 1) meters that agree with the official system; 2) affordable meters; 3) reasonable assurance that any meter purchased [under the program] can be used for a number of years; and 4) uniformity between states. At the same time, citing the competitiveness of the industry, he pointed out that industry was always seeking to reduce costs and did not want to "freeze" technology; larger, progressive operations wanted multi-constituent meters.

Responding to some of these comments, other Sector members pointed out that the Sector was a *technical* sector. As such, it was appropriate for the Sector to deal primarily with *technical* issues related to its objectives of: (1) developing type evaluation criteria, test procedures, and data analysis criteria; (2) recommending changes to Handbook 44 to update the code to accommodate the latest technology; (3) improving (*and maintaining*) the uniformity of grain moisture measurement between the official and commercial systems and within the commercial system; (4) setting up a type evaluation program toward the accomplishment of (3); and (5) providing assistance to regulatory officials by defining an infrastructure to support testing and inspection of grain moisture meters and associated equipment. Strategic direction for the Sector comes from the NTEP Board of Governors. Input on how the Sector's proposals might work in the field comes from the active participation of Device Manufacturers, Weights and Measures officials, and Grain Industry representatives in Sector activities. Additional review of the Sector's proposals comes from NCWM Regional Committees, from the NCWM S&T Committee, and from Delegates to the NCWM Annual Meeting.

The Sector was in agreement that much of the negative opinion expressed regarding Sector activities and the resulting programs was due to misunderstandings and unreasonable expectations about the programs. Some of the misunderstandings were believed to have their roots in Grain Press articles which had taken information out of context or which played to the fears and sensitivities of the industry. It was suggested that a news release from NIST, in the form of frequently asked questions, might be a good way to clear up some of the misunderstandings.

In conjunction with this discussion, the Sector reviewed a Memorandum, dated February 27, 1997, sent to the Sector by Sid Colbrook, Illinois Department of Agriculture, Bureau of Weights and Measures (See Attachment). The Sector had the following comments:

Individual States have the discretion to delay enforcement of any provision of Handbook 44 Code. The Code does not prohibit the continued use of non-NTEP devices which were manufactured or in service prior to the non-retroactive (and effective) date. GIPSA has announced that it will be choosing a new meter for official inspection in June of this year and expects to put the new meters into service on some grains in July of 1998. The non-retroactive provisions of the Code do not become effective until January 1, 1999. Noting that almost every elevator in the State of Illinois presently have at least one Motomco 919 (the current meter used in official inspection) some Sector members wondered how many *new* Motomcos would be expected to be put into service in Illinois in 1999 should GIPSA not adopt a new meter as scheduled.

The Sector is not qualified to give legal advice and suggests that Mr. Colbrook consult his States Attorney's Office for advice on the matter of whether or not a regulatory agency can be held financially accountable if a terminal or elevator purchases an NTEP approved device later found to be inaccurate. One Sector member offered the opinion that to establish liability on the part of the regulatory agency in such a case, the elevator or terminal would have to prove that the condition (the inaccuracy) existed at the time the agency's inspector approved the device. When GIPSA adopts a new meter for official use, the Motomco 919 will no longer be the device which establishes the official grade.

Regarding the question of accuracy, the grain industry has indicated to the Sector that their primary interest is in uniformity (agreement with the official system). Accuracy (agreement with the standard air oven) is of secondary interest. As long as the grain market regards measurements made by GIPSA or licensed grain inspection agencies (the official system) as "truth", the fact that a particular commercial device is more accurate compared to the air oven doesn't mean much. The matter of uniformity relates to improving overall system performance. In that regard, uniformity might be considered "system accuracy." There are a number of reasons that NTEP meters will improve uniformity or "system accuracy". A few of these are: (1) the automatic features of NTEP meters take the operator out of the process, eliminating possible human errors (GIPSA field experience has shown substantial improvement in system performance when the operator was removed from the grain protein measurement process); (2) NTEP devices have been tested for stability and permanence over a range of operating voltages, temperatures, and humidity; (3) NTEP devices provide error messages when operating ranges have been exceeded, preventing unintentional errors; (4) NTEP meters are subject to an annual on-going calibration review and maintenance program to keep their Certificates of Conformance active; and (5) NTEP device manufacturers are provided with calibration data collected on the same sample set used by GIPSA for calibrating the official meters. Grain handlers have acknowledged that automatic features contribute to improved efficiency, allowing the operator to perform other tasks at the same time moisture measurements are being made.

NTEP meters will not display (nor print) a result in either of the following situations: (1) the device is outside its operating temperature range; (2) the temperature of the grain exceeds the range specified; or (3) the temperature difference between grain and meter exceeds the specified difference. If the grain moisture value is outside the moisture range listed on the CC, the moisture may be displayed, but it must be accompanied by a clear indication that the moisture range has been exceeded [H44, Sec.5.56.(a), S.1.3. Operating Range]. The Sector established these requirements to ensure that measurements would be made under the same conditions which the NTEP lab used to evaluate device performance.

In the case of grain moisture exceeding the limit, the Sector reasoned that a good "guess" at moisture was better than no reading at all, because there was little that buyer or seller could do to remedy the situation at that time. Requiring a clear indication of "moisture limit exceeded" alerts both buyer and seller that the measurement may not be within H44 tolerances, so either can choose whether or not to complete the transaction. Fortunately, most of the grain an elevator receives will be within the moisture range for which meters have been calibrated.

As to inhibiting measurements when any of the temperature conditions are not within limits, the Sector reasoned that the two conditions most likely to be encountered were: grain temperature exceeds limits (most likely frozen grain) and difference between grain temperature and device temperature exceeds limits. In the first instance, elevators have already developed a strategy to handle this condition. They seal the grain sample in a pint jar marked with the producer's code and hold it for later determination of the moisture which will appear on the settlement sheet. It is not often that this strategy has to be employed during harvest in Illinois. When the difference between grain temperature and device temperature exceeds limits, the operator has only to run the sample a second time. This is normally sufficient to allow the sample to warm up (or cool down) to an acceptable range. Running the sample a second time takes only 30 to 45 seconds for most NTEP meters. This seems a small penalty to pay for a more accurate measurement. The frequency with which a second measurement will have to be taken depends on the maximum allowable difference between grain and meter specified by the manufacturer. This varies from a minimum of ±10°C to about ±20°C depending on the device. The moisture ranges and grains for which a meter has been calibrated also vary depending on the device. A potential purchaser should carefully review the CC of the device to be purchased to make certain it has the desired characteristics.

In developing Code for Grain Moisture Meters, the Sector was careful not to make the Code technology specific. To the best of the Sector's knowledge, there is nothing in the Code that restricts the development or introduction of meters using new technology. Accuracy (air oven vs. meter) will always be limited by the fact that grain is a biological product whose characteristics change over time. All of the present technologies use indirect methods of measuring the moisture content of the grain. Dielectric type meters use the relationship between the bulk capacitance of a grain sample and moisture as the basis for their measurements. Near Infrared Instruments measure the energy absorbed by water molecules within the sample at specific wavelengths of near infrared light. Each of these technologies has its advantages and disadvantages. Both are affected in varying degrees by characteristics of grain which vary with variety, growing conditions, temperature, kernel size, shape, density, etc. The greatest potential for immediate improvement in perceived accuracy will be found in things which promote uniformity within the system. The Sector is actively involved in looking at ways to ensure that meters, as shipped, and in the field will remain closely aligned with like meters in the NTEP laboratory. The Sector will continue to seek additional means of bringing all NTEP meters into the closest alignment possible with the technologies involved. A positive attitude toward the moisture program by W&M officials in existing NTEP states and their assistance in urging other grain states to adopt an NTEP moisture program will also help in achieving nation-wide system uniformity.

14. GIPSA Response to NTEP Needs

Citing unusually long delays in getting CC's issued for devices which been approved over a year ago and delays in getting the NTEP program up and running for NIR protein analyzers (NIR), Cliff Watson, Consultant, recommended that the Sector ask GIPSA to respond in a more timely manner to the needs of manufacturers with regards to the NTEP program. Diane Lee, NIST, noted that the process for drafting CC's had recently been changed to make it possible to publish CC's in a more timely fashion. She reported that draft CC's were now available for manufacturers to review. These would be published as soon as manufacturers responded. Mr. Watson was concerned that support would be lost for the NIR program if something couldn't be done to get it going soon, and suggested that the Sector ask the NCWM Board of Governors to send a letter to GIPSA requesting that a higher priority be assigned to setting up the NIR program. Dr. Pierce related some of the staffing problems he had experienced and explained that his responsibilities at GIPSA extended well beyond those associated with

running the NTEP grain moisture meter (GMM) program and setting up the NIR program. He believed that a letter would not produce additional resources and noted that getting the NIR program started would take a lot more resources than keeping the GMM program going. Any resource diverted to setting up the NIR program would jeopardize the GMM program. The Sector was in general agreement that the NIR program should not be implemented at the expense of the GMM program. It was recognized that because many states had formal regulatory programs for moisture meters, priority must be given to moisture issues. Dr. Pierce expressed the belief that once the GMM program had been "de-bugged" and was functioning as expected, the effort to keep it going would not be as great as it presently was. At that point work on the NIR program could be resumed.

Attendance List - Sector Meetings March 10-12, 1997 Atlanta, GA

Name	Affiliation	March		
		10	11	12
Jack Barber	JB Associates	x	x	x
Connie Brown	DICKEY-john Corp.	x	x	x
Randy Burns	Arkansas Bureau of Standards	x	x	x
Tina Butcher	NIST/OWM	x	x	
Marty Clements	Steinlite Corporation	x	x	x
Tim Conwell	CSC Scientific	x	x	x
Cassie Eigenmann	DICKEY-john Corp.	x	x	x
Rich Flaugh	GSF, Inc.		x	x
David Hopkin	Sinar Technology	x	x	x
Charles R. Hurburgh Jr.	Iowa State University	x	x	
David Krejci	GEAPS	x	x	x
G. Diane Lee	NIST/Office of Weights and Measures	x	x	x
Keith Locklin	ConAgra Corn Processing (representing GEAPS)	x	x	x
Chuck Lowden	Foss Food Technology	x	x	x
Pontus Nobreus	Perstorp Analytical	x	x	x
Ray Oberg	Zeltex, Inc	x	x	x
Tom O'Connor	National Grain & Feed Association	x	x	x
Carla Pesce	Georgia Weights & Measures	x	x	
Richard Pierce	USDA-GIPSA-TSD	x	x	x
Neal Rooks	Georgia Weights & Measures	x	x	x
Joe Rothleder	California Dept. of Food & Agriculture	x	x	x
Tom Runyon	Seedburo Equipment Co.	x	x	x
Cheryl Tew	North Carolina Dept. Of Agriculture	x	x	x
Cliff Watson	Consultant	x	x	x
Robert Wittenberger	Missouri Dept. of Agriculture, Div. Weights & Meas.	x	x	x
Richard (Will) Wotthlie	State of Maryland	x	x	x

National Type Evaluation Technical Committee
Grain Moisture Meter Sector
Meeting Summary
September 10 – 12, 1997, Chicago (Rosemont), IL

Agenda Items

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1. Report on NCWM Annual Meeting and Grain Moisture Meter Questionnaire

The NCWM Annual Meeting was held July 20-24, 1997 in Chicago, IL. Diane Lee, NIST/OWM, reported that Conference agenda item **356-1**, the Sector's recommendation to modify GMM Code paragraph **S.2.5. Provision for Sealing** and **Table S.2.5. Categories of Device and Methods of Sealing** , was adopted by the Conference with minor editorial revisions. [Note: for additional discussion on this issue refer to *NCWM Publication 16, April 1997*; and to *"Addendum Sheets to the Interim Report of the Committee on Specifications and Tolerances*" for the 82nd Annual Meeting].

Ms. Lee also reported on responses to a questionnaire distributed to State Weights and Measures Directors. The questionnaire sought information on (1) grain moisture meter programs in the States; and (2) State implementation of the January 1, 1998, Handbook 44 non-retroactive requirements for grain moisture meters. The questionnaire was distributed as a result of a panel discussion held at the Central Weights and Measures Association meeting in April 1997. 76 percent of the 53 jurisdictions responded to the questionnaire. [NOTE: See *Attachment 1* "NCWM June 1997 Grain Moisture Meter Questionnaire Results."]

2. Review of NTEP Processes: Phase I and II Critical Dates

[See *Attachments 2 and 3* for the NTEP Grain Moisture Meter Phase I and Phase II Process Flowcharts and Time Lines approved by the Sector.]

Diane Lee, NIST, outlined the process for submitting an application for device type evaluation and reviewed the procedures and critical dates associated with obtaining and maintaining a Certificate of Conformance (CC) under the NTEP grain moisture meter program. Now that the program has been operating for two full years, it has become apparent that some of the deadlines the Sector originally approved for Initial Type Evaluation (Phase I) and On-going Calibration Review (Phase II) events have been difficult, if not impossible, to meet. Slippage of critical dates has created problems for both the NTEP Laboratory and Manufacturers.

Discussion: In reviewing dates associated with Phase I, the Sector considered whether a CC number should be issued prior to the determination of the final calibration coefficients (and any associated bias settings) which would appear on the CC when it was finally published. Specifically addressed was the question: Should a CC number be assigned (and given to the manufacturer) before the NTEP Laboratory has performed bias checks on the "other 12" grains (i.e., other than corn,

hard red winter wheat, and soybeans)? It was pointed out that once a CC number is issued, a manufacturer can sell devices with calibrations which might later prove to be invalid after bias checks have been completed. Several Weights and Measures representatives expressed the opinion that the CC number should not be made available until all calibration details are known. At least one manufacturer objected on the basis that delaying the issuance of the CC from May 1 (the latest Phase I testing completion date which allows a CC to be issued for the coming season) to June 10 (the latest date for the manufacturer to review the Draft CC and submit requested information) effectively cuts one year out of sales. Others expressed the belief that this concern could be addressed if the manufacturer did not wait until the deadline date for submitting a device for type approval. Grain Industry representatives were concerned that early issuance of the CC number might result in the purchase and use of meters which would not have updated calibrations installed until the meter is field inspected, which could be as late as the following season.

Conclusions: By a vote of 13 to 6, the Sector decided that the CC number should not be issued until all calibration details are known (at the latest June 10, if the device is to receive a valid CC for the current harvest year.)

Discussion: Reviewing Phase II dates, manufacturers agreed that they would be able to provide the NTEP Laboratory with re-predicted moisture values in standard data format based on up to three years of NTEP Laboratory data by May 15 if the NTEP data are available to them by March 1 and if data can be sent via e-mail. Grain Industry representatives asked if NTEP meters and the GIPSA Official Meter would update calibrations on the same schedule. Rich Pierce, GIPSA, replied that GIPSA has not announced a schedule for updating calibrations on the new (not announced as of this meeting) Official Meter. In the past, calibration changes for the Official Meter have been made on a staggered schedule with wheat and other small grain calibration changes typically becoming effective around May 1, and with corn, soybeans, and other late season crop calibration changes typically becoming effective around August 1. Changes were timed this way for two reasons: (1) to minimize the economic impact (stocks are lowest just before harvest) and (2) because small grain data are available first. Grain Industry representatives stressed the importance of keeping NTEP calibration changes synchronized with GIPSA calibration changes. They pointed out that re-issuing CC's on July 1 will miss the wheat harvest in most of the country. Noting that data on wheat would be in manufacturer's hands by December 15, one Sector member suggested that it should be possible to determine the details of any revised wheat calibrations as early as April 15 or May 1. If the NTEP Laboratory has reviewed and accepted the new wheat calibrations, manufacturers could notify State W&M Officials that these calibrations have been approved for use and will appear on the CC when it is re-issued in July. Grain Organizations could assist in publicizing such changes. The possibility that the Official Meter and its corresponding type NTEP meter might end up not using the same calibration was also brought up. Manufacturers expressed the belief that this was highly unlikely, because the market would expect the NTEP meter to provide the same results as the Official Meter. The manufacturer's meter selected as the new Official Meter would make certain that its NTEP version agreed with the Official Meter (at least over the range for which the Official Meter was calibrated). The easiest way to accomplish this would be for the manufacturer to make arrangements with GIPSA to obtain the Official Calibrations.

Conclusions: Tables listing the Phase I and Phase II deadline dates agreed to by the Sector are shown below. See *Attachments* for detailed process flow charts covering steps involved in the initial NTEP evaluation (Phase I testing) and the On-going Calibration Program (Phase II testing).

Initial Evaluation (Phase I)		
Activity	**Deadline Date**	**Responsible Party**
Submit Phase I application	Dec 1	Manufacturer

Initial Evaluation (Phase I)		
Device information and letter to manufacturer and NTEP Laboratory	Dec 15	NIST
Deliver meters and calibration data as indicated on the application (for bias checks)	Feb 1	Manufacturer
Provide manufacturer with testing schedule	Feb 1	NTEP Laboratory
Phase I conducted	Dec 1 - April 30	NTEP Laboratory
Phase I complete	May 1	NTEP Laboratory
Bias checks complete	May 21	NTEP Laboratory
Draft CC and review form to manufacturer	June 1	NTEP Laboratory
Draft CC reviewed	June 10	Manufacturer
Initial CC issued	July 1	NIST

Ongoing Calibration Program (Phase II)		
Activity	**Deadline Dates**	**Responsible Party**
Submit Application for Phase II	May 1	Manufacturer
Device information and letter to manufacturer and NTEP Laboratory	May 15	NIST
Phase II starts	July 1	NTEP Laboratory
Phase II testing and data to manufacturer	July 1 - March 1	NTEP Laboratory
Repredicted values in std data format	May 15	Manufacturer
Draft CC and review form to manufacturer	June 15	NTEP Laboratory
Draft CC reviewed	June 20	Manufacturer
Revised CC issued	July 1	NIST

3. Update on Type Evaluation and Phase II Testing

1997 NTETC Grain Moisture Meter Sector Summary

Rich Pierce of GIPSA, the NTEP Participating Laboratory for Grain Moisture Meters, reported that Phase I testing had been completed for the Steinlite SL95, bringing the number of instrument models included in the Phase II calibration program to seven. At the time of his report there was only one active control number related to Phase I testing.

Dr. Pierce cited two examples of anomalous results which had been observed on some of the NTEP devices in the on-going calibration program (Phase II testing). These were characterized by:

- Unusual bias differences between subsequent years, or
- Severe slope differences at higher moistures between subsequent years.

Dr. Pierce pointed out that the present rules for reviewing calibrations are based on examining the bias at each 2% moisture interval using data collected over the years. The problem with this approach is that the "average" bias for multiple years of data can be within tolerance while the biases for individual years can all be out of tolerance. In the first example, the bias differences between individual years were partially canceled when data for the two years were pooled. Dr. Pierce also noted that the rules do not address slope. He suggested that additional rules or tolerances be established to cover instances of unusual bias differences between individual years and to address sudden severe changes in slope. In the absence of such rules, the Sector was asked to consider on what basis action might be taken and what action would be appropriate for the devices in question.

On the question of basis for action, the Sector Technical Advisor suggested that Paragraph **G-S.3. Permanence** of the General Code of H44 might be applicable. This paragraph is reproduced below.

> **G-S.3. Permanence** - All equipment shall be of such materials, design, and construction as to make it probable that, under normal service conditions:
>
> (a) accuracy will be maintained
> (b) operating parts will continue to function as intended, and
> (c) adjustments will remain reasonably permanent.
>
> Undue stresses, deflections, or distortions of parts shall not occur to the extent that accuracy or permanence is detrimentally affected.

He was of the belief that successive year slope differences or bias shifts, far exceeding any which might be expected due to crop or sample differences, should be criteria for rejection. Such differences indicate that either:

- the manufacturer's re-predictions have been miscalculated (either the algorithm is incorrect or significant data entry errors have been made), and, as a result, there has been no validation of the original calibration changes,
- the calibration is not robust,
- the manufacturer gave the NTEP Laboratory incorrect calibration coefficients
- something is wrong with the device itself, or
- the manufacturer's standardization procedures are incapable of providing the required degree of standardization.

Regardless of the cause, he was of the opinion that if a manufacturer was unable to determine and substantiate the cause for anomalous results, it followed that the manufacturer could give no assurance that accuracy would be maintained or that adjustments were permanent (or appropriate.)

A number of questions arose in the discussion of how to handle cases where serious questions or problems arose as a result of Phase II testing:

1. Should a CC be re-issued with a restricted moisture range?

   Some were of the opinion that a CC could be re-issued with a restricted moisture range if (1) the problem is clearly limited to a single grain and does not appear to be indicative of a larger or systemic problem; and, (2) the moisture range is not

less than the moisture range specified for Phase I; some believed that because limitations on use are specified on the CC, it would be possible to have an 'active' certificate with no approved calibrations; while others were of the opinion that any calibration problem of unusual magnitude, for which the manufacturer is not able to identify and correct the root cause, is reason to suspect the manufacturer's ability to maintain accuracy in other calibrations. It was thought that re-issuing a CC with no calibrations or with severely limited moisture ranges put the reputation of the NTEP Program at risk. Although a vote was not taken, there seemed to be agreement that a CC should not be re-issued unless it included calibrations which met Phase I requirements for each of the three grains tested in Phase I (corn, soybeans, and hard red winter wheat.)

2. Should a new category of "pending" CC be defined to indicate that there was a problem which the manufacturer was attempting to resolve?
This was the subject of much additional discussion. Sector members wanted to find some way to motivate the manufacturer to remain in the Phase II program as long as the manufacturer was working in good faith to resolve the problem. One member suggested that the CC should simply be allowed to expire until acceptable calibrations could be developed and validated. Others felt there was a need to differentiate between CC's which expired because of unresolved problems and CC's which expired only because the manufacturer withdraws from Phase II. The Sector agreed that conditions for re-issuing a CC and the maximum length of time a manufacturer should be allowed to remain in Phase II before the CC is withdrawn should be clearly spelled out in the definitions in Section 1, Part **N. Status of Certificate of Conformance; Maintenance Fee** of Publication 14. The proposed wording of the definitions and conditions will be the subject of a letter ballot [See agenda item 3.a.]

3. Should the manufacturer be allowed to continue selling the device?
The Sector was divided on this point. Some believed that a CC should expire when acceptable calibrations cannot be developed and validated. Without a valid CC, devices can no longer be sold for commercial use in States which enforce NTEP rules for moisture meters. Others favored allowing sales to continue, even if a CC were re-issued with severely restricted moisture ranges.

4. Should devices in place continue to be used after CC's expire?
The Sector had previously decided that devices no longer supported by a manufacturer could continue to be used commercially, provided they passed field inspection. The Sector agreed that devices already in service could continue to be used if they passed field inspection provided that the CC was not withdrawn as the result of a specific determination by NTEP.

5. If this anomaly is limited to a single grain (other than the basic 3) can the CC be re-issued as 'Active' with the calibration for the grain in question shown as "not available"?
The Sector agreed that under the conditions cited in this question, the troublesome grain calibration could be dropped and an 'Active' CC could be issued with that change.

6. How much time should be allowed for the manufacturer to resolve problems before the CC is withdrawn?
There was general agreement that a reasonable length of time should be allowed for the manufacturer to determine the root cause of the problems and correct the deficiency. The time agreed upon was two consecutive years (i.e., unable to re-issue CC's for two successive seasons). The Sector agreed that the manufacturer must remain in the Phase II on-going calibration review program and must exhibit a good faith effort to resolve the problem in order for the CC to remain in "expired" status. If the CC is not re-issued within that period, or if the manufacturer withdraws from Phase II before a CC is re-issued, the CC shall be withdrawn.

7. What notification should be given to W&M Officials?
Diane Lee, NIST, provided the Sector with a rough Draft ***Notice of Ongoing Calibration Evaluation Results*** form which would be issued with Certificates of Conformance (CC) of devices which had unresolved problems occuring in the Ongoing Calibration Program Phase II Testing. Sector members were asked to submit written comments to her by October 1, 1997. A letter ballot on the final draft will be sent to voting members by October 20 to be returned by October 27, 1997. [See also Agenda Item 3.a.]

The Sector Technical Advisor and the NTEP Laboratory Representative were asked to suggest for consideration at the next Sector meeting, additional rules and tolerances to use in evaluating calibration performance from year to year in Phase II testing.

On the subject of Phase II data interchange, Rich Pierce, GIPSA, reported that the NTEP Laboratory had experienced problems transforming some manufacturer supplied data into the form required by the Laboratory's statistical analysis program. These problems seemed to be isolated to cases where data fields were space delimited. Dr. Pierce requested manufacturers to submit future data in comma delimited form. Several manufacturers mentioned that they were unable to import NTEP Laboratory data into their spreadsheets and had to manually enter the data in order to re-predict moisture values. Dr. Pierce was surprised to learn of this fact and urged manufacturers to notify him personally if they have any data handling problems in the future. It was pointed out that these problems would have to be resolved if program time deadlines were to be met.

3.a Proposed Change to Publication 14 - Modify Definitions

Unlike Certificates of Conformance (CC's) for other NTEP devices, CC's for Grain Moisture Meters automatically expire July 1. To maintain "active" status, meters must remain in the NTEP on-going calibration program and the CC's must be re-issued annually with valid calibration constants. The unique treatment of CC's for Grain Moisture Meters requires modification of a portion of the Administrative Procedures of Publication 14. Diane Lee, NIST, presented a rough draft of proposed definitions for the Sector to review.

Conclusions: The Sector reached general agreement on the substance of the definitions; however, because a final draft of the wording was not available at the meeting, a letter ballot will be sent out for approval of the proposed changes to Publication 14 and of the form titled: ***Notice of Ongoing Calibration Evaluation Results***. [See also Agenda Item 3.] The results of the letter ballot are as follows: A total of 15 Sector members responded to the ballot (two of the responses were comments only)

Voting Item	**Votes**		
	Affirmative	**Negative**	**Abstain**
Add and modify definitions in Publication 14 Section N.	9	3	1
Agree with structure of the Notice of Ongoing calibration Results	10	2	l

The following are the proposed changes to Publication 14. [See Attachments 4 and 5 of the Notice of Ongoing Calibration Results, and a grain moisture meter status matrix for further guidance with the proposed changes to Publication 14].

N. Status of Certificate of Conformance; Maintenance Fee

Except for Grain Moisture Meters, a Certificate of Conformance does not have an expiration date; however, the device manufacturer must update the design of a device to meet new or modified requirements adopted by the NCWM. The NCWM charges a maintenance fee for active and notified Certificates to support the technical and administrative activities of the NCWM for NTEP.

1. Declaration of Status by Certificate Holder

The Certificate holder, usually the manufacturer or remanufacturer, declares intent to continue to manufacture or remanufacture the device by paying to the NCWM, an annual maintenance fee for the Certificate. If the maintenance fee

is not paid (or if other outstanding bills have not been paid or arranged to be paid for the issuance of a Certificate), the Certificate is "inactive."

In addition to the above, Grain Moisture Meter manufacturers must pay an annual participation fee for the NTEP laboratory On-going Calibration Program, OCP (Phase II) in order to maintain their certificate in an active or notified status.

2. Active Status
Devices are being manufactured or remanufactured for commercial applications under an NTEP Certificate of Conformance. This means that the Certificate is in force with a hard copy of the Certificate issued and distributed.

In addition to the above, a Grain Moisture Meter must remain in the OCP (Phase II) and that participation must result in the issuance of valid calibration constants without unresolved problems or deficiencies occurring during the OCP (Phase II) testing. Grain Moisture Meter Certificates may also be assigned an Active status if: (1) the original manufacturer no longer manufacturers or remanufacturers the device but continues to participate in the OCP(phase II); or (2) a third party elects to maintain the calibrations after a Certificate expires for a device in which the original manufacturer has stopped manufacturing or re-manufacturing the device.

3. Notified Status
A Notified status is assigned to Grain Moisture Meter Certificates when unresolved problems or deficiencies occur during the OCP (Phase II). When a Certificate is assigned this status, a Notice of Ongoing Calibration Evaluation Results will be issued with the Certificate. The notice will describe the problems or deficiencies and the Certificate will designate the affected calibrations. Manufacturers of devices in this category must remain in the OCP (Phase II) actively working to correct the problems or deficiencies. Corrections must be made within two years of the date that the CC is assigned a notified status. If problems or deficiencies are not corrected by that date, the Certificate will be withdrawn. Any meters manufactured after a Certificate is given a Notified Status cannot be sold or placed into commercial service under a notified certificate. Meters in service will be subject to individual State enforcement activities.

4. Effective Status
Equivalent to ACTIVE status, but a hard copy of the Certificate of Conformance has not yet been issued and distributed. Therefore, a hard copy of the Certificate is not yet included in Publication 5.

5. Inactive Status
An Inactive Certificate of Conformance is a Certificate which was previously Active, but the devices are no longer being manufactured or remanufactured for commercial applications. However, devices already manufactured, installed, or in inventory, but not yet sold, may be used, sold, repaired, and resold, under an Inactive Certificate of Conformance.

6. Withdrawn Status
The Certificate of Conformance remains valid unless withdrawn as the result of a specific determination by NTEP.

A Certificate of Conformance may be withdrawn

a. for deficiencies in the type, or

b. when production devices do not meet type.

Additionally, a Grain Moisture Meter Certificate may be withdrawn when problems or deficiencies occurring in the OCP (Phase II) are not resolved within two years of the date that a Certificate is assigned a Notified status. After a Certificate is withdrawn, the manufacturer must submit a new application and application fee per device model and the device must be reevaluated in Phase I before it is entered in the OCP (Phase II). Any meters manufactured after a Certificate is withdrawn, cannot be sold or placed into service for commercial use. Meters in service will be subject to individual State enforcement activities.

7. Expired Status

An Expired status is assigned to a Grain Moisture Meter Certificate of Conformance when a manufacturer elects to discontinue participation in the On-going Calibration Program and the calibrations listed on the CC were performing acceptably at the time the manufacturer stopped participating in the OCP (Phase II).

A third party would be allowed to assume responsibility for maintaining calibrations for a device which has expired without re-entering Phase I, if the party participates in the OCP (Phase II) testing the year the original certificate expires, and providing the original manufacturer certifies that the device will no longer be manufacturer or re-manufactured. In this case the third party must (1) submit evidence of authorization from the original manufacturer for use of previous test results and also certification from the original manufacturer that the device will no longer be manufactured or re-manufactured, (2) submit a new application, (3) pay the participation fee for the device, (4) demonstrate the ability to re-predict moisture data and modify calibrations as required (5) pay the maintenance fee for the new certificate, and (6) permanently mark the device with the company name. After successful completion in the OCP an active Certificate with a new number would be issued for the device submitted by the third party.

Any meters manufactured after a Certificate has expired cannot be sold or placed into service for commercial use. Meters in service may be used, but actions taken would depend on individual State enforcement activities.

4. Proposed Change to Publication 14 - Sample Temperature Sensitivity

Background: The sample temperature sensitivity test verifies that accurate results will be provided when the sample and instrument are at different temperatures. In some instruments, temperature compensation is accomplished by including, in the calibration set, data obtained on samples at various temperatures. For these instruments, calibration updates may affect the temperature compensation and thus may affect performance over temperature. Temperature studies have not been included in Phase II of the NTEP moisture program and no temperature testing has been performed by the NTEP Laboratory on the "other 12" NTEP grains [i.e., grains other than corn, soybeans, and hard red winter wheat]. For some meters, calibrations for these "other 12" NTEP grains and oil seeds had been in use for many years prior to the existence of the NTEP program for moisture meters. It was reasoned, in the early years of the program, that it would be far less disruptive to the market to accept them for use without formal verification of temperature performance than to have manufacturers abandon them because the cost of testing exceeded any revenue a manufacturer could expect to gain by continuing their support. This issue was re-visited at the Sector's March 1997 meeting in an attempt to find a means for verifying the temperature performance of these "other 12" grains/oil seeds. The Sector was unable to agree on a proposal which would have required manufacturers to submit temperature performance data. Manufacturers objected on the grounds that the data used to determine coefficients for temperature correction and to validate performance over a range of sample temperatures had been recorded many years ago on now-obsolete media (e.g. tape cassettes for HP 9815 Computers) and was no longer retrievable. They further stated that the cost of Temperature Sensitivity Testing (even in a "abbreviated" form) all of the "other 12" grains was prohibitive and might result in a decision to drop those grains from their CC's. The difficulty in obtaining samples for some of the less widely grown grains was also mentioned. Several W&M members thought that some minimal amount of testing should be performed by the NTEP Laboratory on any grain, believing that without NTEP Laboratory testing, the whole NTEP process would be compromised. It was suggested that manufacturers be allowed to request NTEP temperature performance testing of the other 12 grains on an individual grain by grain basis. This approach would be market driven, allowing manufacturers to decide if there was a marketing advantage in being able to show that a particular grain calibration had been temperature verified. To provide a method for selectively verifying temperature performance on a grain by grain basis, and to supply potential purchasers and W&M officials with information regarding the integrity of calibrations for each of "the other 12 grains", the Sector unanimously agreed that the CC shall indicate those grains for which temperature performance has not been verified by the NTEP process. [Note: the "Temperature Performance Not Verified" designation will first appear on CC's issued July 1, 1998.]

Conclusions: Noting that failure to verify temperature performance on the basic three grains (corn, soybeans, and hard red winter wheat) has a potentially greater economic impact than failure to verify the "other 12", the Sector approved the addition of a note to the end of the Sample Temperature Sensitivity Test to address the requirement for verifying temperature performance when calibrations for *any* of the NTEP grains are changed. The Sector also approved the addition of Appendix D which specifies an abbreviated procedure for conducting the verification tests on the "other 12" grains.

II. Sample Temperature Sensitivity:

Additional testing is required to verify that accurate results are provided when the sample and instrument are at different temperatures. This will be referred to as the sample temperature sensitivity test. The purpose of this test is to verify that the instrument provides accurate results when the difference in temperature between the sample and the instrument is at the manufacturer specified difference (a minimum Δ of 10 °C is required). The sample temperature sensitivity test will be conducted using corn, HRW wheat, and soybean samples. Tests will be conducted with the instrument at room temperature and the sample temperature varying from room temperature $+\Delta T_H$ to room temperature $-\Delta T_C$ (where ΔT_H is the manufacturer specified difference for grain above room temperature, and ΔT_C is the manufacturer specified difference for grain below room temperature. In no case will ΔT_H be allowed to exceed 32°C, but the two differences need not be equal.)

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▪
▪
▪

Note: When changes are made in corn, soybeans, or hard red winter wheat calibrations, the Sample Temperature Sensitivity Test will have to be repeated unless spectral or other such 'raw' data are available from an earlier Sample Temperature Sensitivity Test performed by the NTEP Laboratory on the same device type. When such 'raw' data are available, the manufacturer will be required to predict performance at each temperature using the new calibration. If no 'raw' data are available and the manufacturer can show that the temperature compensation factor (or factors) are unchanged and are independent of other calibration parameters, the Sample Temperature Sensitivity Test will not have to be repeated. For performance limits, test instructions, and testing requirements applicable to the "other 12" NTEP grains [i.e., grains other than corn, soybeans, and hard red winter wheat], see Appendix D.

Appendix D - Sample Temperature Sensitivity
(for grains/oil seeds other than corn, soybeans, & hard red winter wheat)

This Appendix specifies the procedure for conducting the sample temperature sensitivity test on NTEP grains/oilseeds other than corn, soybeans, and hard red winter wheat. Tests will be conducted with the instrument at room temperature and sample temperature varying from room temperature $+\Delta T_H$ to room temperature $-\Delta T_C$. (where ΔT_H is the manufacturer specified difference above room temperature for the grains in Section II, and ΔT_C is the manufacturer specified difference for below room temperature for those grains.)

A device submitted for this test must be capable of transmitting, via its communications interface, "raw" data as well as date, grain type, predicted moisture result, and calibration version identification and recording in Standard Data Format on 3.5" diskette all the information listed in Appendix C. If the device itself does not include the necessary keyboard or disk drive, the manufacturer must supply a personal computer and the necessary software to build a file as described in Appendix C.

Note: Two (2) samples are to be selected from each of three 2% moisture intervals for each grain type for which the test is to be performed. Two analyses will be made for each grain sample at each of the three test temperatures. The overall bias for the 12 observations (2 samples x 3 moisture intervals x 2 replicates) run at the temperature extremes must agree with the room temperature results within the tolerances listed in the accompanying table.

Test Procedure:

1. Analyze the room temperature samples on the test instrument (Room 1).

2. Condition samples to the cold temperature and run them on the instrument under test (Cold).

Note: Each sample is to be checked for temperature before it is analyzed. Samples must be within 0.5□C of the desired test temperature at time of analysis, and samples are to be reconditioned to the test temperature after each

analysis. The sample cell on the instrument under test is to be given a minimum of 10 minutes to equilibrate to room conditions between sample analyses.

3. Bring the samples to room temperature, and run the samples on the instrument under test (Room 2).

4. Condition the samples to the hot temperature and run them on the instrument under test (Hot), observing the precautions in the note following step 2.

5. Repeat step 3 to obtain another set of room temperature results (Room 3).

COLD BIAS = Cold □ ((Room 1 + Room 2) / 2)
HOT BIAS = Hot □ ((Room 2 + Room 3) / 2)

Note: When changes are made in any of the "other 12" calibrations, the Sample Temperature Sensitivity Test will have to be repeated unless spectral or other such 'raw' data are available from an earlier Sample Temperature Sensitivity Test performed on the same device type by the NTEP Laboratory. When such 'raw' data are available, the manufacturer will be required to predict performance at each temperature using the new calibration.

Moisture Ranges and Tolerances for Sample Temperature Sensitivity
(for the "other 12" NTEP grains)

Grain Type	Moisture Range for Test	Tolerance Limit (Bias at Temperature Extremes)
Durum Wheat	10-16%	0.35
Soft White Wheat	10-16%	0.35
Hard Red Spring Wheat	10-16%	0.35
Soft Red Winter Wheat	10-16%	0.35
Hard White Wheat	10-16%	0.35
Sunflower seed (Oil)	6-12%	0.45
Grain Sorghum	10-16%	0.45
Two-rowed Barley	10-16%	0.35
Six-rowed Barley	10-16%	0.35
Oats	10-16%	0.45
Long Grain Rough Rice	10-16%	0.45
Medium Grain Rough Rice	10-16%	0.45

5. Proposed Addition to Publication 14 - Standardization of Instruments

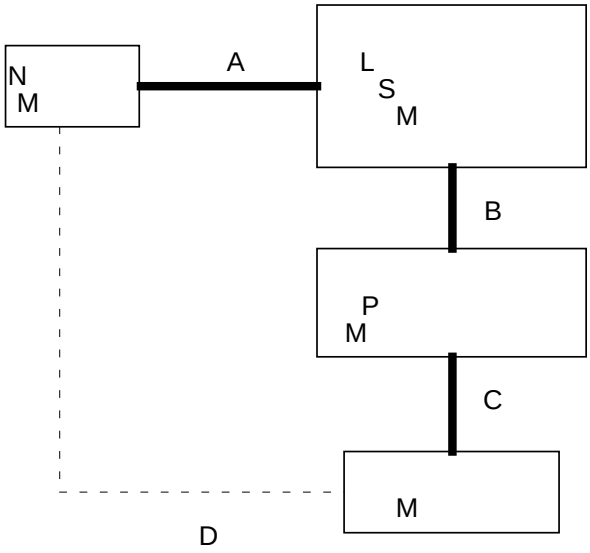
Discussion: Earlier data compiled by Dr. Hurburgh suggested that instruments in the field (or in State Moisture Laboratories) may not be closely aligned with instruments of like type in the NTEP Laboratory. The NTEP Laboratory has also seen unexplained differences between moisture results (using the same calibration and correcting for air oven differences) obtained on the same set of samples at 12-month intervals [*See also, Agenda Item 3*]. In such cases, Phase II data collected on the NTEP Laboratory instruments may not be useful in maintaining calibrations and may not be representative of what can be expected with devices in the field. Manufacturers typically maintain a "standard" instrument (or instruments) against which production units are tested and adjusted to be within the manufacturer's acceptable tolerance limits. At the present time, there are no requirements for the NTEP Laboratory instruments to be periodically compared with manufacturer's standard(s) or adjusted to agree with the manufacturer's "standard(s)." Thus, any change in performance over time, in either the NTEP Laboratory units or the manufacturer's "standard" units, can result in a corresponding loss of accuracy (compared to air oven) in production units. The Sector has agreed that the NTEP units should be standardized against manufacturers' master units annually (typically between March 1 and May 30). The Sector has also agreed that the specific alignment details (e.g. what instrument parameters to measure, what adjustments to make, etc.) would vary with the technology involved and the manner in which that technology had been implemented, and that manufacturers should also be required to demonstrate that their methods for standardizing production units provide assurance that units "as shipped" will agree with the NTEP units within acceptable tolerances. Manufacturers were divided on the question of whether Publication 14 should require that they maintain a log of any adjustments, repairs, etc. performed on their NTEP Laboratory units. The Technical Advisor pointed out that it was in the Manufacturer's best interest to keep such a log. A log could be extremely helpful in resolving problems or discrepancies which might be detected in Phase II testing. Although a majority of Manufacturers agreed, there was not a clear consensus. The keeping of such a log will be left to the discretion of individual manufacturers.

Conclusions: The Sector approved the following addition to Publication 14 to address the issue of standardizing instruments:

V. Standardization of Instruments

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

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



6. Proposed Change to Publication 14 - Sealing Requirements

Discussion and Conclusions: The Sector approved the following changes to portions of Section 2, Chapter 6 of Publication 14 to reflect changes to the Grain Moisture Meter Code of Handbook 44 adopted by NCWM at the 82nd Annual Meeting and to further clarify audit trail requirements. [Editor's note: Because of the extensive nature of changes required to paragraph 4 and its sub-paragraphs, except for additions to Table S.2.5. recommended by the Sector at this meeting, changes and deletions have not been indicated. Consider that the entire section involved has been deleted and replaced by the following.]

Code Reference: S.2.5. Provision for Sealing

4.1 Provision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., audit trail available at the time of inspection as defined in Table S.2.5.) before any change that affects the metrological integrity of the device can be made to any mechanism.

4.1.1 The manufacturer has provided information on how the device should be sealed. **Yes** ☐ **No** ☐ **NA** ☐

For Category 1 Devices:

Yes ☐ **No** ☐ **NA** ☐

4.1.2 All calibration and metrological adjustments can be sealed, or other means of providing security such as event counters are provided.

If equipped with event counters:

.1.3 There are two event counters, one for calibration parameters and one for configuration parameters. **Yes** ☐ **No** ☐ **NA** ☐

4.1.4 The event counters are nonresettable by the operator and have a capacity of at least 000 to 999 events each. **Yes** ☐ **No** ☐ **NA** ☐

4.1.5 The event counters increment appropriately. **Yes** ☐ **No** ☐ **NA** ☐

4.1.6 The counters are capable of retaining their count for at least 30 days while the device is without power. **Yes** ☐ **No** ☐ **NA** ☐

4.1.7 Non-sealable parameters cannot be accessed in the mode which allows sealable parameters to be adjusted. **Yes** ☐ **No** ☐ **NA** ☐

4.1.8 The device is designed to attach a printer which can print the contents of the counters or the device has the capability of displaying the counter contents. **Yes** ☐ **No** ☐ **NA** ☐

4.1.9 Accessing event counter information for review is separate from the mode used to enter or modify sealable parameters.

4.1.10 Event counters can be accessed without requiring the removal of any parts other than the normal requirements to inspect the integrity of a physical seal or to use a key (for a panel lock) to gain access to the means to view counter information or cause it to be printed. **Yes** ☐ **No** ☐ **NA** ☐

For Category 2 Devices:

4.1.11 The hardware enabling access for remote communication is at the device and can be sealed using a physical seal or two event counters. **Yes** ☐ **No** ☐ **NA** ☐

4.1.12 The device clearly indicates when it is in the remote configuration mode. **Yes** ☐ **No** ☐ **NA** ☐

4.1.13 When enabled for remote configuration, the device is not capable of operating in the measure mode. **Yes** ☐ **No** ☐ **NA** ☐

If equipped with event counters:

4.1.14 There are two event counters, one for calibration parameters and one for configuration parameters. **Yes** ☐ **No** ☐ **NA** ☐

4.1.15 The event counters are nonresettable by the operator and have a capacity of at 000 to 999 events each. **Yes** ☐ **No** ☐ **NA** ☐

4.1.16 The event counters increment appropriately. **Yes** ☐ **No** ☐ **NA** ☐

4.1.17 The counters are capable of retaining their count for at least 30 days while the device is without power. **Yes** ☐ **No** ☐ **NA** ☐

4.1.18 Non-sealable parameters cannot be accessed in the mode which allows sealable parameters to be adjusted. **Yes** ☐ **No** ☐ **NA** ☐

4.1.19 The device is designed to attach a printer which can print the contents of the counters or the device has the capability of displaying the counter contents. **Yes** ☐ **No** ☐ **NA** ☐

4.1.20 Accessing event counter information for review is separate from the mode used to enter or modify sealable parameters. **Yes** ☐ **No** ☐ **NA** ☐

4.1.21 Event counters can be accessed without requiring the removal of any parts other than the normal requirements to inspect the integrity of a physical seal or to use a key (for a panel lock) to gain access to the means to view counter information or cause it to be printed. **Yes** ☐ **No** ☐ **NA** ☐

For Category 3, 3a, and 3b Devices:

4.1.22 Event logger which includes and event counter, the parameter ID, the date and time of change, and the new value of the parameter changed has been provided (for multiple constant calibrations, the calibration version number may be used rather than the calibration constants). **Yes** ☐ **No** ☐ **NA** ☐

4.1.23 The event counter is nonresettable by the operator and has a capacity of at least 000 to 999. **Yes** ☐ **No** ☐ **NA** ☐

4.1.24 The event counter increments appropriately. **Yes** ☐ **No** ☐ **NA** ☐

4.1.25 The event logger automatically retains the identification of the parameter changed, the date and time of the change, and the new value of the parameter (for calibration changes consisting of multiple calibration constants, typically 10 or more, the calibration version number is to be used rather than the calibration constants.) **Yes** ☐ **No** ☐ **NA** ☐

4.1.26 The system is designed to attach a printer which can print the contents of the audit trail. **Yes** ☐ **No** ☐ **NA** ☐

4.1.27 The audit trail information is capable of being retained in memory for at least 30 days while the device is without power. **Yes** ☐ **No** ☐ **NA** ☐

4.1.28 The event logger has the capacity to retain records equal to twenty-five times the number of sealable parameters in the device, but not more than 1000 records are required. **Yes** ☐ **No** ☐ **NA** ☐

4.1.29 The event logger drops the oldest event when the memory capacity is full and a new entry is saved. **Yes** ☐ **No** ☐ **NA** ☐

4.1.30 Non-sealable parameters cannot be accessed in the mode which allows sealable parameters to be adjusted. **Yes** ☐ **No** ☐ **NA** ☐

4.1.31 Event logger information is printed in order from the most recent event to the oldest event.

4.1.32 If logger information is printed on more than one line per event, information is printed in readily understandable blocks. **Yes** ☐ **No** ☐ **NA** ☐

4.1.33 The printed audit trail is readily interpretable by a Weights and Measures inspector. **Yes** ☐ **No** ☐ **NA** ☐

4.1.34 Accessing audit trail information for review is separate from the mode used to enter or modify sealable parameters. **Yes** ☐ **No** ☐ **NA** ☐

4.1.35 Audit trail information can be accessed without requiring the removal of any parts other than the normal requirements to inspect the integrity of a physical seal or to use a key (for a panel lock) to gain access to the means to cause the audit trail to be printed. **Yes** ☐ **No** ☐ **NA** ☐

For Category 3 devices:

4.1.36 If a measurement is in process when the device is accessed remotely for the purpose of modifying sealable parameters, the measurement is either:

- terminated before results can be displayed or printed, or **Yes** ☐ **No** ☐ **NA** ☐

co - completed before entering the configuration mode **Yes** ☐ **No** ☐ **NA** ☐

4.1.37 When accessed remotely for the purpose of modifying sealable parameters, the device clearly indicates that it is in the configuration mode and is not capable of operating in the measure mode. **Yes** ☐ **No** ☐ **NA** ☐

Describe the method used to seal the device or access the audit trail information:

_____

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[Editor's note: The following changes apply to the *Categories of Device* Section of *Appendix B - Philosophy for Sealing* in Chapter 6 of Publication 14. For improved legibility, added text in Table S.2.5., except for the additions recommended by the Sector at this meeting, has not been underlined. The entire table is an "addition" to S.2.5.]

Categories of Device

Grain measuring devices must either be physically sealed or must incorporate an approved form of audit trail. A device that allows virtually unrestricted access (unlimited access or by means of a password), whether by the operator or by a remote device, to configuration parameters or calibration parameters must have an event logger as its minimum form of the audit trail. A device incorporating hardware (e.g. a manually operated switch or push button) to enable remote communication for the purpose of modifying configuration or calibration parameters must either be physically sealed or must incorporate two event counters, one for calibration parameters and one for configuration parameters. Device categories and their required methods of sealing are defined in Table S.2.5. of the Grain Moisture Meters Code.

An event logger contains detailed information on the parameters that have been changed and documents the new parameter values. An event logger requires a significant amount of memory; however, it is anticipated that any device to which unrestricted access is given, will be part of sophisticated measurement process that will have considerable memory available.

Grain Moisture Meters Code:

~~S.2.3~~ S.2.5. Provision for Sealing

~~(a)~~ Provision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security, (e.g., audit trail available at the time of inspection as defined in ~~part (b)~~ Table S.2.5.), before any change that affects the metrological integrity of the device can be made to any mechanism.

~~(b) If the operator is able to make changes that affect the metrological integrity of the device, (e.g., slope, bias, etc.) in normal operation, the device shall use an audit trail. The minimum form of the audit trail shall be an event logger and shall include:~~

- ~~An event counter (000 to 999)~~
- ~~the parameter ID,~~
- ~~the date and time of the change, and~~
- ~~the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number is to be used rather than the calibration constants.)~~

~~The device is not required to display this information, but a printed copy of the information must be available through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) times the number of sealable parameters in the device, but not more than 1000 records are required.~~

~~***Note: Does not require 1000 changes to be stored for each parameter.***~~

[Note: Zero-setting and test point adjustments are considered to affect metrological characteristics and must be sealed.]

Table S.2.5. Categories of Device and Methods of Sealing	
Categories of Device	*Method of Sealing*
Category 1: No remote configuration capability	*Seal by physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999). If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.*
Category 2: Remote configuration capability, but access is controlled by physical hardware *Device shall clearly indicate that it is in the remote configuration mode and shall not be capable of operating in the measure mode while enabled for remote configuration.*	*The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters; one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999.) If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.*
Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password) *When accessed remotely for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measure mode.*	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change , and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants). A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) times the number of sealable parameters in the device, but not more than 1000 records are required.* ***(Note: Does not require 1000 changes to be stored for each parameter.)***
Category 3a: No remote capability, but operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc.) in normal operation	*Same as Category 3*
Category 3b: No remote capability, but access to metrological parameters is controlled through a software switch (e.g., password)	*Same as Category 3*

6.a Proposed Change to Handbook 44 - Table S.2.5. - Categories of Device and Methods of Sealing

Discussion: When the Sector reviewed the proposed Sealing Requirement changes to the Publication 14, it was noted that there was no requirement for a Category 3 device to indicate that it was in the configuration mode when it was being accessed for remotely modifying sealable parameters. The Sector agreed that the requirements for a Category 3 device should be no less stringent than for a Category 2 device which is required to clearly indicate that it is in the remote configuration mode and is not be capable of operating in the measure mode while enabled for remote configuration.

Conclusions: The Sector unanimously voted in favor of adding the following wording to the description of Category 3 devices in Table S.2.5. of Handbook 44:

When accessed remotely for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measure mode.

7. Discussion and Consideration of Subcommittee Report on Long Range Planning Issues

Background: At the Sector's March 10-12, 1997, meeting in Atlanta, questions relating to long-term continuation and acceptance of the Grain Moisture Meter (GMM) program were discussed. In the course of updating the expected time lines of Phase I and II testing, the Sector recognized the unique metrological situation created by requiring participation in an ongoing data collection program with yearly passage of a calibration test to maintain an active Certificate of Conformance (CC). Typically, in other metrological devices, the CC, once issued, remains valid unless there is a Code-mandated upgrade, which is fairly rare and subject to the nearly two-year process of NCWM. Continuing accuracy is then monitored by field inspection.

Moisture meters are unique in that there is neither an absolute nor a totally stable reference basis. The ongoing Phase II (calibration maintenance) program was created to track changes in grains over time, with a common sample set to verify uniformity across device types. As presently written, Publication 14 requires a meter to participate in the data collection program and pass the annual calibration check tolerances to retain a CC. Key questions raised were:

- What happens if a manufacturer drops out of the Phase II program for one of several reasons (out of business, introduced a new model, financial stress, etc.)?
- How do we deal with the uneven application of the NTEP program across states and with states that have no grain moisture programs? Meters with lapsed CC's, or meters that never had a CC, will be salable in several states with large grain production. In some states, meters are not subject to field inspection.
- If meters pass field inspection (in states that have field inspection, by whatever method this is done), how can the program declare them unusable because of CC lapse?
- As with other metrological devices, field inspection is the point of user contact with NTEP. Do we need more effort to design standard field inspection procedures that in and of themselves would contribute significantly to national uniformity, regardless of Type Approval status or enforcement?
- What is "national uniformity" in a practical sense? Traders maintain that agreement with the GIPSA official meter as operated in their service point is the key factor.
- After a period of time, say five years, do we need to test calibrations annually?
- What are the options for funding the calibration program when the present CRADA (joint funding from NIST, GIPSA, and manufacturers) arrangement runs out (1999)?
- Different technologies (e.g., near-infrared vs. capacitance) may read individual samples very differently from each other even if both pass the tolerances relative to the oven.

A subcommittee was formed to develop a report on long-term GMM program issues, with options and alternatives, for consideration at the September 1997 sector meeting.

Conclusions: Although some of these issues were resolved by the Sector at this meeting [see Agenda Items 3 and 3a], further consideration of the subcommittee's report was tabled due to time constraints. It will be taken up at the Sector's March 1998 meeting.

8. Test Weight per Bushel Indications

Background: The Grain Moisture Meter Code in H44 contains the following field test requirement for Test Weight per Bushel Indications:

> **T.3. For Test Weight Per Bushel Indications or Recorded Representations.** The maintenance and acceptance tolerances on test weight per bushel indications or recorded representations shall be 0.193 kg/hL or 0.15 lb/bu. The test methods used shall be those specified by the USDA FGIS.
> (Amended 1992)

Some time ago, when the Sector was discussing this requirement, the reasonableness of the tolerance, was questioned, especially as it applied to the test weight of corn. It was pointed out that the tolerance was taken from FGIS (now GIPSA) procedures using three samples of dockage-free dry hard red winter wheat and comparing the average of five replicate measurements (with the highest and lowest results discarded before averaging) on each sample using the "standard" quart container to a like average obtained with the container under test. The Sector agreed that the test was not realistic for assessing the performance of the various types of devices in commercial use and that a different tolerance should be considered for each grain type. The Sector considered dropping this section from the Moisture Meter Code, reasoning that it would be more appropriate to include it in a separate chapter of H44 devoted specifically to the requirements for test weight per bushel devices. Several members of the Weights and Measures Community objected, however, stating that deletion of this section, prior to the development of a separate code chapter, would leave them without inspection and enforcement authority over test weight devices.

There are now at least two NTEP Grain Moisture Meters which have the capability to automatically provide an indication and recorded representation of test weight per bushel. Because of the unrealistic tolerances in the existing Code, however, the test weight indications of these devices are typically not allowed to be used for commercial transactions.

The Sector had previously agreed that Test Weight per Bushel devices (Grain Bulk Density Apparatus) should be addressed in Code separate from the Grain Moisture Meter Code (even for those grain moisture meters which were capable of providing a bulk density measurement). To find out the range of devices which the new code might have to address, Weights and Measures representatives were asked to survey their jurisdictions. This survey revealed that a wide variety of test weight devices are in use in the field. For free-standing devices, container sizes range from pint to two quarts and weighing devices range from hand held beam balance to electronic scales. Enforcement differs from state to state. Some do not permit the use of hand held devices, while others do. Some check test only with wheat, others check test with the grains most widely traded in their respective jurisdictions. Some do not allow moisture meters with test weight capability to display test weight. Others allow test weight to be displayed, but require that a notice be posted to the effect that the test weight indication is an approximation and is not approved for determining discounts. All jurisdictions reporting used the standard GIPSA apparatus as a reference, but none of those reporting indicated that volume checks were being performed on the quart container. Most jurisdictions reported that they received more complaints on the accuracy of test weight on wheat than on any other grain. One jurisdiction reported that test weight on oats was also a major source of accuracy complaints.

Discussion: There was general agreement that the GIPSA procedure would be the reference method for test weight. The Sector agreed that initially, a separate tolerance will be considered for each grain type. It was suggested that the tolerance for field inspection should be set at three times the tolerance of the laboratory standard method. Rich Pierce, GIPSA, pointed out that tolerance data on the reference method would most likely be available only for wheat. In further discussions on the tolerance issue, one Sector member pointed out that there are three sources of uncertainty in a test weight measurement: (1) the device; (2) the condition of the sample; and, (3) the operator. Of these three, the operator is the major source of uncertainty. At this point, one member suggested that the Sector reconsider its decision to develop separate code for test weight devices, and instead consider revising paragraph T.3. of Grain Moisture Meter Code 5.56(a) to show realistic test weight tolerances for individual grains. It was suggested that data collected on NTEP Grain Moisture Meters with automatic test weight capability, which effectively remove the operator as a source of uncertainty, could be used to evaluate the reasonableness of suggested field tolerances. Figuring out how to deal with the multiplicity of test weight devices in the field could be postponed

until later. Grain Industry representatives endorsed this approach, believing that this would enable their constituents to take advantage of automated test weight technology at an earlier date than would be possible if separate code were to be developed. One member objected on the grounds that this approach would inhibit the development of new technology, believing that manufacturers may want to develop stand alone technology. Another member pointed out that the present situation (no reasonable tolerances in the Code) inhibited the use of existing technology, and there was nothing in the Sector's proposed change of course which would prevent the development of stand alone devices. In fact, by developing reasonable tolerances, the Sector would be providing guidance to manufacturers of stand alone devices.

Conclusions: The Sector agreed that priority should be given to drafting changes to T.3. of the Grain Moisture Code to specify field test methods and reasonable acceptance/maintenance tolerances for individual grains. The Sector Technical Advisor was asked to draft proposed wording changes for consideration at the Sector's March 1998 meeting. Manufacturers were urged to review the test weight performance of their devices so tolerance proposals could be discussed.

9. Time and place for next meeting

A two-day or two and one-half day meeting (one and one-half or two days for the Grain Moisture Meter Sector and one-half day for the NIR Protein Sector) is planned for March 17-19, 1998 in Las Vegas, NV. A meeting notice will be sent out when hotel details are known.

10. Proposed Change to Handbook 44 - Table S.1.2. Grain Types Considered for Type Evaluation and Calibration and Minimum Acceptable Abbreviations

Discussion and Conclusions: GIPSA has combined the wheat classes "Eastern White Wheat" and "Western White Wheat" into a single new class named "Soft White Wheat." The Sector unanimously recommended changing Table S.1.2. of Grain Moisture Meter Code 5.56(a) reflect this action. The changes are shown below:

Table S.1.2. Grain Types Considered for Type Evaluation and Calibration and Minimum Acceptable Abbreviations

Grain Type	***Minimum Acceptable Abbreviation***	***Grain Type***	***Minimum Acceptable Abbreviation***
Corn	*CORN*	*Soybeans*	*SOYB*
Durum Wheat ~~*Eastern White Wheat*~~ ~~*Western White Wheat*~~ *Soft White Wheat* *Hard Red Spring Wheat* *Hard Red Winter Wheat* *Soft Red Winter Wheat* *Hard White Wheat*	*DURW* ~~*EWW*~~ ~~*WWW*~~ *SWW* *HRSW* *HRWW* *SRWW* *HDWW*	*Two-rowed Barley* *Six-rowed Barley* *Oats*	*TRB* *SRB* *OATS*
Sunflower seed (Oil)	*SUNF*	*Long Grain Rough Rice* *Medium Grain Rough Rice*	*LGRR* *MGRR*
Grain Sorghum	*SORG or MILO*	*Small oil seeds (under consideration)*	

National Type Evaluation Technical Committee
Near Infrared Grain Analyzer Sector
Meeting Summary
September 12, 1997, Chicago (Rosemont) IL

Agenda Items

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1. Time and place for next meeting

A two-day or two and one-half day meeting (one and one-half or two days for the Grain Moisture Meter Sector and one-half day for the NIR Protein Sector) is planned for March 17-19, 1998 in Las Vegas, NV. A meeting notice will be sent out when hotel details are known.

2. Report on NCWM Annual Meeting

The NCWM Annual Meeting was held July 20-24, 1997 in Chicago, IL. Diane Lee, NIST/OWM, reported that Conference agenda item 357-1, the Sector's recommendation to modify NIR Code paragraph S.2.6. Provision for Sealing, was adopted by the Conference and will appear in the next issue of H44. [Note: for additional discussion on this issue refer to *NCWM Publication 16, April 1997.*]

3. Update on National Type Evaluation Testing Schedule

Dr. Richard Pierce, Grain Inspection, Packers and Stockyards Administration/Inspection Systems Engineering (GIPSA), reported that the GIPSA Laboratory in Kansas City had made little or no progress on the work necessary to obtain authorization as the NTEP participating laboratory for near infrared grain analyzers. With limited resources, priority was being given to tasks related to maintaining the NTEP Grain Moisture Meter Program. Dr. Pierce indicated it was unlikely that they would be able to work on authorization between the present and the Sector's March 1998 meeting, and if additional resources were not in place by March 1998, there was the possibility that authorization would be delayed another year.

In the discussion following Dr. Pierce's report it was noted that the NIR Code has been in "Tentative" status since 1994. Some wondered what it would take to remove the "Tentative" designation. Diane Lee, NIST, explained that Tentative code allows the States to gain experience using the code without having to enforce it. Problems uncovered in field testing can be corrected before the code is made enforceable. The Specifications and Tolerances (S&T) Committee examines the results States have obtained using the Tentative code before recommending that it be put before the National Conference for adoption as formal code. She urged States having experience with the Tentative code to submit their results to the S&T Committee. Questions were raised regarding the fact that the existing Tentative code has effective dates of January 1, 2000 and still contains retroactive dates of January 1, 2005. Although no vote was taken on the issue, most members felt that the retroactive dates would have to be removed before the Conference would agree to activating the code. The Sector had previously agreed that effective dates could be changed if necessary.

Weights and Measures representatives reported that NIR Analyzers were beginning to appear in their jurisdictions, but much of the commercial usage was for corn and soybeans which the present tentative code did not address. Grain Industry representatives noted that the industry is increasingly contracting directly with the producer to obtain 'enhanced value' grains. There is a growing demand for measurement of protein, and frequently oil, in an increasing number of grain types.

With regard to including these additional grains in the type evaluation of NIR analyzers, Dr. Pierce pointed out that each new grain requires another 100 specially selected samples and additional analytical tests. This would have the effect increasing the cost of type evaluation and of further delaying certification of the laboratory. It was also noted that GIPSA was examining the possibility of adding programs for corn and barley, but at the present time there was no formal Federal program for protein in barley or for oil and protein in corn. This raised several questions:

1. In the absence of a Federal program:
    a. what should be used as reference samples for field inspection?
    b. could independent laboratories (e.g., AOAC laboratories) be used? If so, how?
    c. what moisture basis should be used?

2. Is there a way to eliminate or simplify type approval testing? (e.g., separate hardware approval from calibration approval.)

In light of the fact that: (1) an increasing number of NIR analyzers are being used commercially for grains not presently covered by the code; and (2) the NTEP Laboratory is not presently authorized as the participating laboratory for near infrared grain analyzers, it was decided that the Sector should give priority to modifying the tentative code to cover additional grains. Deciding how these additional grains should be handled in type approval will be postponed for an indefinite time.

4. Proposed Change to Publication 14 - Sealing Requirements

Discussion and Conclusion: The Sector unanimously approved the following changes to portions of Section 2, Chapter 6 of Publication 14 to reflect changes to the Near Infra-red Grain Analyzers Code of Handbook 44 adopted by NCWM at the 82nd Annual Meeting and to further clarify audit trail requirements. [Editor's note: Because of the extensive nature of changes required to paragraph 3.9 and its sub-paragraphs, changes and deletions have not been indicated. Consider that the entire section involved has been deleted and replaced by the following.]

Code Reference : S.2.6. Provision for Sealing

3.9 An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change , and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants)**.**

A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)

3.9.1	The manufacturer has provided information on how the device should be sealed.	Yes ☐ No ☐ NA ☐
3.9.2	An event logger which includes and event counter, the parameter ID, the date and time of change, and the new value of the parameter changed has been provided (for multiple constant calibrations, the calibration version number may be used rather than the calibration constants).	Yes ☐ No ☐ NA ☐

3.9.3	The event counter is nonresettable by the operator and has a capacity of at least 000 to 999.	Yes ☐ No ☐ NA ☐
3.9.4	The event counter increments appropriately.	Yes ☐ No ☐ NA ☐
3.9.5	The event logger automatically retains the identification of the parameter changed, the date and time of the change, and the new value of the parameter (for calibration changes consisting of multiple calibration constants, typically 10 or more, the calibration version number is to be used rather than the calibration constants.)	Yes ☐ No ☐ NA ☐
3.9.6	The system is designed to attach a printer which can print the contents of the audit trail.	Yes ☐ No ☐ NA ☐
3.9.7	The audit trail information is capable of being retained in memory for at least 30 days while the device is without power.	Yes ☐ No ☐ NA ☐
3.9.8	The event logger has the capacity to retain records equal to twenty-five times the number of sealable parameters in the device, but not more than 1000 records are required.	Yes ☐ No ☐ NA ☐
3.9.9	The event logger drops the oldest event when the memory capacity is full and a new entry is saved.	Yes ☐ No ☐ NA ☐
3.9.10	Non-sealable parameters cannot be accessed in the mode which allows sealable parameters to be adjusted.	Yes ☐ No ☐ NA ☐
3.9.11	Event logger information is printed in order from the most recent event to the oldest event.	Yes ☐ No ☐ NA ☐
3.9.12	If logger information is printed on more than one line per event, information is printed in readily understandable blocks.	Yes ☐ No ☐ NA ☐
3.9.13	The printed audit trail is readily interpretable by a Weights and Measures inspector.	Yes ☐ No ☐ NA ☐
3.9.14	Accessing audit trail information for review is separate from the mode used to enter or modify sealable parameters.	Yes ☐ No ☐ NA ☐
3.9.15	Audit trail information can be accessed without requiring the removal of any parts other than the normal requirements to inspect the integrity of a physical seal or to use a key (for a panel lock) to gain access to the means to cause the audit trail to be printed.	Yes ☐ No ☐ NA ☐

3.9.16 If a measurement is in process when the device is accessed remotely for the purpose of modifying sealable parameters, the measurement is either:

- terminated before results can be displayed or printed, or Yes ☐ No ☐ NA ☐
- completed before entering the configuration mode Yes ☐ No ☐ NA ☐

Describe the method used to seal the device or access the audit trail information:

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5. Proposed Change to Publication 14 - Sample Tempering Procedure for Sample Temperature Sensitivity Test

Background: For the Sample Temperature Sensitivity Test, the NTEP Laboratory applicant has verified that they will be unable to obtain complete sets of high moisture samples for classes of wheat less frequently traded and those classses grown in more arid regions and had requested that the Sector approve the use of tempered samples if necessary. The Sector subsequently approved the addition of the following sentence to the Sample Temperature Sensitivity Test of Publication 14: "When high moisture samples are not available for any protein range in any class, testing may be conducted using tempered (artificially moistened) samples." In response to the Sector's request for the NTEP Laboratory to document the tempering procedure which would be used, tests were run at GIPSA to determine the minimum acceptable procedure for tempering samples. Unfortunately, the results of this test were inconclusive because of spoilage of some of the samples. As of this meeting, limited resources have prevented GIPSA from re-running the test.[Note: The Sector does NOT approve the use of tempered samples for field testing. Tempered samples will be used ONLY for the Sample Temperature Sensitivity Test.]

Conclusions: Addition of minimum acceptable tempering procedures to Publication 14 will be delayed until test data are available for review.

Attendance List
Grain Moisture Meter & Near Infrared Grain Analyzer Sector Meetings
September 10-12, 1997 Chicago (Rosemont), IL

Name	Affiliation	September		
		10	11	12
Jack Barber	JB Associates	x	x	x
Connie Brown	DICKEY-john Corp.	x	x	x
Randy Burns	Arkansas Bureau of Standards	x	x	x
Marty Clements	Steinlite Corporation	x	x	x
Tim Conwell	CSC Scientific	x	x	
Bob Davis	Illinois Department of Agriculture	x	x	x
Cassie Eigenmann	DICKEY-john Corp.	x	x	x
David Hopkin	Sinar Technology	x	x	
David Krejci	GEAPS	x	x	x
G. Diane Lee	NIST/Office of Weights and Measures	x	x	x
Angelo Losurdo	Seedburo Equipment Co.	x	x	x
Don Muller	Bran+Luebbe	x	x	x
Ray Oberg	Zeltex, Inc	x	x	x
Tom O'Connor	National Grain & Feed Association	x	x	x
Richard Pierce	USDA-GIPSA-TSD	x	x	x
Ole Rasmussen	Foss North America	x	x	x
Joe Rothleder	California Dept. of Food & Agriculture	x	x	x
Tom Runyon	Seedburo Equipment Co.	x	x	x
Cheryl Tew	North Carolina Dept. Of Agriculture	x	x	x
Cliff Watson	Consultant	x	x	x
Robert Wittenberger	Missouri Dept. of Agriculture, Div. Weights & Meas.	x	x	x
Richard (Will) Wotthlie	State of Maryland	x	x	x

National Type Evaluation Technical Committee
Grain Moisture Meter Sector
Meeting Summary
March 16 – 18, 1998, Las Vegas, NV

Agenda Items

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1. Report on NCWM Interim Meeting

The National Conference on Weights and Measures (NCWM) Interim Meeting was held January 11-15, 1998 in San Antonio, TX. [Note: Item numbers and headings shown below correspond to the item numbers and headings of the Interim Meeting Agenda, NCWM Publication 15, dated December 1997. Additional discussion of these issues can be found in that publication.]

Diane Lee, NIST/OWM, reported that the Specifications and Tolerances (S&T) Committee agreed to add the following items as voting items to the Agenda for the Conference's Annual Meeting in July 1998:

a. Item 356-1 Table S.2.5. Categories of Device and Methods of Sealing; Category 3
b. Item 356-2 Table S.1.2. Grain Types Considered for Type Evaluation and Calibration and Minimum Acceptable Abbreviations
c. Item 356-3 Calibration Transfer

She also reported that Item 102-10, Additions and Revisions to the Definitions for Grain Moisture Meters in NCWM Publication 14, had been accepted by the Board of Governors for consideration as a voting item at the Annual Meeting. [*Note: See Sector Agenda Item 2, below, for subsequent modifications adopted by the Sector at their March meeting.*]

Tina Butcher, NIST/OWM, briefly reviewed recent changes in the NCWM. The NCWM was incorporated in August 1997 to protect them from liability in various NCWM activities. NCWM, Inc. will be assuming many of the NCWM business and administrative functions previously performed by NIST. For the most part, the impact of these changes will be transparent with respect to the operation of the technical sessions of the Conference. The NCWM's current Constitution and Bylaws will be combined into one publication to be called the "Bylaws" of NCWM, Inc. The membership will vote on the proposed Bylaws during a special voting session during the NCWM annual meeting in July, 1998. When the new Bylaws are approved, the Executive Committee will become the "Board of Directors" of the corporation. Additional details of the reorganization can be found in the February 1998 issue of *W&M today*, the Newsletter of the National Conference on Weights and Measures, Inc.

2. Review of Committee Letter Ballot 83-01, Additions and Revisions to the Definitions for Grain Moisture Meters in NCWM Publication 14

Background: Agenda item 3.a. of the Sector's September 1997 meeting proposed (1) changes to NCWM Publication 14 and (2) distribution of a "Notice of Ongoing Calibration Results." These items were generally approved at that meeting, but copies of the final wording of the changes and the final structure of the Notice were not available for approval. Letter Ballot 83-01, was issued October 20, 1997, after final wording had been developed. The two items were approved by a 9 to 3 vote. Before the recommendation was forwarded to the NTEP Board of Governors (BOG) at the NCWM Interim Meeting, minor revisions were made to the wording of several definitions to address comments received with the responses to Committee Ballot 83-01. The proposal was accepted by the BOG for consideration as a voting item at the Annual Meeting and assigned Conference Agenda Item Number 103-10, but the BOG asked the Sector to reaffirm their recommendations considering the changes which had been made subsequent to Ballot 83-01.

Discussion: [Note: Portions of the following discussion took place when Sector Agenda Item 4 was considered. They have been included here because they directly affected the final version of the proposed *Additions and Revisions to the Definitions*.] Several Sector members questioned the conditions under which a third party would be allowed to assume the responsibility for maintaining calibrations for a device. One member felt that it was inappropriate to require a manufacturer to certify that the device would no longer be manufactured before a third party could assume the responsibility for maintaining calibrations. There was also concern that the new definitions seemed to imply that a third party could not enter into a contractual agreement to provide calibration services for the manufacturer of a device. The Sector was reminded that the intent of the new definitions was multi-faceted:

1) to recognize that a Certificate of Conformance (CC) for a Grain Moisture Meter (GMM) must be renewed annually;
2) to stipulate that a GMM must remain in the Ongoing Calibration Program, OCP (Phase II), to maintain an Active Certificate of Conformance (CC);
3) to clarify that the annual fee for participating in the OCP (Phase II) is in addition to the CC maintenance fee charged by the NCWM;
4) to provide a time period for a device manufacturer to correct problems discovered during OCP testing before action is taken to withdraw a CC;
5) to provide the means for notifying Weights and Measures Officials when grain calibrations for a device type could not be certified as "approved" or "pending"; and
6) to spell out the conditions under which a third party could assume the responsibility for maintaining calibrations (and thus an "Active" CC) for a device no longer manufactured, without having to submit the device for Phase I testing.

The transfer of calibration responsibility to a third party, without requiring Phase I testing, was limited to the condition that devices previously manufactured met type and had an "Active" CC when the original manufacturer stopped making the device. The primary reason for having the original manufacturer certify that the device will no longer be manufactured was to make it clear which entity had the overall responsibility for assuring that devices in the field would continue to meet type. The paragraph spelling out these requirements was intended to cover the case where a third party, having no contractual agreement or business relationship with the original manufacturer, wanted to provide calibrations (most likely for a fee) to the installed base of meters of that type. It was not intended to limit a manufacturer's ability to contract with outside organizations for calibration services. Nor was it intended to prohibit a U.S. distributor from assuming the calibration maintenance and quality assurance responsibilities for a device manufactured by another company outside the U.S. The NIST representative noted that a Certificate of Conformance (CC) has already been issued to a U.S. distributor who has assumed the responsibility for calibration maintenance responsibility and quality assurance for a device manufactured by a company in England. It was suggested that making the paragraph in question a "note" rather than including it as part of the definition for "Expired Status" would eliminate much of the confusion which had been voiced by several members.

During the discussion of Agenda Item 4 on guidelines for assigning a "Notified" status, the Sector discussed at length what should appear on a CC for a device which had one or more grain calibrations with unresolved problems at the time for CC renewal. There was concern that allowing the manufacturer to drop grains with unresolved problems didn't give state W&M officials any guidance on how to handle devices which passed field test for these grains. If the problem was "real" but not easily detected with the samples used for field testing, several members felt that the State would be exposed to liability for any damages incurred by the user of a device which the field inspector had approved for use on that grain. Others felt that the introduction of "notified" status over-complicated the administration of the program. They believed that the CC should simply be "Withdrawn" until the manufacturer was able to resolve the problem. The NIST representative noted that a "Withdrawn" CC would simply be removed from the data base. If the CC were withdrawn, there would be no simple way to keep track of the device or to allow the manufacturer to continue in the OCP.

At an earlier meeting the Sector had agreed that unless a device had satisfactory calibrations for all of the three major grains (corn, hard red winter wheat, soybeans) it should not be allowed to be used for any grain. This brought up the question as to whether a device which had been assigned "Notified" status for problems with a corn calibration should be disallowed for use on edible beans or popcorn which are just as important as the "major" grains to some operations. Corn, hard red winter wheat, and soybeans had been selected for use in Phase I type approval testing because they were representative of the characteristics of the grains which the device might be required to test in the field. It was reasoned that a device which could not pass the Phase I tests for all three "major" grains was not suitable for general commercial use. The Sector decided that this restriction did not necessarily have to apply to OCP (Phase II) tests.

Several opinions were voiced as to how much information should be put on a CC to indicating why calibrations had been removed [or classified as "No Longer Approved"]. W&M members generally favored making as much information available as possible so they would have information to pass on to users. It was pointed out that the data collected and the data summary are proprietary information. The Sector was in general agreement, however, that the limitations on using a device must be made obvious on the CC.

Conclusion: The Sector concluded that any grain calibration with unresolved slope or bias problems, as defined in Agenda Item 3, would be listed on a CC as "No Longer Approved"; that "Notified Status" should be eliminated; and that the "Notice of Ongoing Calibration Results" would no longer exist. [*See also Agenda Item 4.*] They further agreed that wording similar to the following should appear on a CC which has one or more calibrations listed as "No Longer Approved":

> "This Certificate was issued to update calibrations for grains x, y, and z and to delete calibrations for grains a, b, and c based upon testing performed in the OCP and the tolerances specified in Section IV of the Checklist for Grain Moisture Meters in NCWM Publication 14.≅

Finally, by a vote of 19 to 0, the Sector agreed that the language proposed to the BOG for Conference Agenda Item 102-10 should be changed to read as follows:

Note: The A<u>underline text</u>≅ is the original changes to the definition that will remain as part of the proposed definitions. The A~~underlined and strickout text~~≅ are the portions to be removed as a result of changes from the March 1998 meeting. The A<u>*underlined and italic text*</u>≅ is the portion added to the definitions as a result of changes from the March 1998 meeting.

N. Status of Certificate of Conformance; Maintenance Fee

<u>Except for Grain Moisture Meters,</u> <u>a</u> Certificate of Conformance does not have an expiration date; however, the device manufacturer must update the design of a device to meet new or modified requirements adopted by the NCWM. The NCWM charges a maintenance fee for Active ~~and Notified~~ Certificates to support the technical and administrative activities of the NCWM for NTEP.

1. Declaration of Status by Certificate Holder

The Certificate holder, usually the manufacturer or remanufacturer, declares intent to continue to manufacture or remanufacture the device by paying to the NCWM, an annual maintenance fee for the Certificate. If the maintenance fee is not paid (or if other outstanding bills have not been paid or arranged to be paid for the issuance of a Certificate), the Certificate is "inactive."

<u>In addition to the above, Grain Moisture Meter manufacturers must pay an annual participation fee for the NTEP laboratory On-going Calibration Program, OCP (Phase II) in order to maintain their certificate in an Active status.</u>

2. Active Status

Devices are being manufactured or remanufactured for commercial applications under an NTEP Certificate of Conformance. This means that the Certificate is in force with a hard copy of the Certificate issued and distributed.

<u>In addition to the above, a Grain Moisture Meter must remain in the OCP (Phase II)</u> ~~and that participation must result in the issuance of valid calibration constants without unresolved problems or deficiencies occurring during the OCP (Phase II) testing~~<u>. Grain Moisture Meter Certificates may also be assigned an Active status if: (1) the original manufacturer no longer manufacturers or remanufactures the device but continues to participate in the OCP (phase II); or (2) a third party elects to maintain the calibrations after a Certificate expires for a device in which the original manufacturer has stopped manufacturing or re-manufacturing the device. *(See Note.)*</u>

~~**3. Notified Status**~~

~~A ANotified≅ status is assigned to Grain Moisture Meter Certificates when problems or deficiencies occur during the OCP (Phase II). When a Certificate is assigned this status, a ANotice of Ongoing Calibration Evaluation Results≅ will be issued with the Certificate. The notice will describe the problems or deficiencies, and the Certificate will designate the affected calibrations. Manufacturers of devices in this category must remain in the OCP (Phase II) actively working to correct the problems or deficiencies. Corrections must be made within two years of the date that the CC is assigned a notified status. If problems or deficiencies are not corrected by that date, the Certificate will be withdrawn. Any meters manufactured after~~

~~a Certificate is given a Notified status cannot be sold or placed into commercial service under a Notified certificate. Meters in service will be subject to individual State enforcement activities.~~

~~4.~~ 3. Effective Status
Equivalent to ACTIVE status, but a hard copy of the Certificate of Conformance has not yet been issued and distributed. Therefore, a hard copy of the Certificate is not yet included in Publication 5.

~~5.~~ 4. Inactive Status
An Inactive Certificate of Conformance is a Certificate which was previously Active, but the devices are no longer being manufactured or remanufactured for commercial applications. However, devices already manufactured, installed, or in inventory, but not yet sold, may be used, sold, repaired, and resold, under an Inactive Certificate of Conformance.

~~6.~~ 5. Withdrawn Status
The Certificate of Conformance remains valid unless withdrawn as the result of a specific determination by NTEP.

A Certificate of Conformance may be withdrawn

a. for deficiencies in the type, or

b. when production devices do not meet type.

Additionally, a Grain Moisture Meter Certificate may be withdrawn when ~~problems or deficiencies occurring in the OCP (Phase II) are not resolved within two years of the date that a Certificate is assigned a Notified status~~ for two consecutive years problems or deficiencies occurring in the OCP (Phase II) have prevented the issuance of valid calibration constants for all calibrations previously classified as "Approved" or "Pending". After a Certificate is withdrawn, the manufacturer must submit a new application and application fee per device model and the device must be reevaluated in Phase I before it is entered in the OCP (Phase II). Any meters manufactured after a Certificate is withdrawn, cannot be sold or placed into service for commercial use. Meters in service will be subject to individual State enforcement activities.

~~7.~~ 6. Expired Status
An Expired status is assigned to a Grain Moisture Meter Certificate of Conformance when a manufacturer elects to discontinue participation in the On-Going Calibration Program and the calibrations listed on the CC were performing acceptably at the time the manufacturer stopped participating in the OCP (Phase II).

Any meters manufactured after a Certificate has expired cannot be sold or placed into service for commercial use. Meters in service may be used, but actions taken would depend on individual State enforcement activities. *(See Note.)*

Note: A third party would be allowed to assume the responsibility for maintaining calibrations for a device which has expired without re-entering Phase I if the party participates in the OCP (Phase II) testing the year the original certificate expires, and providing the original manufacturer certifies that the device will no longer be manufactured or remanufactured. In this case, the third party must: (1) submit evidence of authorization from the original manufacturer for use of previous test results and also certification from the original manufacturer that the device will no longer be manufactured or remanufactured; (2) submit a new application; (3) pay the participation fee for the device; (4) demonstrate the ability to re-predict moisture data and modify calibrations as required; (5) pay the maintenance fee for the new certificate; and (6) permanently mark the device with the company name. After successful completion in the OCP an Active Certificate with a new number would be issued for the device submitted by the third party.

3. Update on Type Evaluation and Phase II Testing

Rich Pierce of the Grain Inspection, Processors and Stockyards Administration (GIPSA, the NTEP Participating Laboratory for Grain Moisture Meters) reported that all data on the 1997 crop, including moisture predictions (using current calibrations) for crop years 1996 and 1995, where available, had been sent to manufacturers by the end of February. Dr. Pierce asked manufacturers to let him know immediately if the data is in a form which they find difficult to work with. With three years of crop data included in the reports and the necessity to re-predict all three years when a calibration change is made, data handling is not a trivial job. He would like to get any data handling problems cleared up before the next round of data is collected.

As of March 16, only one application for Type Evaluation was open. The model involved had been submitted for evaluation by the Laboratory as one of "like type" to a device already approved. The Laboratory is conducting preliminary tests to determine if the meter can be considered of a "like type". If not, it will be evaluated as a new type, and there could be as many as seven meter models in the OCP (Phase II) for 1998 crop year.

Discussion: In connection with the Dr. Pierce's report, the Sector reviewed the existing rules for evaluating moisture meter performance in the OCP (Phase II). Publication 14 states, "The latest three years of data will be used to make decisions regarding the need to make a calibration update." It was pointed out that after the 1998 harvest, four crop years of NTEP data will be available for several NTEP meters. Under existing guidelines, 1995 crop year data would not be used in evaluating performance at the end of the 1998 crop year. Dr. Pierce listed several facts for the Sector to consider in deciding if 1995 crop data should be disregarded:

- ∃ A special effort was made in 1995 to collect data on corn having 30-40 percent moisture content. Dropping 1995 data from consideration will significantly reduce the number of high moisture samples in the evaluation set.

- ∃ Some manufacturers may want to drop 1995 crop data. To resolve instrument standardization concerns, the NTEP Laboratory is already disregarding 1995 crop data on corn and soybeans for one manufacturer.

- ∃ As we begin the 1998 crop year, there are instruments in the program with one, two, and three years of NTEP data. Identical data sets are not being used to standardize NTEP instruments.

One member expressed the opinion that whatever the Sector decides to do about the number of years of data has to be the same for all meters in the program. Another objected on the grounds that it would not be appropriate to include data known to be faulty, e.g., data collected on a meter later found to be defective or inappropriately standardized. The NTEP Laboratory representative pointed out that this was exactly the case which led to discarding one year's data for one meter in the program.

It was noted that calibration approval for any 2% moisture interval is based on data collected in the OCP (Phase II). Manufacturers have the option to provide data to extend the moisture range beyond that for which data is collected in the OCP (Phase II). Dr. Pierce suggested that manufacturers could re-submit the 1995 high moisture data as "manufacturer supplied data". Unfortunately, Publication 14 states, "Calibration status for any range can be no better than "pending approval" when based solely on manufacturer data." As a consequence, under existing rules, if manufacturers re-submit the NTEP 1995 data as "manufacturer supplied data" to extend the range beyond which current data are available, that range will automatically be classified as "pending approval". Manufacturers pointed out that there is a perception among users that "pending approval" is not as good as "approved". Changing a range from "approved" to "pending approval" from one year to the next gives the appearance that the meters aren't as good this year as last. Some expressed the opinion that in the absence of data indicating that a calibration does not meet accuracy requirements in any 2% interval, it should NOT be downgraded from "approved" to "pending". Others were of the opinion that even if a calibration change has been made, manufacturers should be allowed to use an entire year of "expired" OCP (Phase II) data without having to classify it as "manufacturer supplied". The Sector did not act on these two suggestions.

Grain Industry representatives asked how changing a high moisture range from "approved" to "pending approval" for the NTEP version of the Official meter would affect calibrations used on that model in the Official system. GIPSA representatives explained that the calibrations used in Official meters most likely would be exactly the same as the NTEP calibrations for that model. If there are differences, they would not be of the sort that would affect moisture results. They may, for example, impose more restrictive temperature limits on meters used in the Official system and may limit the use of the Official meter to corn moistures below 30%. In summary, the Federal system is a restrictive subset of the Commercial system, dropping the high moisture data and changing the status of the 2% ranges formerly covered by that data will have no effect on the Official system.

One manufacturer asked if manufacturers could submit samples to GIPSA for use in the OCP (Phase II). Answering for GIPSA, Dave Funk indicated that they are open to accepting samples, but this would have to be considered on a case by case basis. He pointed out that GIPSA does not have an infinite capability to run samples. Also, they would want to be certain that samples are sound and did not all come from the same limited geographical area. On the subject of samples, he mentioned that each year GIPSA sends letters to all State Departments of Agriculture requesting help in obtaining samples. Response to these requests has been somewhat limited. Dave indicated that while GIPSA's interest in corn moisture may never exceed 30%, they

would entertain the possibility of conducting special projects in the high moisture range from time to time, but it was not realistic to expect that they could obtain [and process] an adequate high moisture sample set every year.

Several opinions were voiced regarding a proposal to modify Publication 14 to allow the NTEP Laboratory to use more than three years of crop data to evaluate performance. The NTEP lab representative did not want the NTEP lab to have to decide which years to use or not use (unless it could be shown that any year's data were not valid). He also favored using only the three most recent years of data on the grounds that handling anything other than that was excessively cumbersome and would lead to increased possibility of errors in data handling alone. Some felt that using up to five years of data would increase the probability that resultant calibrations would be closer to the mean of year to year variations. Others believed that the recent acceleration in the rate of introduction of new varieties would give excessive weight to four or five year old data.

Conclusion: When put to a vote, the Sector decided by 14 to 0 to retain the existing Publication 14, Section IV requirement to use the latest 3 years of data [where available].

4. Guidelines for Assigning "Notified" Status

[Note: During the discussions on this item, the Sector modified the recommendations it had originally made to the BOG as *Additions and Revisions to the Definitions* in Publication 14 (NCWM Agenda item 102-10). That portion of the discussion is reported under Sector Agenda Item 2.]

Discussion: Two examples of anomalous results were observed on some of the NTEP devices in the on-going calibration program (Phase II testing) at the end of the 1997 crop year. These were characterized by:

- X Unusual bias differences between subsequent years, or
- X Severe slope differences at higher moistures between subsequent years.

Present rules for reviewing calibrations are based on examining the bias at each 2 percent moisture interval using data collected over the years. The problem with this approach is that the "average" bias for multiple years of data can be within tolerance while the biases for individual years can all be out of tolerance. In the first example, the bias differences between individual years were partially canceled when data for the two years were pooled. The present rules also fail to address situations in which significant slope differences are observed between subsequent years. The Sector reviewed additional rules and tolerances which had been proposed to cover instances of unusual bias differences between individual years and to address sudden severe changes in slope.

The tolerances in "a.", below, are equal to the H-44 maintenance tolerance for the largest moisture interval in the NTEP-specified 6% base moisture interval, i.e., 0.05x18% = 0.90 for corn; 0.05x16% = 0.80 for rice, oats, sunflowers and sorghum; and 0.70 (the minimum maintenance tolerance) for wheat, soybeans, and barley. Although the average biases are based on data obtained on all samples of a grain type in a given year, no consideration was given to the fact that H44 tolerances start spreading out at moistures above the NTEP-specified 6% base interval. Even then, it was stressed that these are extremely wide tolerances. A model [device type] is not likely to fail at these tolerance levels unless it has serious problems in either: 1) standardization, or 2) suitability for use on a specific grain type. These problems are not likely to be detected in Phase I testing. They first become apparent when two or more years of data are examined.

Conclusion: The Sector agreed to add the following criteria immediately after the fourth paragraph in Section IV of Publication 14 of the Grain Moisture Meter Check List.

> <u>Whenever a calibration update is made, the Manufacturer shall re-predict moisture values using the three most recent years of available raw data collected by the Type Evaluation Laboratory.</u>
>
> <u>New calibrations will be approved based upon the re-predicted moisture values. Approval tolerances will be one-half of the Handbook 44 acceptance tolerance, and will be applied in 2 percent intervals over the range of available data. Additionally, for the three years of available data:</u>

a. The difference between the average bias to air oven for all samples in a given year and the average bias to air oven for any other year shall not exceed: 0.90 for corn; 0.80 for rice, oats, sunflowers and sorghum; and 0.70 for wheat, soybeans, and barley.

b. The range of year-to-year differences in bias to air oven shall not exceed the H-44 tolerances for three or more consecutive 2% moisture intervals. Only moisture intervals consisting of five or more samples per year will be considered for this comparison.

Failure to meet the requirements in either item a. or b., above, will cause a "No Longer Approved for Use" status to be assigned to the affected grain type(s) on the NTEP Certificate of Conformance (CC) for that instrument. Calibration coefficients will not be listed for any calibration failing these requirements.

5. Effective Dates for NTEP and GIPSA Calibration Changes

Discussion: Grain Industry representatives have repeatedly stressed the importance of keeping NTEP calibration changes synchronized with GIPSA calibration changes (at least for the GIPSA Official Meter and its NTEP equivalent type). In the past, calibration changes for the Official Meter have been made on a staggered schedule typically between May 1 and August 1, with dates chosen to coincide with the time at which stocks would be at their lowest level to minimize economic impact. GIPSA recently announced that the number of dates for changing calibrations would be reduced to two: May 1 for the NTEP grains wheat, barley, sorghum, rice, and oats; and August 1 for corn, soybeans, and sunflowers. These dates represent a compromise between making calibrations available prior to harvest but not so early that grain stocks will not be near their lowest levels. The present timeline for NTEP Phase II activities lists July 1 as the date for re-issuing annual Certificates of Conformance (CC's). At the Sector's last meeting grain Industry representatives pointed out that re-issuing CC's on July 1 would miss the wheat harvest in most of the country.

To address these issues, it was proposed that the CC for the Official Meter be re-issued by May 1 for all NTEP grain calibrations with effective dates shown for each calibration to indicate when a new calibration would be put into use in the Official system. Issuing the Official Meter's CC at an earlier date would also allow manufacturers of other meters to take into account changes in the Official system when considering the possibility of making changes in their own calibrations. Meter manufacturers would also be allowed to apply for earlier re-issue of their CC's. As for expiration dates of CC's issued prior to the normal July 1 issue date, the Sector was in agreement that all CC's should expire on June 30 of the year following the year in which they were issued.

In response to a W&M representative's question regarding what actions manufacturers take to ensure that all meters in the field are being updated with the latest information, manufacturers reported that one or more of the following methods are typically used to notify users of calibration changes:

- X Publication in state Grain and Feed Association newsletters
- X News releases to trade publications
- X Direct mail to users of record
- X Posting on manufacturer's web site on the Internet

A NIST representative was troubled by the implication that the manufacturer was responsible for ensuring that the latest calibrations had been installed in devices in the field, pointing out that the device owner has the responsibility of keeping equipment up-to-date. The "User Requirements" section of the Grain Moisture Meter Code states: "Grain moisture determinations shall be made using only the most recently published calibration." One W&M representative suggested that it was a shared responsibility between manufacturer and user. Another suggested that it might be helpful if the device's Instruction Manual contain a bold notice stating that the user is responsible for ensuring that the most recent calibration is installed in the meter.

One W&M representative wondered how to handle meter inspections performed in July, asking which calibration should be used, the one effective August 1 or the existing one. Opinions were divided on the best way to handle this situation. In one state, old calibrations would be allowed to be used until the effective date of the new calibration, after which the device would be re-inspected to verify that the new calibration had been installed. Others felt that this method of enforcement was not realistic, because it could result in requiring two or more trips per year to the majority of meters in their jurisdictions. They

favored having the user install the new calibration at time of inspection. A manufacturing representative pointed out that the only purpose of specifying "effective dates" on a CC was to match the dates on which the new calibrations would be used in the Official system. He suggested that W&M inspectors tell the user that the new calibration must be installed on the effective date if they wanted their meter to be in closer agreement with the official meter. It was recognized that the use of effective dates wasn't a new concept. Prior to the NTEP program, manufacturers had revised calibrations at various dates, sometimes without much warning, and often after a significant number of meters had already been inspected for the current season. States with inspection programs had already figured out how to deal with this situation. The Sector decided that the details of enforcement should be left to each state to decide based on their individual needs.

Conclusion: The Sector decided that it would not be necessary to revise the table of Deadline Dates published in *National Type Evaluation Program for Grain Moisture Meters - Phase I and Phase II Process Time-lines and Deadline Dates*. The Sector also agreed to the following guidelines.

- ∃ Re-issue the NTEP CC for the Official Meter no later than May 1 for all NTEP grain calibrations (Advance notice of any pending wheat, barley, sorghum, rice or oats changes could be given [to manufacturers] prior to May 1).

- ∃ Retain July 1 as the ***deadline date*** for re-issuing an NTEP CC. This would allow other NTEP meter manufacturers to decide individually whether to meet the earlier schedule (May 1). All CC's will have the same expiration date regardless of when the CC is issued.

- ∃ Add information to CC's to show an "Effective Date" for each calibration.

- ∃ The "Effective Date" for the calibration is the last date by which the calibration *must* be installed. If someone wants to install it earlier, they may do so. A definition of "Effective Date" will be included on the CC.

6. Discussion and Consideration of Subcommittee Report on Long Term Planning Issues

Background: At the Sector's March 10-12, 1997, meeting in Atlanta, questions relating to long-term continuation and acceptance of the Grain Moisture Meter (GMM) program were discussed. The Sector recognized the unique metrological situation created by requiring participation in an ongoing data collection program with yearly passage of a calibration test to maintain an active Certificate of Conformance (CC). Typically, in other metrological devices, the CC, once issued, remains valid unless there is a Code-mandated upgrade, which is fairly rare and subject to the nearly two-year process of NCWM. Continuing accuracy is then monitored by field inspection.

Moisture meters are unique in that there is neither an absolute nor a totally stable reference basis. The ongoing Phase II (calibration maintenance) program was created to track changes in grains over time, with a common sample set to verify uniformity across device types. As presently written, Publication 14 requires a meter to participate in the data collection program and pass the annual calibration check tolerances to retain a CC. Key questions raised at that time were:

- X What happens if a manufacturer drops out of the Phase II program for one of several reasons (out of business, introduced a new model, financial stress, etc.)?
- X How do we deal with the uneven application of the NTEP program across states and with states that have no grain moisture programs? Meters with lapsed CC’s, or meters that never had a CC, will be salable in several states with large grain production. In some states, meters are not subject to field inspection.
- X If meters pass field inspection (in states that have field inspection, by whatever method this is done), how can the program declare them unusable because of CC lapse?
- X As with other metrological devices, field inspection is the point of user contact with NTEP. Do we need more effort to design standard field inspection procedures that in and of themselves would contribute significantly to national uniformity, regardless of Type Approval status or enforcement?
- X What is Anational uniformity≅ in a practical sense? Traders maintain that agreement with the GIPSA official meter as operated in their service point is the key factor.
- X After a period of time, say five years, do we need to test calibrations annually?

- X What are the options for funding the calibration program when the present CRADA (joint funding from NIST, GIPSA, and manufacturers) arrangement runs out (1999)?
- X Different technologies (e.g., near-infrared vs. capacitance) may read individual samples very differently from each other even if both pass the tolerances relative to the oven.

At the March 1997 Sector meeting a subcommittee was appointed to report on the long-term strategic planning questions in four topic areas. Following are the groupings and the recommendations of each.

1. What is the long-term funding strategy for the calibration program and is there a need to check calibrations annually after the initial 5-year startup?
   - ∃ Re-negotiate an extension to the current system of multi-year shared costs through meter manufacturers, NIST, and USDA-GIPSA. This would have the practical effect of using 1/3 private funds and 2/3 public funds to pay for the program.

     Chair=s Note: This was not a unanimous view in that manufacturers paying the entire cost (rather than 1/3) was supported by one member of this issue group. Actually, funding for the NTEP lab is just one portion of the larger question of how to fund various grain measurement standardization issues (moisture, protein, foreign material, etc.)

2. What does the program do if states do not enforce the code uniformly or not at all? What should happen if a CC lapses? Is passage of field tests enough for these units to continue in use or to be sold? Can a third party restore lapsed CC=s by picking up the support of calibrations?
   - ∃ Develop an outline of suggested enforcement guidelines for states to follow. A device manufactured following the expiration of the CC may not be placed in service for commercial use. The continued use of devices in service prior to CC expiration should be allowed as long as they meet state inspection tolerances. A third party may pick up support of a device providing that they demonstrate the ability to respond to recommended calibration changes. There is a need for an ongoing data gathering effort that would document the usefulness and success of the program.

3. What are options for standardized field inspection procedures? Who should design them? How does the program get more states involved, even if resources are limited?
   - ∃ A model program should be developed which is in some way traceable to the oven and to the official system. This model will suggest appropriate laboratory equipment and procedures. It will also suggest field inspection procedures.

   - ∃ A cost benefit study for the model program should also be done as an informational tool in gaining support for GMM programs. This study should use statistics from states that do have programs. It should include actual costs of programs related to the number of annual inspections, bushels of grain produced, and average price discount on deliveries and shipments due to moisture.

   - ∃ The GMM Sector could take the lead in identifying the strategy for developing the model program and its cost assessment.

4. What constitutes national uniformity? How to accommodate sample differences caused by multiple technologies even if all are within tolerance of the NTEP lab?
   - ∃ Operate the official meter(s) in all parts of the NTEP laboratory work and identify its performance along with meter(s) under evaluation. Publish estimates of the expected variation 1) across the NTEP meters as a group, 2) relative to the official meter, and 3) relative to the reference. Consider adding a second level of tolerances relative to the official meter, based on multiple years= data from the NTEP lab.

   - ∃ Design of field inspection procedures should consider how the official meter, operated in the official system, could be used to verify performance.

Several of these questions were answered at the September 1997 meeting, but the issues of funding, standardized field inspection, annual testing of calibrations, and dealing with different technologies remained unresolved.

Discussion and Conclusion: Time constraints at the September 1997 meeting had prevented the Sector from addressing some of the more crucial long term issues. To insure that critical issues would be covered in this meeting, Sector members who wished to comment were each allowed up to five uninterrupted minutes in which to present their concerns. After all concerns had been aired, the discussion was opened to address the concerns raised.

A common concern of all parties was the uncertain future of the availability funding to continue the NTEP laboratory On-going Calibration Program, OCP (Phase II) beyond 1999, and the possible effect loss of funding might have on the existing GMM program and other work of the Sector. Grain Industry representatives favored deferring work on test weight and delaying the proposed expansion of the tentative code for NIR Grain Analyzers to allow the Sector to focus its efforts on the Grain Moisture Meter (GMM) program. They also questioned if adding additional commodities and constituents to the tentative NIR Grain Analyzer Code was premature and ahead of the needs of the marketplace. Another Sector member expressed concern that certification of GIPSA as the NTEP laboratory for NIR Grain Analyzers had been delayed indefinitely by lack of funding at GIPSA, asking if another lab should be considered or if NIR protein analyzers should not be type evaluated. He also mentioned that value added grains, especially those with enhanced protein or oil content, are being talked about with increasing frequency. He suggested that the Sector should consider whether or not to become involved. [*Editor's note: W&M representatives were unanimously in favor of expanding the tentative NIR Code. See NIR Grain Analyzer Sector Meeting Summary for more information on this subject.*]

One member expressed concern over the lack of universal acceptance (and enforcement) of the GMM Code by State W&M Agencies. States represented on the Sector have made a serious effort to apply the Code and actively support NTEP principles, but other states don't have the resources to do this. He suggested that the Sector needed to focus on how to help States improve uniformity and participate in the NTEP process.

Diane Lee, NIST, responded that the Office of Weights and Measures has recognized the need to work more closely with the States on GMM matters. A draft outline of a GMM Program Handbook was presented for the Sector's consideration (See Attachment). The Program Handbook would assist States wanting to implement a GMM Testing Program. It would outline how a grain moisture laboratory should operate; and would specify required facilities, equipment, testing methods, sample storage and handling procedures, and required reports. She also suggested that the Sector form a working group to develop an Examination Procedures Outline (EPO) for GMM's to serve as a guide for field enforcement.

In reference to concerns about funding availability, she announced that NIST and GIPSA have agreed on a proposal for funding the OCP beyond 1999 on a more permanent basis. The initial agreement would cover a five year period. After that, it would be renewed automatically, subject to an annual review to determine if changes should be made. Details of program costs were explained by Rich Pierce, GIPSA. NIST and GIPSA would each contribute one-third the cost of the program subject to an annual maximum of $18,000 each. The balance of costs would be borne by manufacturers and would depend on the number of meter models in the NTEP "pool". Program costs would exclude the official meter (GIPSA would cover the costs associated with the official meter), but DICKEY-john would participate in the program contributing on the same basis as other participating manufacturers. There are now six models in the NTEP "pool". If the "pool" remains at six models, each manufacturer would be assessed $6,429 annually for participation in the OCP. This fee rises to $8,550 with nine meter models in the pool and drops to $3,375 if only three models are in the pool. These figures are based on a program cost of $13,500 per model, excluding GIPSA's Official meter. David Funk, GIPSA, indicated that it was reasonable to consider that these costs would remain constant over the next five years. Future increases in the efficiency of data collection were expected to balance out any cost increases which might come about due to inflation. [Note: See Attachment for a detailed analysis of the effect of the number of participating models on shared program costs.]

Manufacturers were polled to determine if the proposed sharing of costs was acceptable. They were in general agreement that the one-third, one-third, one-third sharing of costs (even with an $18,000 cap each for GIPSA and NIST) was reasonable, noting that the proposed fees for participating in the OCP were small in comparison to the costs they have incurred in obtaining NTEP approval and keeping up with changes in NTEP requirements. One manufacturer expressed the opinion that $6,429 was a reasonable price for the data which they received by participating in the program.

NIST and GIPSA will draw up individual co-operative research agreements (based on the one-third, one-third, one-third cost structure discussed above) to present to each manufacturer for approval.
At this Sector meeting, no manufacturer indicated that it would be dropping out of the program at the end of the current agreement.

To deal with the matter of Field Enforcement and Inspection Procedures (part 3 of the Sub-Committee report), the Sector agreed that a working group should be formed to draft an EPO for GMM's. One Sector member suggested that the working group should consider identifying alternate methods (with appropriate tolerances), such as meter-to-meter testing, for inspecting large numbers of meters where resources are limited. The NIST representative pointed out that EPO's relate directly to H44 requirements. An EPO for GMM's is intended to provide guidance to States on how to implement H44 which call for using grain samples with moisture content values assigned by the reference method (air oven drying) used by GIPSA. The Sector left this issue in the hands of the working group. [Note: The following individuals indicated a willingness to serve on the EPO working group which will be chaired by Diane Lee (NIST): Randy Burns (Arkansas Department of Agriculture), Cheryl Tew (North Carolina Department of Agriculture), Bob Wittenberger (Missouri Department of Agriculture), Rich Pierce (GIPSA), Sid Colbrook (Illinois Department of Agriculture), Will Wotthlie (Maryland Department of Agriculture), and Jack Barber (JB Associates). In addition, Don Onwiler (Nebraska Department of Agriculture) indicated that John Fecht (Nebraska Public Service Commission) would serve in his place. Diane Lee expected that the group would be able to conduct its business by e-mail and fax. No separate meetings were anticipated.]

On the issue of National Uniformity (part 4 of the Sub-Committee report), Dave Funk, GIPSA, asked manufacturers if they would find it useful to see performance data which showed the error (official meter vs. air-oven) in each two percent moisture interval for the average of all samples collected over a three year period. This information could be provided on updated [Official] calibrations in time to guide manufacturers who might contemplate making matching calibration changes for their devices. One member said it would be more useful to have statistics showing how individual models varied with respect to the Official Meter on a sample-by-sample basis. Mr. Funk replied that GIPSA was not open to releasing this data on a sample-by-sample basis, explaining that these data are covered by Cooperative Research Agreements with manufacturers and are thus proprietary data belonging to the manufacturer. Several suggestions were made on how States might become more involved in the program, ranging from providing manufacturers with data collected on instruments loaned to the States to making field inspection data available to manufacturers. It was proposed that the matter of State involvement be addressed at a future meeting.

7. Proposed Change to Handbook 44 to Cover Meters Capable of Measuring Test Weight per Bushel

Background: The Grain Moisture Meter Code in H44 contains the following field test requirement for Test Weight per Bushel Indications:

> **T.3. For Test Weight Per Bushel Indications or Recorded Representations.** The maintenance and acceptance tolerances on test weight per bushel indications or recorded representations shall be 0.193 kg/hL or 0.15 lb/bu. The test methods used shall be those specified by the USDA FGIS. (Amended 1992)

The 0.15 lb/bu tolerance was taken from an FGIS (now GIPSA) maintenance procedure which compared results obtained using a "standard" quart test kettle to results obtained on the kettle under test. Three samples of dockage-free dry hard red winter wheat were used for the test.
Five replicate measurements were made on each sample. The results were averaged after discarding the highest and lowest result. The Sector agreed that the test was not realistic for field testing the various types of devices in commercial use and that a different tolerance should be considered for each grain type.

There are now at least two NTEP Grain Moisture Meters which have the capability to automatically provide an indication and recorded representation of test weight per bushel. Because of the unrealistic tolerances in the existing Code, however, the test weight indications of these devices are typically not allowed to be used for commercial transactions.
At its September 1997 meeting, the Sector agreed that priority should be given to drafting changes to the Grain Moisture Code to specify field test methods and reasonable acceptance/maintenance tolerances for individual grains.

Discussion: The Sector review a draft of proposed changes to the Code. Discussion centered on three issues: 1) height of test weight indications; 2) acceptance and maintenance tolerances; and 3) field testing procedures.

Height of test weight indications:
Manufacturers questioned the need to require a minimum height of 10 mm for test weight indications, noting that the information displayed in connection with moisture measurements already occupied most of the available area on their displays. It would be prohibitively expensive to incorporate larger displays into their devices. It was also noted that the General Code does not specify height, requiring only that the information be clear, definite, and easily read.

Acceptance and maintenance tolerances:
The OCP (Phase II) data supplied by manufacturers was used to develop the proposed tolerances for field inspection. The tolerances are based on three times the standard deviation of the test weight errors over ***all*** samples of a grain type in a single year plus an allowance for instrument to instrument variation. The final tolerances were adjusted by a factor of one over the square root of three to account for the averaging of three drops field testing. When asked if the proposed tolerances would be acceptable to the Grain Industry, industry representatives stated that this would depend on what their customers felt was required for consistency with the manual (test kettle) method. They asked if the tolerances would be appropriate for GIPSA. Dave Funk (GIPSA) explained that consistency from point to point is important for the Official System, and, although the proposed tolerances seemed reasonable for GMM's with test weight capability, it was unlikely that GIPSA would be using them for Official test weight determinations. A W&M representative related that, in his experience, improper use of the test kettle method [improper strike-off, improper loading of grain into kettle, use of kettles of less than one-quart size, etc.] was not an unusual occurrence in the field and could result in errors greater than the proposed tolerances. The Sector was reminded that tolerances must be small enough that they don't cause problems to either buyer or seller, but not so small as to make the cost of devices unreasonable. The need for different Acceptance and Maintenance tolerances was questioned. A single tolerance was preferred.

Field testing procedures:
The necessity for testing with more than one grain type was questioned. Because different grain types may load into a meter's test cell differently, tests should be made with more that one grain type, preferably with the grain types for which the device is to be used. The Sector recognized that moisture may also affect the way grain loads into a meter's test cell, but acknowledged that using the lowest moisture sample [of the samples required for moisture testing] would provide more reproducible results for field testing. It was reasoned that the device's ability to measure test weight over a range of moistures could be established during type approval testing.

Conclusion: The Sector agreed that the height of the test weight indication should not be specified in S.1.1.(b). [Note: The minimum height for the digits used to display moisture content will remain at 10 mm to comply with OIML requirements.] The draft was modified to make the Maintenance tolerance equal to the Acceptance tolerance. The Sector also agreed that the minimum testing for test weight should include tests using all grain types for which the meter is to be used (not to exceed three); and that test weight information need be collected only on the lowest moisture sample used for moisture testing. Action to forward the draft to the S&T Committee was deferred pending receipt of additional feedback from the grain trade on the acceptability of the proposed tolerances and feedback from W&M members on a sampling of field test results applying those tolerances. The draft, incorporating the changes agreed to at this Sector meeting is shown below:

A. Application

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

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S. Specifications

S.1. Design of Indicating, Recording, and Measuring Elements.

S.1.1. Digital Indications and Recording Elements.

(a) Meters shall be equipped with a digital indicating element.

(b) The minimum height for the digits used to display moisture content shall be 10 mm.

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

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

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

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

(g) On multi-constituent or multi-property meters (e.g., meters which also measure test weight per bushel or grain protein), provision shall be made for displaying and recording the constituent or property label (such as moist, protein, etc.) to make it clear which constituent or property is associated with each of the displayed and recorded values.
(Added 1995)

(Added 1993)(Amended 1994 and 1995)

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

(a) Temperature Range of the Meter
The temperature range over which the meter may be used and still comply with the applicable requirements shall be specified. The minimum temperature range shall be 10 EC to 30 EC. No moisture value may be displayed when the temperature range is exceeded. An appropriate error message shall be displayed when the temperature of the meter is outside its specified operating range.

(b) Temperature Range of each Grain or Seed
The temperature range for each grain or seed for which the meter is to be used shall be specified. The minimum temperature range for each grain shall be 0 EC to 40 EC. No moisture value may be displayed when the temperature range is exceeded. An appropriate error message shall be displayed when the temperature of the grain sample exceeds the specified temperature range for the grain.

(c) Moisture Range of the Grain or Seed

The moisture range for each grain or seed for which the meter is to be used shall be specified. A moisture value may be displayed when the moisture range is exceeded if accompanied by a clear indication that the moisture range has been exceeded.

(d) Maximum Allowable Meter/Grain Temperature Difference
The maximum allowable difference in temperature between the meter and the sample for which an accurate moisture determination can be made shall be specified. The minimum temperature difference shall be 10 EC. No moisture value may be displayed when the maximum allowable temperature difference is exceeded. An appropriate error message shall be displayed when the difference in temperature between the meter and the sample exceeds the specified difference.
(Added 1993)(Amended 1995)

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

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

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S.2.4. Calibration Integrity

S.2.4.1. Calibration Version. - A meter must be capable of displaying either calibration constants, a unique calibration name, or a unique calibration version number for use in verifying that the latest version of the calibration is being used to make moisture content and test weight per bushel determinations.
(Added 1993)(Amended 1995)

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S.2.6. Determination of Quantity and Temperature. - The moisture meter system shall not require the operator to judge the precise volume or weight and temperature needed to make an accurate moisture determination. External grinding, weighing, and temperature measurement operations are not permitted. In addition, if the meter is capable of measuring test weight per bushel, determination of sample volume and weight for this measurement shall be fully automatic.
(Added 1994)(Amended 1995)

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S.4. Operating Instructions and Use Limitations. - The manufacturer shall furnish operating instructions for the device and accessories that include complete information concerning the accuracy, sensitivity, and use of accessory equipment necessary in obtaining a moisture content Operating instructions shall include the following information:

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

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

(c) date of issue;

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

(e) the limitations of use, including but not confined to the moisture measurement range, test weight per bushel 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)

N. Notes

N.1. Testing Procedures.

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

(Amended 1992)

N.1.2. Minimum Test.[1]- A minimum test of a grain moisture meter shall consist of tests with samples of each grain or seed type (need not exceed three) for which the device is used, and for each grain or seed type shall include the following:

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

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

(Amended 1986 and 1989)

[Editor's note: Paragraph N.1.2. has been completely re-organized. Some of the wording formerly in sub-paragraph (a) has been moved to the main paragraph. The wording formerly in sub-paragraph (b) has been moved to (a), and the wording now in (b) is new. Underlining indicates *only* additions to wording. No indications are given for relocated wording.]

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[1] The U.S. Department of Agriculture, Grain Inspection, Packers and Stockyards Administration (GIPSA) uses a single brand and model of moisture meter for official inspection of moisture content in grains and other commodities. The moisture calibrations for the model are based on the official air-oven method and are developed and monitored on an established schedule using a broad range (with respect to geographical source, kind, class, moisture content, maturity, etc.) of grain samples at its central laboratory. GIPSA uses a hierarchical series of meter-to-meter intercomparisons to determine whether its field meters are operating within acceptable tolerances (∀0.2% with respect to standard meters). It has been shown that field meters checked by GIPSA procedures perform within H-44 maintenance tolerances (T.2.) when tested (N.1.) using official grain samples. Agencies lacking a sample capability representing the entire nation and traceable to the official laboratory reference method shall not use meter-to-meter field testing.

T. Tolerances[2]

T.1. To Underregistration and to Overregistration. - The tolerances hereinafter prescribed shall be applied to errors of underregistration and errors of overregistration.

T.2. Tolerance Values. - Maintenance and acceptance tolerances shall be as shown in Table T.2. Tolerances for moisture measurements are expressed as a fraction of the percent moisture content of the official grain sample, together with a minimum tolerance. Tolerances for test weight per bushel are (+) positive or (!) negative with respect to the value assigned to the official grain sample.

~~**T.3. For Test Weight Per Bushel Indications or Recorded Representations.** The maintenance and acceptance tolerances on test weight per bushel indications or recorded representations shall be 0.193 kg/hL or 0.15 lb/bu. The test methods used shall be those specified by the USDA GIPSA.~~
~~(Amended 1992)~~

[2] These tolerances do not apply to tests in which grain moisture meters are the transfer standard.

Table T.2. Acceptance and Maintenance Tolerances for Grain Moisture Meters		
Moisture		
Type of Grain or Seed	**Acceptance and Maintenance Tolerance**	**Minimum Tolerance**
Corn, oats, rice, sorghum, sunflower	0.05 of the percent moisture content	0.8 percent in moisture content
All other cereal grains and oil seeds	0.04 of the percent moisture content	0.7 percent in moisture content
Test Weight per Bushel		
Type of Grain or Seed	**Acceptance and Maintenance Tolerance**	
Corn	1.1 pounds per bushel	
Sorghum, soybeans, and all wheat classes	0.6 pounds per bushel	
Barley, oats, rice, sunflower, and all other small cereal grains and oil seeds	0.9 pounds per bushel	

UR. User Requirements

UR.1. Selection Requirements.

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

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UR.3.4. Printed Tickets.

(a) Printed tickets shall be free from any previous indication of moisture content or type of grain or seed selected.

(b) The customer shall be given a printed ticket showing the date, grain type, grain moisture results, test weight per bushel, and calibration version identification. The ticket shall be generated by the grain moisture meter system. (Amended 1993 and 1995)

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UR.3.10. Posting of Meter Operating Range. - The operating range of the grain moisture meter shall be clearly and conspicuously posted in the place of business such that the information is readily visible from a reasonable customer position. The posted information shall include the following:

(a) The temperature range over which the meter may be used and still comply with the applicable requirements. If the temperature range varies for different grains or seed, the range shall be specified for each.

(b) The moisture range and test weight per bushel range for each grain or seed for which the meter is to be used.

(c) The temperature range for each grain or seed for which the meter is to be used.

(d) The maximum allowable difference in temperature that may exist between the meter and the sample for which an accurate moisture determination can be made. (Added 1988)

8. Proposed Change to Publication 14, Application for NTEP Testing

Discussion: GIPSA has combined the wheat classes "Eastern White Wheat" and "Western White Wheat" into a single new class named "Soft White Wheat." At its last meeting, the Sector unanimously recommended changing Table S.1.2. of Grain Moisture Meter Code 5.56(a) reflect this action. *[Note: The NCWM will vote on this recommendation, Item 356-2, at the annual meeting.]*

Corresponding changes are also required to the table of grain types in the *Application for NTEP Testing* on page 6-7 of Publication 14.

Conclusion: Remove references to "Eastern White Wheat" and "Western White Wheat" in the Table on page 6-7 of Publication 14 and replace them with "Soft White Wheat". The moisture range remains "10-16%". Also, change Note (1) to read:

(1) A Certificate of Conformance will be granted to cover the full range of ~~16~~ 15 NTEP grains upon successful testing of the meter with corn, soybeans, and hard red winter wheat (shaded boxes above).

9. Time and Place for Next Meeting

With seven moisture meter models successfully type evaluated and with the OCP (Phase II) into its fourth season, the necessity of continuing to meet twice a year was questioned. It was suggested that some matters could be settled by written ballot. Another possibility mentioned was having a longer meeting only once a year (or every other year). Most agreed that in terms of conference activities, the ideal time of the year for a Sector meeting was sometime after the annual NCWM meeting in July but before the November 1 deadline for items to be included in the Interim Meeting Agenda, NCWM Publication 15. Unfortunately, this is a very busy time period for those involved in any way with harvest or the major post-harvest agricultural shows.

The decision as to whether there would be sufficient items to warrant having a Fall meeting was deferred until July 1. This decision will depend somewhat on the progress made by the EPO working group, on whether the proposed changes to H44 are ready to hand off to the S&T Committee by that time, and if any Sector issues arise in any of the Regional Meetings. If a Fall meeting is necessary, it will be held during the week of September 21 or September 28. If a Fall meeting is not required, the next most likely time will be March 1999.

Three cities were selected as possible choices for the next meeting: St. Louis, Kansas City, and Chicago. The final choice will be depend on availability and least over-all expense to the NCWM. If a Fall meeting is necessary, fax (or e-mail) notification will be sent to voting members as soon details are known. A normal meeting notice will be mailed shortly thereafter to all members and interested parties.

National Type Evaluation Technical Committee
Near Infrared Grain Analyzer Sector
Meeting Summary
March 18, 1998, Las Vegas, NV

Agenda Items

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1. Removal of Retroactive Dates from NIR Analyzer Code

Discussion: At the previous Sector meeting, questions were raised regarding the fact that the existing Tentative Code has effective dates of January 1, 2000 and still contains retroactive dates of January 1, 2005. Although no vote was taken on the issue at that time, most members felt that the retroactive dates would have to be removed before the Conference would agree to activating the code. The Sector had previously agreed that effective dates could be changed if necessary.

Weights and Measures (W&M) representatives reported that they were seeing an increasing number of NIR Analyzers in their jurisdictions. Iowa W&M inspected 40 NIR devices last year as grain moisture meters and expects to see an additional 30 devices this year. As many as 400 NIR devices may be installed in Iowa by 1999. In the past year, Missouri had requests to inspect 5 NIR devices. More requests are anticipated this year. An estimated 200 to 400 NIR devices are in use in Nebraska. Arkansas has 30 known NIR analyzers in commercial use. Although some of the devices in these states have been inspected under the Grain Moisture Meter Code, the main use of these devices is the determination of the percent content of one or more constituents, such as protein or oil, in a number of different commodities not covered by the NIR Analyzer Code.

The Sector was reminded that the NIR Analyzer Code is still "tentative". Tentative code has only trial or experimental status and is not intended to be enforced. The requirements are designed for study prior to the development and adoption of a final Code. Except for a study conducted in Nebraska, the Sector has not received feedback from the W&M community on the practical experience of field inspections using the tentative code. With an increasing number of instruments coming into the field and an increasing need for requirements to regulate NIR Analyzers, this is an ideal time for States to actively study the code to determine if it needs to be modified before the Sector can recommend that it be upgraded to permanent code.

Diane Lee, NIST, offered to send a letter to State W&M Officials to find out if they would be willing to participate in a study of the Code. A copy of the letter soliciting industry volunteers to participate in Nebraska's study would be included as an example of how to initiate a study program. It was suggested that an Examination Procedure Outline (EPO) would also be helpful for the study.

W&M representatives expressed a need for additional training in the use of the various models of NIR Analyzers they were likely to encounter in field testing. Especially important was the need to be able to verify calibrations. Many of the devices in the field pre-date the Tentative Code and don't have some of the features which the Code requires (such as the ability to print the calibration identifier on the results ticket). Based on Nebraska's study, there will be some users who have no idea how to display calibration information on these older instruments.

Some Sector members questioned proceeding with the Code in light of the fact that it seemed unlikely that an NTEP Lab would be certified for NIR Analyzers in the foreseeable future. Tina Butcher, NIST, explained that it was not necessary to have a type evaluation program before code could be enforced, citing examples of devices for which no NTEP program exists but which are currently being regulated by code [wire and cordage measuring devices, fabric measuring devices, etc.].

The Sector was in general agreement that they should focus on moving the Code from "tentative" to "permanent" whether or not the NTEP program moves forward. Most members agreed that unless retroactive dates were removed, the Conference would never accept the Code as permanent. The non-retroactive date of January 1, 2000 was thought to be premature in light

of the fact that a thorough study of the tentative code is not likely to be completed until late 1999. Members were reluctant to suggest a date too far in the future fearing that it was important to have enforceable code as soon as possible.

Conclusion: The Sector unanimously agreed that retroactive dates should be removed and that the non-retroactive date of January 1, 2000 should be changed to January 1, 2002.

2. Changing the NIR Grain Analyzer Tentative Code to Cover Additional Grains and Oil Seeds

Background: At the previous Sector meeting, Weights and Measures representatives reported that NIR Analyzers were beginning to appear in their jurisdictions, but much of the commercial usage was for corn and soybeans which the present Tentative Code did not address. Grain Industry representatives noted that the industry is increasingly contracting directly with the producer to obtain 'enhanced value' grains. There is a growing demand for measurement of protein, and frequently oil, in an increasing number of grain types.

In light of the fact that: (1) an increasing number of NIR analyzers are being used commercially for grains not presently covered by the code; and (2) the certification date for the NTEP Lab has been delayed indefinitely, the Sector decided that priority should be given to modifying the Tentative Code to cover additional grains. Deciding how these additional grains should be handled in type approval was postponed indefinitely.

Discussion: The Sector reviewed changes to the NIR Grain Analyzer Tentative Code which had been proposed to cover additional grains and oil seeds. Sunflower seed (oil type) was dropped from immediate consideration due to calibration difficulty. With the exception of starch in corn, it was determined that the Grain Inspection Packers and Stockyards Administration (GIPSA) would be able to assign standard reference values to samples provided by the States for the Tentative Code study [see Discussion on Sector Agenda Item 1].

David Funk, GIPSA, proposed acceptance tolerances for the added grains [see Table T.2.], noting that they are roughly two times the standard deviation of the errors GIPSA has observed in their tests. A three times multiplier was not used because reference samples will be pre-screened to eliminate any which differ from the reference method by more than one-half the acceptance tolerance when tested on an official GIPSA NIR grain analyzer [see paragraph N.1.2.].

Conclusion: The Sector agreed to modify the NIR Grain Analyzer Tentative Code as shown below to include tests for corn (protein, oil, starch), barley (protein), and soybeans (protein, oil).

S. Specifications

S.1. Design of Indicating, Recording, and Measuring Elements.

S.1.1. Digital Indications and Recording Elements.

(a) Analyzers shall be equipped with a digital indicating element.

(b) The minimum height for the digits used to display constituent values shall be 10 mm.

(c) Analyzers shall be equipped with a communication interface that permits interfacing with a recording element and transmitting the date, grain type or class, constituent values, and calibration version identification.

(d) A digital indicating element shall not display, and a recording element shall not record, any constituent value before the end of the measurement cycle.

(e) ~~Wheat protein content shall be recorded and displayed as percent protein reported on a constant moisture basis of 12 percent wet basis.~~ Constituent content shall be recorded and displayed as percent of total mass using the moisture basis specified in Table S.1.1.(e).

(f) An analyzer shall not display or record any constituent value that is beyond the operating range of the device unless the constituent value representation includes a clear error indication (and recorded error message with the recorded representation).

S.1.2. Selecting Grain Class and Constituent. - Provision shall be made for selecting, and recording the type or class of grain and the constituent(s) to be measured. The means to select the grain type or class and constituent(s) shall be readily visible and the type or class of grain and constituent(s) selected shall be clearly and definitely identified in letters (such as HRWW, HRSW, etc. or PROT, etc.). *A symbol to identify the display of the type or class of grain and constituent(s) selected is permitted provided that it is clearly defined adjacent to the display. Meters shall be capable of indicating the grain type using a minimum of four characters. Minimum acceptable abbreviations are listed in Table S.1.2.*

Table S.1.1.(e) Constant Moisture Basis for Constituent Display and Recording

Grain Type or Class	Constituent(s)	Moisture Basis
Durum Wheat, Hard Red Spring Wheat, Hard Red Winter Wheat, Hard White Wheat, Soft Red Winter Wheat, Soft White Wheat	protein	12 percent
Soybeans	protein oil	13 percent
Two-rowed Barley Six-rowed Barley	protein	0 percent (dry basis)
Corn	protein oil starch	0 percent (dry basis)

Table S.1.2. Grain Types Considered for Type Evaluation and Calibration and Minimum Acceptable Abbreviations

Grain Type	Minimum Acceptable Abbreviation

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

N.1. Testing Procedures.

N.1.1. Field Inspection. - Whole grain samples shall be used as the official field inspection standards. Five samples per grain type or class shall be used to check instrument performance. Each sample will be analyzed once. One of the samples will be analyzed an additional four times to test instrument repeatability. For ground grain instruments, the ground sample will be repacked four times. A new grind is not required.

~~Wheat protein~~ Constituent values shall be assigned to test samples by the Grain Inspection, Packers and Stockyards Administration (GIPSA). Tolerances shall be applied to individual sample measurements, the average of individual measurements on each of the five test samples, and the maximum difference (range) in results for five analyses on one of the test samples.

N.1.2. Standard Reference Samples~~, Wheat~~. - 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 ~~wheat protein~~ constituent values obtained using the GIPSA standard reference method and an official GIPSA NIR ~~wheat protein~~ grain analyzer does not exceed ~~0.3~~ one-half of the acceptance tolerance shown in Table T.2. for individual test samples or ~~0.15~~ 0.375 times the acceptance tolerance shown for the average of five samples.

T. Tolerances

T.1. To Underregistration and to Overregistration. - The tolerances hereinafter prescribed shall be applied to errors of under registration and errors of overregistration.

T.2. Tolerance Values. - Acceptance and maintenance tolerances shall be equal. Tolerances for individual samples and the average for five samples are shown below:

Table T.2. Acceptance and Maintenance Tolerances for NIR ~~Wheat Protein~~ Grain Analyzers

Type of Grain	Constituent	Individual Samples (percent)	Average for Five Samples (percent)	Range for Five Retests (percent)
Durum Wheat, Hard Red Spring Wheat, Hard Red Winter Wheat, Hard White Wheat, Soft Red Winter Wheat, Soft White Wheat	protein	0.60	0.40	0.40
Soybeans	protein	0.80	0.60	0.60
	oil	0.70	0.50	0.50
Two-rowed Barley Six-rowed Barley	protein	0.70	0.50	0.50
Corn	protein	0.80	0.60	0.60
	oil	0.70	0.50	0.50
	starch	1.00	0.80	0.80

3. Update on Certification of GIPSA as the NTEP Participating Laboratory

Discussion and Conclusion: Dr. Richard Pierce, GIPSA, reported that the situation was little changed since the Sector's September 1997 meeting at which he announced that the GIPSA Laboratory in Kansas City had made little or no progress on the work necessary to obtain certification as the NTEP participating laboratory for near infrared grain analyzers. With limited resources, priority was being given to tasks related to maintaining the NTEP Grain Moisture Meter Program. There was a feeling at GIPSA that there was little interest on the part of major wheat producing states in seeing something done. There may be more interest in corn-oil than in wheat-protein. Dave Funk, GIPSA, expressed the belief that it may be premature to develop a program for maintaining NIR analyzer calibrations. The rapid evolution of calibration techniques, such as artificial neural networks which can lead to more stable calibrations, may materially change the way a maintenance program should be set up. At the present time GIPSA considers the matter of NTEP lab certification "on hold."

4.Time and Place for Next Meeting

With seven moisture meter models successfully type evaluated and the OCP (Phase II) is into its fourth season, the necessity of continuing to meet twice a year was questioned. It was suggested that some matters could be settled by written ballot. Another possibility mentioned was having a longer meeting only once a year (or every other year). Most agreed that in terms of conference activities, the ideal time of the year for a Sector meeting was sometime after the annual NCWM meeting in July but before the November 1 deadline for items to be included in the Interim Meeting Agenda, NCWM Publication 15. Unfortunately, this is a very busy time period for those involved in any way with harvest or the major post-harvest agricultural shows.

The decision as to whether there would be sufficient items to warrant having a Fall meeting was deferred until July 1. This decision will depend somewhat on the progress made by the EPO working group, on whether the proposed changes to H44 are ready to hand off to the S&T Committee by that time, and if any Sector issues arise in any of the Regional Meetings. If a Fall meeting is necessary, it will be held during the week of September 21 or September 28. If a Fall meeting is not required, the next most likely time will be March 1999.

Three cities were selected as possible choices for the next meeting: St. Louis, Kansas City, and Chicago. The final choice will be depend on availability and least over-all expense to the NCWM. If a Fall meeting is necessary, fax (or e-mail) notification will be sent to voting members as soon details are known. A normal meeting notice will be mailed shortly thereafter to all members and interested parties.

National Type Evaluation Technical Committee
Near Infrared Protein Analyzer Sector
August 25, 2000, Kansas City, MO
Meeting Summary

Agenda Items

*1. Criteria for Like Type
* 2. Update on NTEP Transition Activities and NIST/OWM Personnel Changes
* 3. Report on the 2000 NCWM Interim and Annual Meetings
* 4. Time and Place for Next Meeting
5. NIR Tentative Code Study - Review of Additional Data
6. NIR Tentative Code - Indication of Additional Constituent Values
7. Review of Evaluation Procedure Outlines (EPO's) and Test Procedures for the Field Evaluation of Near Infrared Grain Analyzers

∗ Note: Because of common interest, items marked with an asterisk (∗) were considered in joint session of the NIR Protein Analyzer and the Grain Moisture Meter Sectors.

1. Criteria for Like Type

Background: A National Type Evaluation Program (NTEP) Certificate of Conformance (CC) represents conformance of a designated model (or models) to a single type or pattern. NCWM Publication 14 defines "Type" as:

> A model or models of a particular measurement system, instrument, element or a field standard that positively identifies the design. A specific type may vary in its measurement ranges, size, performance, and operating characteristics as specified In the Certificate of Conformance.

When a manufacturer introduces a new model which is similar to a type for which a CC has been issued, a decision must be made as to whether the new device is subject to a full evaluation, or whether it can be considered as a "like type" to the existing unit and thus eligible to be added to the existing CC without testing. Publication 14, offers the following guidelines for making this decision:

1. Superficial Differences Between Devices

Types that are identical in design, materials, and components used, and measurement ranges, but that differ superficially in their enclosures, detailed size, color, or location of non-metrological appointments (function lights, display location, operational key locations, etc.) will usually be submitted to a single

evaluation.

2. Component Variations

Types produced by the same manufacturer with nominally identical components or materials procured from different suppliers can usually be regarded as the same type. They will be covered by a single evaluation if the different components or materials are not likely to affect the regulated metrological characteristics, reliability, or life of the types.

If changes in components or materials are likely to affect the performance or operational characteristics of a device, separate evaluations will generally be required. A type is considered MODIFIED if a change alters a metrological or technical characteristic.

Discussion: Dr. Charles Hurburgh, Jr., Iowa State University - Agricultural Extension Service, has requested a discussion of the following questions:

- What constitutes like type (the criteria for being like type) for NTEP CC purposes?
- If data from non-like type devices (or non-approved and approved devices) is combined into a new calibration, how would GIPSA, NTEP, and State Weights and Measures officials treat the new calibration? (E.g., Is the new calibration permissible if it passes the tests?)
- Is the Official GIPSA system bound by the same definitions of like type as NTEP? (E.g., Will the Official system consider instruments equal and interchangeable even if NTEP has separate Certificates of Conformance because they were judged not to be of like type?)

He reports that these questions arise from the recent introduction of modifications to NIR instruments that may make them not of like type, even though they use the same calibrations or use a calibration derived from a database containing data from both original and modified instruments. The trend to worldwide neural networks and local regression databases may result in the development of calibrations based on data from non-like type instruments. He cited the new 1241 Infratec, submitted as a separate unit from the Infratec 1227 and 1229 units (which have been issued a separate CC) as a case in point. He is of the belief that a policy is needed here that is protective but not restrictive of technology.

Conclusion: Because of time limitations, this item was not discussed. It will be carried over to the Sector's next meeting.

2. Update on NTEP Transition Activities and NIST/OWM Personnel Changes

Background/Discussion: The NCWM was incorporated in August 1997 to protect them from liability in various NCWM activities. NCWM, Inc., is now assuming many of the NCWM business and administrative functions previously performed by NIST. By October 1, 2000, all administrative duties associated with NTEP are scheduled to be turned over to NCWM, Inc. Diane Lee, NIST, reported that OWM and NCWM had established the following schedule for specific activities related to processing Certificates of Conformance (CCs) during the transition period: All type-evaluated devices that meet NIST Handbook 44 requirements will ultimately receive NTEP CCs. NTEP CCs issued prior to October 1 will be issued as NIST NTEP CCs. CCs issued on or after October 1 will be issued as NCWM NTEP CCs. Until October 1, NIST will continue to issue CC numbers for devices that have been evaluated and found to comply with the NTEP criteria to allow the NTEP CCs to become effective. NCWM will continue this practice after October 1. However, many of the CCs for devices for which NIST issues CC numbers will be issued as NCWM CCs since these CCs may not be finalized prior

to October 1. Draft CCs and applications for paper updates received at NIST before August 1 will result in CCs issued by NIST. Draft CCs and applications for paper updates received at NIST between August 1 and August 31 may not be finalized by October 1 and may be issued as NCWM NTEP CCs. NIST will process as many CCs as possible prior to October 1. Applications for devices requiring testing received at NIST prior to September 1 will be processed by NIST. CCs for these devices may not be finalized prior to October 1 in which case they will be issued as NCWM NTEP CCs. 3. Beginning September 1, all NTEP applications should be sent to NCWM Headquarters at:

National Conference on Weights and Measures
15245 Shady Grove Road - Suite 130
Rockville, Maryland 20850-3222
Telephone: (240) 632-9454
Fax: (301) 990-9771

The application fee charged by NCWM will be the same as that currently charged by NIST ($690). NCWM accepts payment by check (made out to NCWM, Inc.) or payment with Visa, MasterCard, and American Express credit cards. NCWM does not accept purchase order numbers. Applications received at NIST on or after September 1 will be returned to the company for re-submission directly to NCWM. NTEP CCs resulting from these applications will receive NCWM CCs. On and after October 1, All CCs will be issued by NCWM as NCWM NTEP CCs. All current, open applications will be transferred to NCWM for final processing on September 29 (October 1 falls on a Sunday). Necessary steps will be taken to protect proprietary information. Applications for which testing is still in process as of October 1 will continue through the already established NTEP process under the management of NCWM. CCs resulting from successful testing of these devices will be issued as NCWM NTEP CCs.

Regarding NIST/OWM Personnel Changes, Ms. Lee reported that Gil Ugiansky, formerly Chief of the Office of Weights and Measures (OWM), had been promoted to the position of Deputy Director, Office of Management Services. Henry Oppermann has replaced him as Chief of OWM. Long time Sector members will remember that Henry was an active participant in the Sector's early days. The Sector welcomes Henry back to the OWM. Ms. Lee also reported that Stephen Patoray had been hired by NCWM to serve as NTEP Director. He will be attending future Sector meetings as the NCWM/NTEP representative.

3. Report on the 2000 NCWM Interim and Annual Meetings

Background/Discussion: The 2000 NCWM Interim meeting was held January 18-23 in Bethesda, MD. The NCWM annual meeting was held July 16-20 in Richmond, VA. Diane Lee reported on action taken at these meetings on issues of interest to the Sector.

- **S&T Item 357-1 -** The NIR Protein Analyzer Sector's proposal to modify the NIR Grain Analyzer Tentative Code to include **Indication of Additional Constituent Values** was reviewed by the S&T Committee and was given informational status while the Sector develops appropriate language to address the moisture basis issue for new constituents.

4. Time and Place for Next Meeting

The next meeting is tentatively planned for the week of August 20, 2001, in the Kansas City, MO, area. Meetings will be held in the either the conference facility at the GIPSA Tech Center or in one of the meeting rooms at the NOAA Weather Training Center. A tentative schedule is shown below.

Wednesday, August 22	1:00 p.m. - 5:00 p.m.	GMM Sector Meeting
Thursday, August 23	8:00 a.m. - 3:00 p.m.	GMM Sector Meeting
Thursday, August 23	3:00 p.m. - 5:00 p.m.	Joint Session GMM & NIR Analyzer
Friday, August 24	8:00 a.m. - 12:00 noon	NIR Protein Analyzer Sector Meeting

The above schedule is subject to change pending confirmation of funding availability and determination of final agenda issues. Sector members and interested parties are asked to try to keep that week open until firm dates have been set.

5. NIR Tentative Code Study - Review of Additional Data

Background: At its March 1998 meeting the Sector recognized that feedback on the practical experience of using the tentative code (and its proposed modification to include corn, soybeans, and barley) in field inspections would be required before the Sector could recommend making the tentative code permanent. To obtain this feedback, State W&M Officials were asked to participate in a study of the Code with the following objectives:

- To gain information on whether or not modifications need to be made to the NIR Tentative Code before recommending that it be upgraded to permanent code.
- To gain information on the proposed modifications to the NIR Tentative Code (adding test for corn (protein, oil, starch), barley (protein), and soybeans (protein, oil))
- To gain information on the current status of commercial NIR devices.
- To gain information on mechanisms for establishing State NIR inspection programs.

At the time of the Sector's September 1999 meeting, results had been received from five states: Arkansas, Iowa, Illinois, Nebraska and North Carolina.

Discussion: Diane Lee, NIST, reported that a memo had been sent to earlier participants requesting information on the moisture basis on which results had been reported for the instruments tested. Information received to date did not materially change the results.

6. NIR Tentative Code - Indication of Additional Constituent Values

Background: At the Sector's March 1998 meeting, State Weights and Measures representatives reported that they were seeing an increasing number of NIR Analyzers in their jurisdictions. It was also reported that much of the increase in commercial usage of NIR devices was for corn and soybeans. Protein has been a price determining feature for Barley for a number of years. In recognition of these facts, the Sector proposed modifications to the NIR Grain Analyzer Tentative Code to include tests for corn (protein, oil, and starch), barley (protein), and soybeans (protein, oil). In comments submitted by Grain Industry representatives on the Sector's proposed addition of corn, soybeans, and barley to the Tentative Code, the industry expressed the belief that it was premature to establish a specific moisture basis in the NIR code for products other than the 12 % basis for wheat, because the marketplace is currently unsettled on an appropriate moisture basis for many of the commodities, such as high oil corn. It was their belief that establishing specific moisture bases for these products could create confusion and potential market disruption if W&M officials enforce the proposed moisture bases for corn and soybeans when commercial contracts call for different bases. The Grain Industry prefers flexibility in setting a moisture basis for a specific product because of the wide differences in moisture bases used when buying or selling

grains with unique characteristics.

Reviewing data obtained in the field study of the tentative code (including the indication of additional constituent values) at its September 1999 meeting, the Sector noted that a significant number of rejects may have been due to a misunderstanding on the part of some device operators as to what moisture basis the device had been calibrated for, or confusion about how to handle the conversion between the device's reading and a different moisture basis. In the ensuing discussion, it became apparent that the practical problems associated with maintaining uniformity between devices in the field seemed to mandate that inspections, tolerances, and regulatory samples used in inspection be based on specified fixed moisture bases. On the other hand, the Sector recognized that the Grain Industry requires the flexibility to use different moisture bases.

Present day commercial devices handle the conversion to different moisture bases in a variety of ways. Assessing the suitability of many NIR instruments for operating in a regulatory environment, the Sector recognized the following problems:

- Constituent results were frequently displayed/recorded with no clear indication of moisture basis.
- There was no way for field inspectors to reliably determine the moisture bases on which calibrations were derived.

Pending resolution of the moisture basis issue, the proposal to modify the Tentative Code to include additional grains and additional constituents remains an informational item on the National Conference on Weights and Measures (NCWM) Annual Meeting agenda (Item 357-1).

Discussion: The Sector was in general agreement that the criteria listed below address the issues of enforcement and user flexibility where market conditions might require that constituent concentrations be reported on different moisture bases. It was mentioned that converting constituent values [to different moisture bases] for type evaluations might be expensive. Possible solutions to this issue and a discussion of whether the National Type Evaluation Program (NTEP) Certificate of Conformance (CC) should indicate the moisture range over which constituent calibrations were developed were postponed until the next Sector meeting.

Criteria for addressing issues related to using different moisture bases:
[Note: included in square brackets following each bulleted item are paragraph/table numbers of the Tentative Code which have been added or changed to address the bulleted item.]

- Inspections, tolerances, and regulatory samples used in inspection will be based on specified fixed moisture bases. Those moisture bases shall be the same as those used by GIPSA. [Table S.1.1.(e), T.1., N.1.]

- The moisture basis of constituent concentration measurements shall be displayed and recorded (printed). Whole grain instruments which produce results on an "as is" basis without displaying or recording a moisture value shall clearly indicate and record that the result is expressed on an "as is" moisture basis. In this case, Inspectors will convert the "as is" constituent concentration measurements of test samples to the standard moisture bases for inspection and enforcement using moisture values determined with the facility's moisture meter (which must be approved for commercial use.) Ground grain instruments must always display and record a moisture measurement for "as is" results. [S.1.1.(c), S.1.1.(e), N.1.1.]

- If an NIR instrument permits user entry of the moisture value for an "as is" constituent measurement, that moisture value must have been obtained on the same sample and must have been measured on a moisture meter approved for commercial use. [UR.2.5.]

- If a whole grain NIR instrument displays a moisture, the instrument shall be type approved as a moisture meter in addition to its type approval as an NIR grain analyzer (See Table below). [A.3.1.]

- If an NIR instrument uses a self-generated moisture measurement internally but does NOT display or record a moisture value, the moisture calibration shall be considered to be a part of the constituent calibration. For such calibrations, the CC shall note, "Includes non-displayed moisture calibration." Changes to any part of such calibrations shall require changes to the CC. [A.3.2.]

- Moisture measurements made by an NIR instrument, whether displayed and recorded or not, shall be concurrent with the measurement of other constituents. [S.1.1.(g)]

- If constituent concentrations are converted to a user entered moisture basis, the "native" concentration and the "native" moisture basis must appear on the printout in addition to the converted concentration and the user entered moisture basis. The information presented on the printout shall be arranged in a consistent and unambiguous manner. [UR.2.3.]

- If an instrument has the capability, the user is permitted to select the moisture basis to be used on any measurement. [UR.2.1.]

- The CC shall indicate the native moisture basis of each calibration. A "native" moisture basis is typically the moisture basis on which the calibration was derived. More generally, it is the default moisture basis of the sealable calibration (or calibration pair when a non-displayed moisture calibration is also involved). [A.3.2.]

- The CC shall indicate the instrument settings which are appropriate for the each calibration. These settings shall be considered "metrologically significant" and shall be sealable. [S.2.5.2]

The Sector considered a number of possible ways to handle the proposed changes including:

- Incorporate the changes to informational item 357-1 and keep it informational.
- Recommend that the original Tentative Code be made permanent and separately propose that the changes be incorporated in the new permanent Codes.
- Incorporate only the changes relating to moisture basis in the original Tentative Code for NIR wheat protein analyzers and recommend that it be made permanent. Keep the issue of additional grains/constituents an informational item.
- Sector Technical Advisor to make all the changes to the informational item, then sent it out for ballot. If agreement is obtained, send changes to S&T committee with recommendation that they be incorporated into the Tentative Code as a voting item. In August 2000 review for a permanent code.

Conclusion: By a vote of 13 to 2, the Sector agreed on the following course of action:

1. The Sector's Technical Advisor will develop appropriate language for all the proposed additions and changes to the Tentative Code.
2. The proposed additions will be submitted to the Sector in the form of a letter ballot.
3. If the response to the letter ballot is favorable, a recommendation that the changes be incorporated into the Tentative Code will be forwarded to the Specifications and Tolerances Committee. At the August 2001 meeting the Sector will again review the Tentative Code with the intent of forwarding a recommendation that the Tentative Code be made permanent.

Subsequent to the Sector's August 2000 meeting the Sector's Technical Advisor developed the following language covering all the changes to be included in the letter ballot:

A.3. Type Evaluation. - The National Type Evaluation Program will accept for type evaluation only those devices that comply with the nonretroactive requirements scheduled to take effect on January 1, 2002. State enforcement will be based upon the effective dates identified with each requirement when specific dates are shown.

A.3.1. Dual Type Approval. - In addition to meeting the requirements of this code, a device that displays a measured moisture value must also comply with the requirements of the Grain Moisture Meter Code and be type approved as a grain moisture meter.

A.3.2 Calibrations. - The National Type Evaluation Certificate of Conformance (CC) shall indicate the native moisture basis of each calibration. The "native" moisture basis is the default moisture basis of the sealable constituent calibration (or constituent calibration pair when a non-displayed moisture calibration is also involved.) If an NIR analyzer uses a self-generated moisture measurement internally but does NOT display or record a moisture value, the moisture calibration shall be considered to be a part of the constituent calibration. For such calibrations, the CC shall note, "Includes non-displayed moisture calibration." Changes to any part of such calibrations shall require changes to the CC.

A.4. - See also Sec. 1.10; General Code requirements.

S. Specifications

S.1. Design of Indicating, Recording, and Measuring Elements.

S.1.1. Digital Indications and Recording Elements.

(a) Analyzers shall be equipped with a digital indicating element.

(b) The minimum height for the digits used to display constituent values shall be 10 mm.

(c) Analyzers shall be equipped with a communication interface that permits interfacing with a recording element and transmitting the date, grain type or class, constituent values, the moisture basis for each constituent value (except moisture), and calibration version identification.

(d) A digital indicating element shall not display, and a recording element shall not record, any constituent value before the end of the measurement cycle.

(e) ~~*Wheat protein content shall be recorded and displayed as percent protein reported on a constant moisture basis of 12 percent wet basis.*~~ *Constituent content shall be recorded and displayed as percent of total mass. The moisture basis shall also be recorded and displayed for each constituent content result (except moisture). If a whole grain analyzer that is calibrated to display results on an "as is" moisture basis does NOT display or record a moisture value, it must clearly indicate that results are expressed on an "as is" moisture basis. Ground grain analyzers must ALWAYS display and record a moisture measurement for "as is" content results (except moisture).*

(f) An analyzer shall not display or record any constituent value that is beyond the operating range of the device unless the constituent value representation includes a clear error indication (and recorded error message with the recorded representation).

(g) If an NIR analyzer is used to determine a moisture value, either to determine the moisture of an "as is" constituent content measurement, or to convert from one moisture basis to another, the moisture measurement must be concurrent with the measurement of other constituents.

[Nonretroactive and effective as of January 1, 2002]

Table S.1.1.(e) Constant Moisture Basis for Type Evaluation and Field Inspection

Grain Type or Class	*Constituent(s)*	*Moisture Basis*
Durum Wheat, Hard Red Spring Wheat, Hard Red Winter Wheat, Hard White Wheat, Soft Red Winter Wheat, Soft White Wheat	*protein*	*12 percent*
Soybeans	*protein* *oil*	*13 percent*
Two-rowed Barley *Six-rowed Barley*	*protein*	*0 percent (dry basis)*
Corn	*protein* *oil* *starch*	*0 percent (dry basis)*

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

[Nonretroactive and effective as of January 1, 2002]

S.1.3. Operating Range. *- An analyzer shall automatically and clearly indicate when the operating range of the device has been exceeded. The statement of the operating range shall be specified in the operator's manual and shall operate as follows:*

(a) The ambient temperature range over which the analyzer may be used and still comply with the applicable requirements shall be specified. The minimum temperature range shall be 10 °C to 30 °C. No constituent value may be displayed when the temperature range is exceeded. An appropriate error message shall be displayed when the temperature of the analyzer is outside its specified operating range.

(b) The constituent range at the moisture basis specified in Table S.1.1.(e) shall be specified for each grain or seed for which the analyzer is to be used. A constituent value may be displayed when the constituent range is exceeded if accompanied by a clear indication that the constituent range has been exceeded.

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S.2.5. Calibration Transfer and Verification.

Table S.1.2. Grain Types Considered for Type Evaluation and Calibration and Minimum Acceptable Abbreviations

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

S.2.5.1. Calibration Transfer. *- The instrument hardware/software design and calibration procedures shall permit calibration development and the mathematical transfer of calibrations between instruments of like models.*

Note: *Only the manufacturer or the manufacturer's designated service agency may make calibration transfer or slope adjustments on near-infrared grain analyzers and, except for instrument failure and repair, only during a prescribed period of time during the year. This does not preclude the possibility of the operator installing the manufacturer-specified calibration constants or standardization parameters under the instructions of the manufacturer or the manufacturer's designated service agency. Nor does it preclude operator bias adjustments when made under the conditions specified in UR.2.8.*
[Nonretroactive and effective as of January 1, 2002.]
(Note added 1995) (Amended 1995)

S.2.5.2. Calibration Version. - *An instrument must be capable of displaying either calibration constants, a unique calibration name, or a unique calibration version number for use in verifying that the latest version of the calibration is being used to make constituent determinations, and that the appropriate instrument settings have been made for the calibration being used .*
[Nonretroactive and effective as of January 1, 2002].
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N.1. Testing Procedures.

N.1.1. Field Inspection. - *Whole grain samples shall be used as the official field inspection standards. Five samples per grain type or class shall be used to check instrument performance. Each sample will be analyzed once. One of the samples will be analyzed an additional four times to test instrument repeatability. For ground grain instruments, the ground sample will be re-packed four times. A new grind is not required. Test results must be converted to the standard moisture bases shown in Table S.1.1.(e) before applying the tolerances of Table T.2. Test results on whole grain analyzers that produce results on an "as is" basis without displaying or recording a moisture value shall be converted to the standard moisture bases shown in Table S.1.1.(e) using sample moisture values determined with the facility's moisture meter (which must be approved for commercial use.)*

~~Wheat protein~~ Constituent values shall be assigned to test samples by the Grain Inspection, Packers and Stockyards Administration (GIPSA). Tolerances shall be applied to individual sample measurements, the average of individual measurements on each of the five test samples, and the maximum difference (range) in results for five analyses on one of the test samples.

N.1.2. Standard Reference Samples~~, Wheat~~. - *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 ~~wheat protein~~ constituent values obtained using the GIPSA standard reference method and an official GIPSA NIR ~~wheat protein~~ grain analyzer does not exceed ~~0.3~~ one-half of the acceptance tolerance shown in Table T.2. for individual test samples or ~~0.15~~ 0.375 times the acceptance tolerance shown for the average of*

five samples.

T. Tolerances

T.1. To Underregistration and to Overregistration. *- The tolerances hereinafter prescribed shall be applied to errors of underregistration and errors of overregistration and shall be based on constituent values expressed at the moisture bases shown in Table S.1.1.(e).*

T.2. Tolerance Values. *- Acceptance and maintenance tolerances shall be equal. Tolerances for individual samples and the average for five samples are as shown in Table T.2.*

Table T.2. Acceptance and Maintenance Tolerances for NIR ~~Wheat Protein~~ Grain Analyzers

Type of Grain	Constituent	Individual Samples (percent)	Average for Five Samples (percent)	Range for Five Retests (percent)
Durum Wheat, Hard Red Spring Wheat, Hard Red Winter Wheat, Hard White Wheat, Soft Red Winter Wheat, Soft White Wheat	protein	0.60	0.40	0.40
Soybeans	*protein*	*0.80*	*0.60*	*0.60*
	oil	*0.70*	*0.50*	*0.50*
Two-rowed Barley *Six-rowed Barley*	*protein*	*0.70*	*0.50*	*0.50*
Corn	*protein*	*0.80*	*0.60*	*0.60*
	oil	*0.70*	*0.50*	*0.50*
	starch	*1.00*	*0.80*	*0.80*

UR. User Requirements

UR.1. Installation Requirements. *- The NIR analyzer shall be installed in an environment within the range of temperature and/or other environmental factors specified in the operating manual.*

UR.2. User Requirements.

UR.2.1. Operating Instructions. *- The operating instructions for the NIR analyzer shall be readily available to the user, service technician, and weights and measures official at the place of installation. It shall include a list of accessory equipment if any are required to obtain constituent values, and the type or class of grain to be measured with the NIR analyzer. If an NIR analyzer has the capability, the user is permitted to select the moisture basis to be used on any measurement.*

UR.2.2. Other Devices not used for Commercial Measurement. - *If there are other NIR analyzers on the premises not used for trade or determining other charges for services, these devices shall be clearly and conspicuously marked "Not for Use in Trade or Commerce."*

UR.2.3. Printed Tickets. -

(a) Printed tickets shall be free from any previous indication of constituent or grain type selected. The printed ticket shall indicate constituent values ~~reported on a constant~~ and the moisture basis associated with each constituent value (except moisture). If the analyzer is calibrated to display results on an "as is" moisture basis and does NOT display or record a moisture value, the ticket must clearly indicate that results are expressed on an "as is" moisture basis.

(b) The customer shall be given a printed ticket showing the date, grain type or class, constituent results, and calibration version identification. If the analyzer converts constituent results to a manually entered moisture basis, the "native" concentration and the "native" moisture basis must appear on the printed ticket in addition to the converted results and the manually entered moisture basis. If the manually entered moisture basis is intended to be the moisture value for an "as is" constituent concentration measurement, that moisture value must have been obtained on the same sample and must have been measured on a moisture meter approved for commercial use. The information presented on the ticket shall be arranged in a consistent and unambiguous manner. The ticket shall be generated by the near-infrared grain analyzer system.

[Nonretroactive and effective as of January 1, 2002]

UR.2.4. Grinders. - *Place grinders in a separate room from the NIR analyzer to avoid instrument contamination. If a separate room is not available, the grinder may be in the same room with the NIR analyzer provided the grinder is not placed within 1 meter of the air intake on the NIR.*

UR.2.5. Sampling. - *Samples shall be obtained by following appropriate sampling methods and equipment. These include, but are not limited to, grain probes of appropriate length used at random locations in the bulk, the use of a pelican sampler, or other techniques and equipment giving equivalent results. The sample shall be taken such that it is representative of the lot. If an NIR analyzer permits user entry of the moisture value for an "as is" constituent measurement, that moisture value must have been obtained on the same sample and must have been measured on a moisture meter approved for commercial use.*

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7. Review of EPO's and Test Procedures for the field evaluation of Near Infrared Grain Analyzers

Background: At the March 1998 GMM/NIR Sector meetings three working groups were established to develop Examination Procedure Outlines (EPO's) and Field Evaluation Test Procedures for GMM and NIR devices to provide guidance to States on implementing H44 as it applies to these devices. The

groups were assigned the following development tasks:

Group 1- EPO XXX for Grain Moisture Meters and NIST HB 44 Recommended Field Evaluation Test Procedures for Grain Moisture Meters, Whole Grain Sample Method.

Group 2 - EPO XXX for Near Infrared Grain Analyzers and Appendix A of EPO XXX, NIST HB 44 Recommended Field Evaluation Test Procedures for Near Infrared Analyzers.

Group 3 - Appendix B, Alternative Field Evaluation Test Procedures for Grain Moisture Meters, Meter to Meter Method.

Templates were developed to assist the working groups with their assignments in documenting the EPO's and field evaluation test procedures. The output of the working groups was reviewed at the Sector's September 1999 meeting.

Commenting on the Draft EPO for NIR Grain Analyzers, the Sector noted:

1. Several of the items in the check list are specifications which can be verified only during NTEP conformance testing.
2. The retroactive dates have been removed from the Tentative Code. It would be helpful if the EPO provided some suggestions on which portions of the code should be applied to pre-NTEP devices.

The Test Procedure was not available for review, but the Sector noted:

1. The test protocol developed for the NIR Tentative Code Study (see Item 6, this Summary) contains the essential information needed for the Test Procedure.
2. When the Test Procedure is developed, it should be edited to be consistent with the Test Procedures for GMMs.

Because of time limitations, and recognizing that major editing might be involved in a line-by-line review of each EPO and Test Procedure, the NIST representative was asked to edit the EPOs and Test Procedures to incorporate the Sector's suggestions. Revised EPO's and Test Procedures will be available for review at the August 2000 Sector meeting.

Conclusion: This item was not discussed because of time limitations. The latest draft of the NIR EPO was not available at the meeting. It will be distributed with the Sector's Meeting Summary. Development of the NIR Field Evaluation Test Procedure has been tabled pending the outcome of the changes which have been proposed to the NIR analyzer tentative code.

National Type Evaluation Technical Committee
Grain Moisture Meter Sector
August 23-25, 2000 Kansas City, MO
Meeting Summary

Agenda Items

1. **Proposed Test Weight per Bushel Criteria for Section 5.56(a) of Handbook 44**
   a) **Tolerances**
   b) **Field Evaluation of Proposed Tolerances**
   c) **Proposed Additions to Publication 14 Test Procedures**
   d) **Additional Test Weight per Bushel Criteria for Section 5.56(a) of Handbook 44:**
      Moisture Limits
      Grain Level Sensing
2. a) **Review of Final Draft of Evaluation Procedure Outlines (EPO's) and Test Procedures for the Field Evaluation of GMM Devices**
   b) **Proposed Changes to Handbook 44 - Addition of Tolerances for Meter to Like-Meter Testing and Removal of Footnote 1.**
3. **Update on NTEP Type Evaluation and OCP (Phase II) Testing**
4. **Proposed Change to Publication 14 - GMM Check List Paragraph 4.5.2, Calibration Transfer**
5. **Status of NTEP Meters in the Field - Review of Data from State Inspections**
6. **Inspection Problems Arising from "Cross-Utilized" (Federal/Commercial) Moisture Meters**
7. **Intercomparison of Air Oven Moistures between GIPSA, the States, and Manufacturers**

* 8. **Criteria for Like Type**
* 9. **Update on NTEP Transition Activities and NIST/OWM Personnel Changes**
* 10. **Report on the 2000 NCWM Interim and Annual Meetings**
* 11. **Time and Place for Next Meeting**

*Note: Because of common interest, items marked with an asterisk (*) were considered in joint session of the NIR Grain Analyzer and the Grain Moisture Meter Sectors.

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1. Proposed Test Weight per Bushel Criteria for Section 5.56(a) of Handbook 44

Background: There are at least two NTEP Grain Moisture Meters which have the capability to automatically provide an indication and recorded representation of test weight per bushel. Because of the unrealistic tolerances in the existing GMM Code, however, the test weight indications of these devices are typically not allowed to be used for commercial transactions. The Sector first considered this issue at its March 1996 meeting. In 1997 at its September meeting, the Sector agreed that priority should be given to drafting changes to the Grain Moisture Code to specify field test methods and reasonable tolerances. A draft of proposed changes to the Code was reviewed by the Sector at its March 1998 meeting. Action to forward the draft to the Committee on Specifications and Tolerances (S&T) was deferred pending receipt of feedback from the grain trade on the acceptability of the proposed tolerances and feedback from Weights and Measures (W&M) members on a sampling of field test results applying those tolerances. Committee Ballot 84-03 to add the proposed changes to NIST Handbook 44, Section 5.56(a), was issued on August 18, 1998, with ballots due for return by September 10, 1998. Most of the Sector members agreed with the need for criteria but were not in agreement with the tolerances proposed at that time.

1.(a) Tolerances

At the Sector's September 1999 meeting, tolerances of ±0.8 pounds per bushel for corn and oats; ±0.5 pounds per bushel for all classes of wheat; and ±0.7 for soybeans, barley, rice, sunflower, and sorghum were proposed for further study. Although several members opposed adopting the proposed tolerances and groupings for the following reasons: 1) difficult to meet the proposed tolerance for wheat; 2) difficult to obtain samples for field test; and 3) not discriminating enough for corn, they agreed to consider them for further study. The Sector concluded that it was premature to recommend that the National Conference adopt the proposed changes as part of the GMM code. However, the Sector considered the matter of sufficient importance to recommend that it be submitted to the Central Weights and Measures Meeting and the Southern Weights and Measures Meeting for consideration as an item for development so it could appear on the National Conference on Weights and Measures (NCWM) Interim Agenda. Diane Lee, NIST, reported that the proposal was published as a developing issue in the Committee Reports for the 85th Annual Meeting under the process established by the NCWM to disseminate information about emerging issues which have merit and are of national interest. Developing issues have not received sufficient review by all parties affected by the proposals or may be insufficiently developed and are not ready for review by the S&T Committee.

1.(b) Field Evaluation of Proposed Tolerances

To further evaluate the proposed tolerances and test methods, several state metrology representatives have agreed to participate in a field evaluation. States that have agreed to participate include:

Arkansas	North Carolina
Illinois	Maryland
Nebraska	Missouri

Dr. Charles Hurburgh, Jr., ISU Agricultural Extension Service, will contact Darryl Brown of the Iowa Department of Agriculture, Department of Weights and Measures to solicit Iowa's participation, also.

Discussion: The Sector reviewed a conceptual outline of a laboratory and field evaluation protocol drafted by Dr. Hurburgh. The first draft of the protocol is shown below:

Protocol for State Inspections of
Test Weight Devices
Dr. Charles R. Hurburgh, Jr.

Basic Assumptions

1. Because there is no NTEP program for test weight, state laboratory data will have to be pooled to make a fundamental evaluation of devices.
2. A state could do either lab evaluation or field evaluation or both depending on its resources and equipment availability.
3. The reference for test weight for a given state will be the lab quart bucket method, standardized against the GIPSA system master apparatus.

Laboratory Evaluations

If a state has devices, then the samples collected for the moisture program could be used to generate calibration data on test weight.

a. The state should standardize its laboratory quart apparatus to GIPSA by the same process as used for official service points.
b. Each comparison sample should be run three times in the apparatus and three times in the device.
c. The same sample condition (cleanliness, etc.) requirements as used for moisture apply to test weight.
d. Device evaluation would be by bias and standard deviation of differences relative to reference.
e. Data would be pooled by grain by device across labs to make an overall evaluation. Manufactureres would have the responsibility of assuring uniformity of devices. Non-uniformity would increase SDD and thus harm approval chances. Either NIST or the NTEP lab or another lab could be responsible for compiling the data.
f. This data would evaluate the fundamental ability of the device. The first collection would be for information rather than regulatory purposes.

Field Evaluations

If a state has a moisture program, one sample there of (preferably dry) could be used to monitor performance of fielded instruments.
a. The chosen sample should be clean, dry (<14 % moisture) and pre-screened to be a good predictor on lab units.
b. The reference value would be the average of 10 replicates on the standardized lab apparatus.
c. The inspector portion of this sample will be at least 1000g . This allows testing of fielded apparatus and rechecking of the reference when the inspector returns to the lab for periodic moisture updates.
d. Comparison will be made on the average of three replicates made by the inspector in the field device to the pre-established reference value. These would likely be the same drops as used for moisture.
e. Test weight increases if samples lose moisture. The test weight sample should be at a low, stable moisture; until more data is available the adjustment of the reference value based on a device (as is sometimes done for moisture) is not recommended.
f. Data would be compiled at some central location, NIST, NTEP lab or another lab. The first year of data would be used for information purposes.

Decision: The Field Evaluation of Tolerances project will be conducted in two phases:

Phase 1. Standardization of Quart Kettle Test Weight Apparatus
To initiate the study, the USDA/Grain Inspection Packers and Stockyards Administration (GIPSA) will send one portion of a hard red winter wheat (HRW) standardizing sample to each of the participating State Laboratories. Participating laboratories are to verify that the quart kettle used in the standard test weight per bushel apparatus meets the requirements spelled out in GIPSA's volume test. They are also to verify that the apparatus is set up according to GIPSA standards before testing the HRW standardizing samples. Test results on standardizing samples are to be returned to GIPSA no later than 5 days after the HRW samples are received by the participating laboratory.
After GIPSA has verified standardization among the participating laboratories on the HRW sample, Dr. Hurburgh will supply GIPSA with corn and soybean samples that will be split and tested by GIPSA on their standard quart kettle test weight per bushel apparatus before they are sent to the participating laboratories. Participating laboratory test results on the corn and soybean samples are to be returned to GIPSA no later than 5 days after the samples arrive at the participating laboratories. The target date for completion of Phase 1 is October 1, 2000.

Phase 2. Field Tests of Test Weight per Bushel Capability
Participating laboratories will be responsible for obtaining their own samples for this test. Samples must be stable and dry. The participating laboratory will make an initial determination of the test weight per bushel of each sample portion with the standard quart kettle apparatus before sending it to the field. The surface condition of these samples will have an effect on the TW measurements. To minimize surface effects, the following was recommended: 1) do NOT refrigerate samples, and 2) test no more than 20 instruments with each sample portion. Tests should be run on both the facility's grain moisture meter and on the kettle test weight apparatus used at that facility. The kettle test should be performed by the operator who normally makes test weight per bushel determinations at that location. No instruction should be given to the operator on how to perform the test. The participating laboratory will make a final determination of test weight per bushel when the sample is returned to the lab. Data is to be collected on as many meters as possible in the designated time period. Field test data is to be returned to Diane Lee at NIST no later than January 8, 2001. Periodic submission of data is encouraged so all the data won't arrive on the last day! It is imperative that this date be met if compiled data is to be available for review prior to the NCWM Interim meeting later in January.

1.(c) Proposed Additions to Publication 14 Test Procedures

Discussion: To give manufactureres a better idea how the proposed code might be applied in type approval, a subcommittee was formed to draft additions to the test procedures and checklist of NCWM Publication 14 for the evaluation of GMMs incorporating test weight per bushel (TW) capability. In arriving at the draft presented to Sector, the subcommittee considered the following:

1. To minimize the cost of type evaluation testing and provide an existing database for manufacturers to use in evaluating the proposed procedures, the subcommittee initially considered structuring tests to parallel the tests already established for GMMs. While this approach was determined to be feasible for most of the basic instrument tests, the subcommittee felt that test procedures and sample set selection should be modified for some tests to place the emphasis on test weight effects rather than on moisture effects. This was a particular concern for the accuracy, precision, and reproducibility tests in Phase I.

   A related concern is that Phase II samples are the primary source of Phase I accuracy samples. By the time air oven portions (200 g) have been cut out of the samples, only one-half to two-thirds of the samples are large enough to obtain a test weight reference value for Phase I tests using the procedures specified by the standard quart kettle method [*note: the standard method requires a 1000 g to 1050 g sample for all grains except oats and sunflower seed*]. Also, the TW values currently being supplied to participants in the GMM Phase II ongoing calibration review (OCR), cannot be considered "official" test weight results. Some of these TW values are obtained using samples just large enough to fill the TW kettle with very little overflow. Sample packing and TW results are typically reduced for these samples.

   Because TW readings are influenced by test conditions that affect grain surface characteristics, for some tests it is not desirable to use the same procedures for GMM and TW evaluations. For example, it seems desirable to reduce the number of repetitions per sample to avoid "polishing" grain samples. Also, it may be necessary to conduct all TW testing in an environmental chamber in which relative humidity can be controlled.

   For the above reasons (and for the reasons given in item 3, below), TW evaluations were not incorporated into the existing Phase I GMM tests; instead, addition of a new subsection containing only TW test procedures and tolerances was proposed.

2. The subcommittee proposed that display and printout of TW be confined to moisture measurements within the 6 % minimum NTEP required moisture range specified in the Application for NTEP testing for the following reasons: 1) measurement of TW beyond the upper limit of the 6 % range is going to be of questionable accuracy/precision; 2) the moisture region of greatest importance for TW is at or near normal moistures associated with storage or no-dockage-for-moisture levels which are included in the minimum NTEP required moisture range. The subcommittee's decision to limit TW to the "standard" 6 % moisture ranges was not unanimous. Tom Runyon, Seedburo, favored using the same moisture range for both TW measurements and moisture measurements, because grains coming into the initial receiving stations at harvest exhibit moistures that are at the upper levels of the approved moisture ranges. When there is an issue of low test weight due to poor weather conditions or stress during maturation stages, grain elevators need to identify a Low Test Weight condition at first receipt, not just after the grain has been dried to the lower moisture levels.

3. The matter of sample selection for TW was given serious consideration. Samples currently selected for moisture testing may not be suitable for TW testing. Because of existing criteria for selecting samples for Phase I moisture accuracy tests, it is already difficult to assemble a set of test samples. Imposing additional selection criteria for TW may make it impossible. The following criteria were included in the initial draft proposal submitted to the Sector:
   a) A total of 12 samples will be used per grain type.
   b) No less than 8 samples should come from the lowest two-thirds of the 6 % moisture range.
   c) No less than 2 samples should come from the highest one-third of the 6 % moisture range.
   d) Samples should represent a distribution of TWs (ranges to be determined).
   e) For the entire population of 12 samples, the correlation (R^2) between moisture and reference TW is to be less than 0.20.

4. The reference value for TW will be the average of 3 replicates on GIPSA's quart kettle apparatus. Samples will be dropped three times through each of two meters. The average of the initial and final reference values shall be used as the reference value in calculations of meter performance.

5. To have a sufficient number of measurements to determine TW accuracy, the subcommittee proposes that bias and Standard Deviation of the Differences (SDD) be calculated for each instrument using the entire sample set of 12 samples. In addition, a tolerance will be applied to the slope between measured TW (the average of the 3 TW measurements of a sample) and the reference TW (the average of 3 determinations as described above). Slope limits between 0.99 and 1.01 were proposed.

6. TW accuracy, repeatability, and reproducibility tests should be performed on all NTEP grains.

In addition to reviewing the performance tests and tolerances in the Subcommittee's draft proposal, the Sector considered the following questions:

1. What TW range should be specified for Hard Red Winter Wheat samples used in the instrument stability and instrument temperature sensitivity tests?
2. What TW range should be specified for samples used in accuracy, precision, and reproducibility tests?
3. Should the moisture range for TW measurements be restricted to a 6 % range? If not, how should the moisture range be determined, and should tolerances be different at higher moistures?
4. Should Phase II testing be required for TW? If so, how should tolerances be applied and over what range of moistures?

The questions related to limiting moisture ranges for TW measurements were the subject of lengthy discussion. The Sector acknowledged that for practical reasons samples used in NTEP testing would have to be of a restricted moisture range. Sample stability and availability were the major limitations to expanding the moisture range of samples used in Phase I testing. On the other hand, it seemed equally impractical to have different upper limits on grain moisture for TW and moisture measurements, because grains coming into the initial receiving stations at harvest exhibit moistures that are at the upper levels of the approved moisture ranges. When there is an issue of low test weight due to poor weather conditions or stress during maturation stages, grain elevators need to identify a Low Test Weight condition at first receipt, not just after the grain has been dried to the lower moisture levels. In addition, restricting the display and printout of TW information at higher moistures would unnecessarily prevent measurement of TW for operational use (such as binning and drying) as opposed to commercial use.

The suggestion to allow display and printout of TW beyond the 6 % moisture interval, provided the device gave a clear warning that the TW was "outside limits," was deemed impractical by device manufacturers who indicated that major firmware changes would be required to apply different moisture limits to moisture measurements and TW measurements for different grains. Other members expressed the opinion that different moisture limits would be confusing to producers and grain handlers alike.

One Sector member suggested that the issue should be viewed from the perspective of how TW affects the money paid for grain:

Corn - TW becomes important only if TW is very low. Low TW occurs only infrequently. In years when it does, it is typically common to an entire growing region. There is a big difference between typical TW and unusually low TW. Even if accuracy and precision of the TW measurement is reduced at higher moistures, it is still possible to identify a low TW condition.

Wheat - TW is important on wheat every day, but the proposed 10 % to 16 % moisture range is where most wheat is harvested.

Soybeans - TW is somewhat important, but the proposed 6 % moisture range includes normally harvested moistures.

He concluded that allowing display of TW beyond the proposed limits was not a problem as there was no significant economic impact on TW accuracy beyond the proposed limits. Another member disagreed, citing the common harvesting of double cropped soft red winter wheat in his area at moistures above 16 %. He questioned how field testing should be handled if TW results are allowed to be displayed on higher moisture grains. Would the same tolerances apply to TW at higher moistures? If so, should a device be failed if it passes tests using samples within the 6 % interval but is out of tolerance on higher moisture samples? It was suggested that field testing should be limited to moistures within the 6 % range. Refrigeration of TW transfer samples is not recommended, and the ability to maintain the integrity of test samples at higher moistures without refrigeration is questionable. Also, the precision of the device under test and the precision of the standard method begin to suffer at higher moistures. The Sector concluded that field testing at higher moistures did not seem practical.

Decision: To satisfy both the need to limit moistures for NTEP Phase I testing and the need to provide TW indications at moistures beyond those used in Phase I tests, it was decided that grain moisture meters would be allowed to use the same moisture range for both TW measurements and moisture measurements. On CCs, TW calibrations would be shown as "approved" over a 6 % moisture range and "pending" over the remainder of the meter's moisture range. Participation in the Grain Moisture Meter Phase II calibration monitoring program would be required to verify performance over the TW "pending" range. Although the TW data available from the Phase II program may not be suitable for use in the basic instrument tests of Phase I, it was thought that the data would be acceptable for determining the degree to which TW measurements are a function of moisture over the device's operating moisture range. The Sector unanimously recommended that the following criteria be included in the check list to address this concern:

- The slope of TW error with respect to TW shall not be significant at a 95 % confidence level over the 6% moisture range.
- The slope of TW error with respect to percent moisture content shall not be significant at a 95 % confidence level over the approved and pending moisture range of the device.

For all the proposed Publication 14 tests, the Sector was in full agreement that the range of sample TWs should be no less than the range that is grade determining. For example, for yellow dent corn the minimum test weight per bushel is: 56 pounds per bushel for grade #1; 54 pounds per bushel for grade #2; and 52 pounds per bushel for grade #3; thus, the minimum range specified for corn will be 52 pounds to 56 pounds per bushel. The Sector did not specifically address the cases of rice for which TW is not a grade factor, and sunflower which uses a single minimum TW (25 pounds per bushel) for all three grades.

The draft below reflects changes made by the Sector to the subcommittee's proposed addition to the GMM Check List of Publication 14. Several items remain unresolved or in question:

1) Sample Volume test - the angle of repose of wet corn (22 %) is different than that of dry hard red winter wheat. If the device uses a sensor in the hopper to detect adequate sample size, it could conceivably pass the test on wheat but not detect insufficient volume when used with wet corn. Naturally moist wet corn may not be available at the time of year when a device is submitted for testing. It hasn't been determined that artificially moistened corn could be used for this test. Due to time constraints, the Sector could not decide how the test should be modified. This test appears below as originally proposed by the subcommittee.

2) It was suggested that tolerances on some of the basic instrument tests were too tight. The subcommittee acknowledged that they were based on preliminary data and suggested that manufacturers be given the opportunity to see if they are appropriate. These limits remain in the draft as originally proposed.

3) What TW ranges should be specified for rice and sunflowers?

DRAFT - Proposed Addition to NCWM Publication 14, §2, Chapter 6, Checklist for Grain Moisture Meters
[Note: The following is an addition to the existing Test Procedures and Tolerances portion of the GMM check list. To enhance readability, the text has not been underlined to signify an addition.]

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

A. Basic Instrument Tests:
Basic instrument tests will be conducted using a stable moisture (12 % to 14 %) HRW wheat sample to check the effect of sample volume variations, power supply fluctuations, storage temperature, leveling, and warm-up time. Instrument stability tests will be conducted using HRW wheat samples selected from all three 2 % moisture intervals in the 10 % to 16 % moisture range. All instrument tests will be conducted on each of the two instruments submitted by a manufacturer. For purposes of these tests, room temperature will be defined as 22 °C ± 2 °C.

Sample Volume. A single HRW wheat sample with a moisture content between 12 % and 14 % will be used for this test. A quantity of 500 grams (or the maximum amount that can be loaded into the instrument's sample hopper) will be measured 3 times. This quantity will be reduced by 10 grams and then measured 3 times. The sample will continue to be reduced by 10 grams for each set of 3 measurements until the instrument no longer displays and records a test weight per bushel result. The average of each set of 3 measurements will be calculated.

The maximum difference between any of the calculated averages shall not exceed 0.30 pounds per bushel.

Initial Precision. A single HRW wheat sample with a moisture content between 12 % and 14 % will be analyzed 10 times at room temperature and nominal line voltage.

Precision will be checked.

The maximum allowable standard deviation of 10 analyses (precision) is 0.20 pounds per bushel.

Power Supply. (Note: This test may be waived for instruments that have met the grain moisture meter test requirements provided that the instruments use the same volume and weight determining means for both moisture and test weight per bushel measurements.) A single HRW wheat sample with a moisture content between 12 percent and 14 percent will be analyzed 10 times with the meter operating at a nominal voltage of 100 V. The voltage will be adjusted to 117 V, and after 30 minutes, the HRW sample will be analyzed 10 times. The voltage level will then be increased to 130 V, and after 30 minutes, the sample will be analyzed 10 more times.

Changes in bias and precision will be checked. Bias is defined as the change in the average test weight per bushel for 10 analyses made at both the reference and the respective test voltages.

The maximum allowable bias change from the reference is ± 0.20 pounds per bushel. The maximum allowable standard deviation of 10 analyses (precision), at any of the three voltage levels, is 0.20 pounds per bushel.

Storage Temperature. A single HRW wheat sample (12 % to 14 % moisture content) is analyzed 10 times at room temperature prior to temperature cycling. The instrument is then powered down and placed in the environmental chamber. The chamber temperature is then increased to 55 °C over a 1 hour period, and maintained at that temperature for 3 hours. Chamber temperature is then decreased to -20 °C over a 1 hour period, and maintained at that temperature for 3 hours. Repeat the temperature cycle. After letting the instrument equilibrate to room temperature for at least 12 hours, the instrument is turned on for the specified warm-up period and the test sample analyzed 10 more times.

The maximum bias shift allowed for the average of 10 drops before and after temperature cycling is ± 0.20 pounds per bushel.

Leveling. (Note: This test will be waived for instruments that have met the grain moisture meter test requirements provided that the instruments are equipped with leveling indicators and use the same volume and weight determining means for both moisture and test weight per bushel measurements.) Tests for leveling will be conducted using a single HRW wheat sample (12 % to 14 % moisture content). The leveling test will be conducted for a minimum of 2 orientations, front-to-back and left-to-right, at a tilt of 5 %. Additional orientations will be tested as deemed appropriate.

The maximum allowable bias shift is ± 0.20 pounds per bushel for the average of 5 readings.

Warm-up Time. (Note: This test will be waived for instruments that have met the grain moisture meter test requirements, provided that the instruments use the same volume and weight determining means for both moisture and test weight per bushel measurements.) The following test procedures will be used to check warm-up times recommended by the manufacturer. If no warm-up time is recommended by the manufacturer, it will be assumed that accurate results will be provided immediately upon having the instrument powered on.

The instrument will be powered off and stabilized at room temperature. The instrument will be powered on and after waiting the specified warm-up time a single wheat sample (12 % to 14 % moisture content) will be analyzed 5 times. After waiting for a period of time equal to two times the manufacturer suggested warm-up time, the sample will again be analyzed 5 times. The minimum waiting period before retesting the sample is one hour. Thus, for an instrument where no warm-up time is specified, the sample would be tested immediately upon the instrument being powered up and then again after 1 hour.

The maximum allowable bias shift is 0.20 pounds per bushel for the average of 5 readings.

Instrument Stability. HRW wheat samples will be used to test instrument stability over a minimum 4 to 6 week period. A set of three samples, representative of the test weight per bushel range of 56 lb to 61 lb per bushel, will be selected for testing. These samples may be a subset of the HRW test set for accuracy, repeatability, and reproducibility tests. Each of the 3 samples will be dropped 5 times through each of the two meters prior to running any other type evaluation tests, particularly before running the storage temperature test. The average test weight per bushel obtained for the 15 observations (3 samples x

5 replicates) will be recorded. The 3 samples will be retested once all other type evaluation testing has been completed (within 4 to 6 weeks).

The maximum allowable bias shift over the 4 to 6 week period is 0.20 pounds per bushel.

B. Accuracy, Precision, And Reproducibility Requirements:

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 a pending or higher 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 %	52 - 56	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 %	52 - 56	
Hard Red Winter Wheat	10-16 %	56 - 60	
Durum Wheat	10-16 %	56 - 60	
Soft White Wheat (except White Club)	10-16 %	56 - 60	
Hard Red Spring Wheat (and White Club)	10-16 %	55 - 58	
Soft Red Winter Wheat	10-16 %	56 - 60	
Hard White Wheat	10-16 %	56 - 60	
Two-Row Barley	10-16 %	43 - 47	
Six-Row Barley	10-16 %	43 - 47	
Oats	10-16 %	30 - 36	
Sunflower Seed	6-12 %	t.b.d.	
Long Grain Rough Rice	10-16 %	t.b.d.	
Medium Grain Rough Rice	10-16 %	t.b.d.	
Grain Sorghum or Milo	10-16 %	53 - 57	

<u>Accuracy</u>. 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.

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

where,

x_i = average predicted test weight per bushel for sample i (3 replicates)

r_i = average reference test weight per bushel for sample i

n = number of samples (n=12)

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

where

y_i = x_i-r_i (see above)

y = average of the y_i

n = number of samples (n=12)

Tolerances for bias and SDD tests are one-half the absolute value of the 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.

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:

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

where,

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

P_i = average of the three predicted test weight per bushel values for sample i

n = number of samples (n=12)

Tolerances for repeatability are 0.4 x the absolute value of the Handbook 44 acceptance tolerance. Specific tolerances are:

Grain Type	Tolerance
Corn, oats	0.32 pounds per bushel
All wheat classes	0.20 pounds per bushel
Soybeans, barley, rice, sunflower, sorghum	0.28 pounds per bushel

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:

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

where,

d_i = P_{1i} -P_{2i}

P_{1i}= average of three replicates for sample i on instrument 1

P_{2i}= average of three replicates for sample i on instrument 2

d = average of the d_i

n = number of samples (n=12)

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

C. Tolerances for Test Weight per Bushel Calibration Performance:

Test weight per bushel calibration performance must be tested against established criteria at the following stages of the type evaluation process:

1. Evaluation of the calibration data supplied by the manufacturer with the application for type evaluation.

2. Evaluating instrument and calibration performance for all grain types for which the meter has (or will have) a moisture calibration with a pending or higher status (accuracy test discussed earlier).

3. Review of on-going test weight per bushel calibration data collected as part of the national moisture calibration program.

Calibrations will be approved based upon type evaluation testing over the moisture and test weight per bushel ranges specified in §VII.B.

Tolerances used to require a change in calibrations will include the application of a 95 percent confidence interval to the maximum tolerance. The intent of applying the confidence interval is to avoid forcing a calibration change based upon insufficient data. After only one year of data collection, the number of samples will be small and the confidence interval may be as large as the tolerance limit. In this instance, the calibration would have to be extremely poor before a calibration change would be mandated. After the instrument has been in the calibration program for several years, the confidence interval will be smaller and recommendations can be made with greater certainty. The latest three years of data will be used to make decisions regarding the need to make a calibration update.

The status of all test weight per bushel calibrations will be listed on the certificate of conformance. The categories are (1) approved, (2) pending, and (3) not available. The categories are described as follows:

Approved: This category applies only to test weight per bushel measurements in the 6 % moisture ranges specified in §VII.B. Calibrations will be approved based upon the tests specified in §VII. Continued approval requires acceptable performance as part of the ongoing national calibration effort (i.e., none of the average differences between predicted and reference values for the 6 % moisture interval and the test weight per bushel range specified in §VII.B. exceeds one-half the Handbook 44 acceptance tolerance plus a 95 % confidence interval, and the slope of test weight per bushel error with respect to the reference values for test weight per bushel shall not be significant at a 95 % confidence level over the 6 % moisture range).

ending: This category applies to test weight per bushel measurements outside the 6 % moisture ranges specified in §VII.B, but within the moisture range for which the meter has a pending or higher moisture calibration category (typically the operating moisture range of the device). To maintain a pending test weight per bushel classification range, the calibrations must meet the requirements stated above for approval in the 6 % ranges of §VII.B, and the slope of test weight per bushel error with respect to percent moisture content shall not be significant at a 95 % confidence level over the approved and pending moisture range of the device. Pending test weight per bushel calibrations may be used on NTEP devices.

Not Available: A test weight per bushel calibration is not available for this grain included in the national calibration program. A calibration for test weight per bushel for this grain type shall not be used on NTEP approved meters.

1.(d) Additional Test Weight per Bushel Criteria for Section 5.56(a) of Handbook 44

Discussion: It was brought to the attention of the Publication 14 TW Subcommittee that although moisture measurements are not significantly affected when samples are not of sufficient size to completely fill the measuring cell of the meters, the TW measurement is greatly affected when the cell is not filled. Measurement of TW requires determination of two parameters: volume and mass. Meters measuring TW should provide some means to ensure that measurements of TW are not allowed to be displayed or printed when insufficient sample volume has been supplied.

Decision: The Sector agreed to change or amend the following paragraphs of the developmental GMM Code to address this and other TW issues. [Note: Additions associated with this issue are indicated by double underline to differentiate them from the additions originally proposed. Deletions to the existing code and the previously proposed developmental code are both indicated by a strikeout line.]

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

S.1.1. Digital Indications and Recording Elements.

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

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

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

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

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

(c) Moisture Range of the Grain or Seed

The moisture range for each grain or seed for which the meter is to be used shall be specified. ~~A moisture~~ Moisture and test weight per bushel values may be displayed when the moisture range is exceeded if accompanied by a clear indication that the moisture range has been exceeded.

~~(e) Test Weight per Bushel Range of the Grain or Seed~~

~~The test weight per bushel range for each grain or seed for which the meter is to be used shall be specified. A test weight per bushel value may be displayed when the test weight per bushel range is exceeded if accompanied by a clear indication that the test weight per bushel range has been exceeded.~~

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

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

(Added 1993)(Amended 1995)

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

(Added 1994)(Amended 1995, 2000)

S.4. Operating Instructions and Use Limitations. - The manufacturer shall furnish operating instructions for the device and accessories that include complete information concerning the accuracy, sensitivity, and use of accessory equipment necessary in obtaining a moisture content. Operating instructions shall include the following information:

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

(e) the limitations of use, including but not confined to the moisture measurement range, ~~the moisture range applicable to test weight per bushel measurements, test weight per bushel 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)

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

(Amended 1992)

N.1.2. Minimum Test.[1]- A minimum test of a grain moisture meter shall consist of tests with samples of each grain or seed type (need not exceed three) for which the device is used, and for each grain or seed type shall include the following:

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

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

(Amended 1986 and 1989)

T.2. Tolerance Values. - Maintenance and acceptance tolerances shall be as shown in Table T.2. Tolerances for moisture measurements are expressed as a fraction of the percent moisture content of the official grain sample, together with a minimum tolerance. Tolerances for test weight per bushel are (+) positive or (-) negative with respect to the value assigned to the official grain sample.

~~**T.3. For Test Weight Per Bushel Indications or Recorded Representations.** - The maintenance and acceptance tolerances on test weight per bushel indications or recorded representations shall be 0.193 kg/hL or 0.15 lb/bu. The test methods used shall be those specified by the USDA GIPSA.~~

~~(Amended 1992)~~

Table T.2. Acceptance and Maintenance Tolerances for Grain Moisture Meters		
Moisture		
Type of Grain or Seed	Acceptance and Maintenance	Minimum Tolerance

	Tolerance	
Corn, oats, rice, sorghum, sunflower	0.05 of the percent moisture content	0.8 percent in moisture content
All other cereal grains and oil seeds	0.04 of the percent moisture content	0.7 percent in moisture content

Test Weight per Bushel	
Type of Grain or Seed	Acceptance and Maintenance Tolerance
Corn, oats	0.8 pounds per bushel
All wheat classes	0.5 pounds per bushel
Soybeans, barley, ~~oats,~~ rice, sunflower, sorghum	0.7 pounds per bushel

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

UR.3.4. Printed Tickets.

(b) The customer shall be given a printed ticket showing the date, grain type, grain moisture results, test weight per bushel, and calibration version identification. The ticket shall be generated by the grain moisture meter system.
(Amended 1993 and 1995)

UR.3.10. Posting of Meter Operating Range. - The operating range of the grain moisture meter shall be clearly and conspicuously posted in the place of business such that the information is readily visible from a reasonable customer position. The posted information shall include the following:

(b) The moisture range ~~and test weight per bushel range~~ for each grain or seed for which the meter is to be used.

2. Review of EPO's and Test Procedures for the field evaluation of GMM devices

Background: At the March 1998 GMM/NIR Sector meetings three working groups were established to develop Examination Procedure Outlines (EPO's) and Field Evaluation Test Procedures for GMM and NIR devices to provide guidance to States on implementing NIST HB 44 as it applies to these devices. The groups were assigned the following development tasks:

Group 1- EPO XXX for Grain Moisture Meters and NIST HB 44 Recommended Field Evaluation Test Procedures for Grain Moisture Meters, Whole Grain Sample Method.

Group 2 - EPO XXX for Near Infrared Grain Analyzers and Appendix A of EPO XXX, NIST HB 44 Recommended Field Evaluation Test Procedures for Near Infrared Analyzers.

Group 3 - Appendix B, Alternative Field Evaluation Test Procedures for Grain Moisture Meters, Meter to Meter Method.

Templates were developed to assist the working groups with their assignments in documenting the EPO's and field evaluation test procedures. The output of the working groups was reviewed at the Sector's September 1999 meeting.

Regarding the EPO's, the Sector noted:

1. Several of the items in the check list are specifications which can be verified only during NTEP conformance testing.
2. The organization of items is confusing. It was suggested that items common to both Sec. 5.56.(a) and Sec.5.56.(b) of the code be placed in a section listing requirements applicable to all GMMs regardless of date of manufacture. Also, some of the items listed from the General Code are covered in detail in the GMM Code. In these cases, the GMM Code takes precedence, and the General Code need not be repeated.
3. Reference is made to NTEP and non-NTEP meters, but the requirement that the "NTEP" requirements are applicable to any GMM manufactured or placed in service after January 1, 1998.
4. The Scope section should be expanded to include what is being evaluated when using the Test Procedures of Appendix A vs. Appendix B (e.g., Appendix B, Meter to Like Meter - hardware check).

Regarding the Test Procedures, the Sector noted:

1. Editing is needed to achieve consistency between the procedures.
2. If alternative procedures are available, the Scope section of each procedure should describe the situation that would lead to the choice of that particular procedure.
3. Equipment lists should contain only those items necessary to perform the field test described by the procedure.
4. The subtitle of Appendix A, "Whole Grain Sample Method" is not sufficiently descriptive (Appendix B also uses "whole grain samples"). Alternate suggestions: "Oven Reference Method Using Grain Samples as

Transfer Standards" or, simply, "Oven Reference Method."

Discussion: Revised drafts of the Grain Moisture Meter (GMM) Field Evaluation Test Procedures for the air oven reference method and the meter to meter method were distributed for review. The latest draft of the GMM EPO was not available at the meeting. It will be distributed with the Sector's Meeting Summary. Because of time limitations, only the meter to meter method was reviewed in detail. Don Onwiler, Nebraska Dept. of Agriculture, Weights & Measures Division, requested that the Scope be modified to also address non-NTEP meter to meter testing. The Sector acknowledged that States electing to use the meter to like-meter method for field testing for NTEP meters would be unlikely to use a different method for non-NTEP meters. Because meter to like-meter testing verifies only device function, it was pointed out that the State would have to have to establish the validity of calibrations on non-NTEP meters. There was concern that States would not be able to utilize a large enough set of samples to adequately establish calibration validity or uniformity with NTEP meters over the full range of moistures.

Decision: To address meter to like-meter testing of non-NTEP meters, the Sector agreed to modify paragraph 1.1. of the Draft Test Procedure:

> 1.1 This procedure is applicable to the field evaluation of commercial grain moisture meters by means of standard meters of like type calibrated to factory specifications. Use of this procedure will provide information that the meter is functioning properly (functioning similarly to the like-meter that is used as the standard meter) and verification that the correct calibrations are in use. This procedure is an alternate procedure applicable to meters of the same types as those in the NTEP Phase II Ongoing Calibration Maintenance Program where the accuracy of moisture calibrations have been verified with a National Sample Set traceable to the official air oven reference method. <u>States wishing to apply this test procedure to non-NTEP meters of like type must establish the validity of the calibrations over the full range of moistures.</u>

In addition to a number of editorial revisions, the Sector also approved the following significant changes to the draft:

- Change title to read:
  Field Evaluation and Laboratory Test Procedures for Grain Moisture Meters (GMM)
  Meter to Meter Method
- Remove all references to "one pint" as the sample quantity.
- Change the storage temperature range in paragraph 4.1 from "1 ° to 3 ° Celsius" to "2 ° to 7 °Celsius."
- Re-write/re-organize paragraphs 5.4.1 and 5.4.2 to stress that the comparison is between lab standard meters and field standard meters of like type. Don Onwiler is to provide Diane Lee with details of these steps.
- In Table B.2., change the minimum number of drops for all other cereal grains and oil seeds from 2 to 3.

2. b) Proposed Changes to Handbook 44 - Addition of Tolerances for Meter to Like-Meter Testing and Removal of Footnote 1.

Background/Discussion: During the discussion of the Field Test Procedure for the meter to like-meter method, Don Onwiler proposed that the tolerances for the meter to like-meter method be added to both §5.56(a) [applicable to NTEP meters] and §5.56(b) [applicable to non-NTEP meters] of Handbook 44. He also proposed that footnote 1(to paragraphs N.1.1. Transfer Standards and N.1.2. Minimum Test) describing the GIPSA meter to meter method be removed from those sections of the code. Although Sector members were in agreement to the removal of footnote 1, most voiced strong objections to adding the meter to like-meter tolerance to part (b) of the code. It was pointed out that mandatory participation of NTEP meters in the ongoing calibration review program assured that calibrations used on NTEP meters (including the GIPSA official meter) would be validated annually against the air oven using the same sample set, thus assuring uniformity between meters of different make and manufacture. With this program in place to prove the validity of calibrations and uniformity across models, meter to like-meter comparison is a legitimate and effective method of determining in the field if meters are functioning properly. The safeguard of on-going calibration review on a very large national sample set is not present with non-NTEP meters, thus uniformity across models cannot be assured.

Decision: The Sector was unanimous in recommending that footnote 1 be removed from both §5.56(a) [applicable to NTEP meters] and §5.56(b) [applicable to non-NTEP meters] of Handbook 44. By a vote of 9 to 3 the Sector rejected the proposal to add tolerances for meter to like-meter testing to both sections of the code. Subsequently, the Sector agreed unanimously to recommended that language be developed to add the meter to like-meter testing method to §5.56(a) with the tolerances shown below.

Note 1: The specific language for amending §5.56(a) to include the meter to like-meter testing method was not available for Sector review at this meeting. The specific language will be the subject of a letter ballot which will be sent to Sector members in early October so responses will be received in time to forward the proposal to the S&T Committee for placement on the NCWM Interim Meeting Agenda.

Table T.2.2. Acceptance and Maintenance Tolerances Meter to Like-Type Meter Method	
Sample Reference Moisture	**Tolerance**
Up to 22 %	0.5 percent in moisture content

Note 2: Don Onwiler informed the Sector that he intended to submit a proposal to the Central Weights and Measures Association (CWMA) recommending that both §5.56(a) [applicable to NTEP meters] and §5.56(b) [applicable to non-NTEP meters] of Handbook 44 be amended to include the meter to like-meter testing method. At their interim meeting, held September 11-14, 2000, in Bettendorf, IA, the CWMA agreed to forward the proposal to the S&T Committee for inclusion on the NCWM Meeting Agenda.

3. Update on Type Evaluation and Phase II Testing

Background/Discussion: Rich Pierce of the Grain Inspection, Processors and Stockyards Administration (GIPSA, formerly FGIS), the NTEP Participating Laboratory for Grain Moisture Meters, reported on the progress of Type Evaluations and the collection and analysis of OCP (Phase II) data on the 1999 crop. The program is now beginning its sixth year. Certificates based on 1999 data have been drafted and sent to manufacturers for review. Six models participated in the ongoing calibration review program (Phase II) for 1999. Although Foss has chosen not to re-enroll the GrainSpec A in the program, the addition of the Foss Infratec 1241, as a new type, means that there will still be six models in the program for the 2000 harvest year. The cost to manufacturers will be $5,250 per type. Models enrolled for the 2000 harvest include:

DICKEY-john	GAC-2000NTEP Version/GAC-2100/GAC 2100a
Foss	Infratec 1227/ Infratec 1229
Foss	Infratec 1241
Motomco	919E/919ES
Seedburo	GMA-128
Steinlite	SL95

4. Proposed Change to Publication 14 - GMM Check List, Calibration Integrity, Paragraph 4.5.2

Background/Discussion : At its March 1997 meeting, the Sector proposed revisions to paragraph S.2.4.3 of Grain Moisture Meter Code 5.56(a) to make it clear that calibrations must be transferable between instruments of like type **without** requiring user slope or bias adjustments. The proposed revisions were also intended to clarify the difference between standardization adjustments (or parameters) and grain calibration coefficients. These recommendations were adopted by the by the NCWM at their 1998 Annual meeting and were made nonretroactive and effective as of of January 1, 1999. Through an oversight, the GMM checklist in Publication 14 was not updated to reflect adoption by the Conference of the Sector's recommendation.

Decision: To reflect the above change to Handbook 44, revise paragraph 4.5.2 of the GMM Check List in Publication 14 as shown below:

4.5.2.	The instrument hardware/software design and calibration procedures permit calibration development and ~~mathematical~~ transfer of calibrations between instruments of like models <u>without requiring user slope or bias adjustments</u>.	**Yes** ☐ **No** ☐ **NA** ☐

5. Status of NTEP Meters in the Field - Review of Data from State Inspections

Background: At previous Sector meetings, the issues of: 1) the States becoming more involved with NTEP, and 2) obtaining objective evidence that NTEP and the OCP are working, have been discussed. To address these issues,

several States have offered to provide summaries of their field inspection data from the inspection of NTEP Grain Moisture Meters (both dielectric and near infrared technology) to NIST. At the September 1999 Sector meeting, Diane Lee, NIST, reported on results received from Arkansas, Maryland, Illinois, and North Carolina. The Sector was encouraged by the results which show significant improvement compared to baseline data collected several years ago (see chart below).

Moisture Interval % moisture	Average Difference Between NTEP Meters and Air Oven All Data from Field Inspections Prior to 1999 Harvest in AR, MD, IL, & NC (% moisture content / SDD)									
	n	CORN	n	SOYBEAN	n	SOFT RED WINTER WHEAT	n	SORGHUM	n	BARLEY
10 - 12	0	no data	8	-0.20 / 0.22	0	no data	0	no data	0	no data
12 - 14	2	0.59 / 0.01	40	-0.03 / 0.19	36	-0.31 / 0.33	0	no data	0	no data
14 - 16	50	0.07 / 0.34	49	-0.10 / 0.22	31	-0.21 / 0.24	4	-0.26 / 0.09	12	0.20 / 0.15
16 - 18	52	-0.09 / 0.27	12	-0.35 / 0.29	40	0.05 / 0.27	0	no data	0	no data
18 - 20	51	-0.16/0.33	0	no data	0	no data	0	no data	0	no data

n = number of meters

Update: A request for data obtained from annual field inspections for the 2000 harvest season was sent May 8, 2000, to all state labs with grain moisture programs. As of the Sector meeting, data had been received from only three states: Illinois, Missouri, and Maryland. Data will be tabulated when reports have been received from additional states.

6. Inspection Problems Arising from "Cross-Utilized" (Federal/Commercial) Moisture Meters

Background/Discussion: GIPSA has initiated a program whereby elevator or official agency owned instruments can be "cross-utilized" between official inspection and commercial applications. Problems have arisen when such meters fail State inspections (against air oven) after recently being tested and passed by GIPSA (using a meter-to-like meter check test). This problem first arose in Illinois. GIPSA and Illinois W&M officials have developed procedures for addressing problems caused by overlap in their two field examination procedures. Dave Funk, GIPSA, reviewed the procedures for the Sector. Key steps include: The state was provided with a list of meters which were being cross-utilized (and their locations.) When a cross-utilized meter is tested and approved by GIPSA in accordance with procedures in the GIPSA Moisture Handbook, that meter is approved for inspection. If it subsequently fails the state test, it will be re-tested using a different set of grain samples. If the second test passes, the meter will receive a state approval sticker. If it fails the second test, the state will contact GIPSA and both agencies will share and review pertinent information. GIPSA will then perform a second check test. If the meter fails the second GIPSA check test, it will be sent for repair. If the meter passes the second check test, GIPSA will request from the state agency the samples used in the state's second test. To be acceptable for testing cross-utilized meters, the magnitude of the difference between the average of the standard meters and the air oven result should be no greater that the state tolerance minus 0.2 % moisture. If the samples do not meet this criteria, the state will repeat the test using valid samples. If the samples are found to be valid, the meter is returned to the manufacturer. If the meter is found to be out of tolerance, it will be repaired. If in tolerance, the state, GIPSA, and the manufacturer will jointly investigate the discrepancy. The meter will be re-inspected by both agencies after the situation is resolved.

7. Intercomparison of Air Oven Moistures Between GIPSA, the States, and Manufacturers

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-OWM'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 1995 harvest. Results of that study were reported at the March 1996 Sector meeting. In that study, three corn samples, three soybean samples, and two wheat samples were sent to each of 37 participants (the NTEP laboratory, Iowa State University, 13 state metrology laboratories, 7 manufacturers, and 15 Iowa NIR Network Elevators.) Participants were asked to measure these samples on whatever moisture meters were available at their location, and if they had oven capability to also make oven moisture determinations on the samples. The NTEP laboratory (GIPSA) reported air oven results for all three grains while 21 labs reported oven results for corn, and 17 labs reported oven results for soybeans and wheat.

Discussion: 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. On the other hand, sample preparation and distribution are more costly for a collaborative study. The Sector is asked to consider the following:

- Should the another collaborative air-oven study be conducted?
- If so, when should it be conducted?
- How many grain types should be involved?
- Who will provide the samples and act as "pivot" lab?
- Who will act as referee?
- What is the projected cost of a collaborative study?
- Who will pay for the study?
- How often should collaborative studies be conducted?

Decision: Because of time limitations, this item was not discussed. It will be carried over to the Sector's next meeting.

8. Criteria for Like Type

Background: A National Type Evaluation Program (NTEP) Certificate of Conformance (CC) represents conformance of a designated model (or models) to a single type or pattern. NCWM Publication 14 defines "Type" as:

> A model or models of a particular measurement system, instrument, element or a field standard that positively identifies the design. A specific type may vary in its measurement ranges, size, performance, and operating characteristics as specified in the Certificate of Conformance.

When a manufacturer introduces a new model which is similar to a type for which a CC has been issued, a decision must be made as to whether the new device is subject to a full evaluation, or whether it can be considered as a "like type" to the existing unit and thus eligible to be added to the existing CC without testing. Publication 14, offers the following guidelines for making this decision:

> 1. Superficial Differences Between Devices
> Types that are identical in design, materials, and components used, and measurement ranges, but that differ superficially in their enclosures, detailed size, color, or location of non-metrological appointments (function lights, display location, operational key locations, etc.) will usually be submitted to a single evaluation.
>
> 2. Component Variations
> Types produced by the same manufacturer with nominally identical components or materials procured from different suppliers can usually be regarded as the same type. They will be covered by a single evaluation if the different components or materials are not likely to affect the regulated metrological characteristics, reliability, or life of the types.
>
> If changes in components or materials are likely to affect the performance or operational characteristics of a device, separate evaluations will generally be required. A type is considered MODIFIED if a change alters a metrological or technical characteristic.

Discussion: Dr. Charles Hurburgh, Jr., Iowa State University - Agricultural Extension Service, has requested a discussion of the following questions:

- What constitutes like type (the criteria for being like type) for NTEP CC purposes?
- If data from non-like type devices (or non-approved and approved devices) is combined into a new calibration, how would GIPSA, NTEP, and State Weights and Measures officials treat the new calibration? (E.g., Is the new calibration permissible if it passes the tests?)
- Is the Official GIPSA system bound by the same definitions of like type as NTEP? (E.g., Will the Official system consider instruments equal and interchangeable even if NTEP has separate CCs because they were judged not to be of like type?)

He reports that these questions arise from the recent introduction of modifications to NIR instruments that may make them not of like type, even though they use the same calibrations or use a calibration derived from a database containing data from both original and modified instruments. The trend to worldwide neural networks and local regression databases may result in the development of calibrations based on data from instruments that are not of like type. He cited the new 1241 Infratec, submitted as a separate unit from the Infratec 1227 and 1229 units (which have been issued a separate CC) as a case in point. He is of the belief that a policy is needed here that is protective but not restrictive of technology.

Decision: Because of time limitations, this item was not discussed. It will be carried over to the Sector's next meeting.

9. Update on NTEP Transition Activities and NIST/OWM Personnel Changes

Background/Discussion: The NCWM was incorporated in August 1997 to protect them from liability in various NCWM activities. NCWM, Inc., is now assuming many of the NCWM business and administrative functions previously performed by NIST. By October 1, 2000, all administrative duties associated with NTEP are scheduled to be turned over to NCWM, Inc. Diane Lee, NIST, reported that OWM and NCWM had established the following schedule for specific activities related to processing Certificates of Conformance (CCs) during the transition period: All type-evaluated devices that meet NIST Handbook 44 requirements will ultimately receive NTEP CCs. NTEP CCs issued prior to October 1 will be issued as NIST NTEP CCs. CCs issued on or after October 1 will be issued as NCWM NTEP CCs. Until October 1, NIST will continue to issue CC numbers for devices that have been evaluated and found to comply with the NTEP criteria to allow the NTEP CCs to become effective. NCWM will continue this practice after October 1. However, many of the CCs for devices for which NIST issues CC numbers will be issued as NCWM CCs since these CCs may not be finalized prior to October 1. Draft CCs and applications for paper updates received at NIST before August 1 will result in CCs issued by NIST. Draft CCs and applications for paper updates received at NIST between August 1 and August 31 may not be finalized by October 1 and may be issued as NCWM NTEP CCs. NIST will process as many CCs as possible prior to October 1. Applications for devices requiring testing received at NIST prior to September 1 will be processed by NIST. CCs for these devices may not be finalized prior to October 1 in which case they will be issued as NCWM NTEP CCs. 3. Beginning September 1, all NTEP applications should be sent to NCWM Headquarters at:

National Conference on Weights and Measures
15245 Shady Grove Road - Suite 130
Rockville, Maryland 20850-3222

Telephone: (240) 632-9454
Fax: (301) 990-9771

The application fee charged by NCWM will be the same as that currently charged by NIST ($690). NCWM accepts payment by check (made out to NCWM, Inc.) or payment with Visa, MasterCard, and American Express credit cards. NCWM does not accept purchase order numbers. Applications received at NIST on or after September 1 will be returned to the company for re-submission directly to NCWM.

NTEP CCs resulting from these applications will receive NCWM CCs. On and after October 1, All CCs will be issued by NCWM as NCWM NTEP CCs. All current, open applications will be transferred to NCWM for final processing on September 29 (October 1 falls on a Sunday). Necessary steps will be taken to protect proprietary information. Applications for which testing is still in process as of October 1 will continue through the already established NTEP process under the management of NCWM. CCs resulting from successful testing of these devices will be issued as NCWM NTEP CCs.

Regarding NIST/OWM Personnel Changes, Ms. Lee reported that Gil Ugiansky, formerly Chief of the Office of Weights and Measures (OWM), has been promoted to the position of Deputy Director, Office of Management Services. Henry Oppermann has replaced him as Chief of OWM. Long time Sector members will remember that Henry was an active participant in the Sector's early days. The Sector welcomes Henry back to OWM. Ms. Lee also reported that Stephen Patoray has been hired by NCWM to serve as NTEP Director. He will be attending future Sector meetings as the NCWM/NTEP representative.

10. Report on the 2000 NCWM Interim and Annual Meetings

Background/Discussion: The 2000 NCWM Interim meeting was held January 18-23 in Bethesda, MD. The annual meeting was held July 16-20 in Richmond, VA. Diane Lee reported on action taken at these meetings on issues of interest to the Sector.

- **S&T Item 360-3 (App. E) -** The GMM Sector's proposal to **Modify the Grain Moisture Meters Code to Recognize Indications and Recorded Representations in Weight per Bushel** was accepted by the S&T Committee as a developing issue. Developing issues have not received sufficient review by all parties affected by the proposals or may be insufficiently developed, they are not ready for review by the NCWM S&T Committee. They are published to disseminate information about emerging issues which have merit and are of national interest.

11. Time and Place for Next Meeting

The next meeting is tentatively planned for the week of August 20, 2001 in the Kansas City, MO area. Meetings will be held in the either the conference facility at the GIPSA Tech Center or in one of the meeting rooms at the NOAA Weather Training Center. A tentative schedule is shown below.

Wednesday, August 22	1:00 p.m. - 5:00 p.m.	GMM Sector Meeting
Thursday, August 23	8:00 a.m.- 3:00 p.m.	GMM Sector Meeting
Thursday, August 23	3:00 p.m. - 5:00 p.m.	Joint session GMM & NIR Analyzer
Friday, August 24	8:00 a.m. - 12:00 noon	NIR Grain Analyzer Sector Meeting

The above schedule is subject to change pending confirmation of funding availability and determination of final agenda issues. Sector members and interested parties are asked to try to keep that week open until firm dates have been set.

Attendance List
Grain Moisture Meter & NIR Protein Analyzer Sector Meetings
August 23-25, 2000, Kansas City, MO

Name & Affiliation	Address	Phone, Fax, E-Mail	August		
			23	24	25
Jack Barber JB Associates	10349 Old Indian Trail Glenarm, IL 62536	Phone: 217-483-4232 Fax: 217-483-3712 E-mail: jbarber@cityscape.net	x	x	x
Connie Brown DICKEY-john Corp.	5200 DICKEY-john Road P.O. Box 10 Auburn, IL 62615	Phone: 217-438-3371 Fax: 217-438-6157 E-mail: CBrown@dickey-john.com	x	x	x
Randy Burns Arkansas Bureau of Standards	4608 West 61st Street Little Rock, AR 72209	Phone: 501-570-1153 Fax: 501-562-7605 E-mail: BurnsR@aspb.state.ar.us	x	x	x
Marty Clements Steinlite Corporation	121 N. 4th Street Atchison, KS 66002	Phone: 913-367-3945 Fax: 913-367-4523 E-mail: clements@steinlite.com	x	x	
Cassie Eigenmann Pierson DICKEY-john Corp.	5200 DICKEY-john Road P.O. Box 10 Auburn, IL 62615	Phone: 217-438-3371 Fax: 217-438-6157 E-mail: ceigenmann@dickey-john.com	x	x	x
Arnold Eilert Bran+Luebbe	1025 Busch Parkway Buffalo Grove, IL 60089-4516	Phone: 847-520-0700 Fax: 847-520-0855 E-mail: eilert@branluebbe.com	x	x	x
Andrew Gell Foss North America	11 Edvac Drive - Unit #10 Brampton, Ontario L6S 5W5 Canada	Phone: 905-793-6440 Fax: 905-793-6719 E-mail: agell@fossnorthamerica.com	x	x	x
Rich Flaugh GSF Inc.	5225 NW Beaver Drive Johnston, IA 50131	Phone: 515-727-1419 Fax: 515-727-1423 E-mail: richf@gsfinc.com	x	x	
David Funk GIPSA	10383 N. Executive Hills Blvd. Kansas City, MO 64153-1394	Phone: 816-891-0430 Fax: 816-891-8070 E-mail: dfunk@gipsakc.usda.gov	x	x	x
Charles Hurburgh, Jr. Iowa State University Agricultural Engineering Dept.	1541 Food Sciences Building Ames, IA 50011-1061	Phone: 515-294-8629 Fax: 515-294-6383 E-mail: tatry@iastate.edu	x	x	x
David Krejci Grain Elevator & Processing Society	P.O. Box 15026 Minneapolis, MN 55415-0026	Phone: 612-339-4625 Fax: 612-339-4644 E-mail: david@geaps.com	x	x	x
G. Diane Lee Natl. Institute of Stds. & Technology, Office of Weights and Measures	100 Bureau Drive, Stop 2350 Gaithersburg, MD 20899-2350	Phone: 301-975-4405 Fax: 301-926-0647 E-mail: diane.lee@nist.gov	x	x	x

Attendance List
Grain Moisture Meter & NIR Protein Analyzer Sector Meetings
August 23-25, 2000, Kansas City, MO

Name & Affiliation	Address	Phone, Fax, E-Mail	August		
			23	24	25
Tom O'Connor National Grain & Feed Association	1250 I St. NW Suite 1003 Washington, DC 20005	Phone: 202-289-0873 Fax: 202-289-5388 E-mail: toconnor@ngfa.org	x	x	x
Don Onwiler Nebraska Dept. of Agriculture, Weights & Measures Division	301 Centennial Mall South P.O. Box 94757 Lincoln, NE 68509	Phone: 402-471-4292 Fax:: 402-471-2759 E-mail: donlo@agr.state.ne.us	x	x	x
Richard Pierce Grain Inspection, Packers and Stockyards Administration	10383 N. Executive Hills Blvd. Kansas City, MO 64153-1394	Phone: 816-891-0449 Fax: 816-891-8070 E-mail: rpierce@gipsakc.usda.gov	x	x	x
James Rampton Grain Inspection, Packers and Stockyards Administration	10383 N. Executive Hills Blvd. Kansas City, MO 64153-1394	Phone: 816-891-0450 Fax: 816-891-8070 E-mail: jrampton@gipsakc.usda.gov	x	x	
Joe Rothleder California Department of Food & Agriculture	8500 Fruitridge Road Sacramento, CA 95826	Phone: 916-229-3022 Fax: 916-229-3026 E-mail: JRothleder@cdfa.ca.gov	x	x	x
Tom Runyon Seedburo Equipment Co.	1022 West Jackson Chicago, IL 60607-2990	Phone: 312-738-3700 Fax: 312-738-3544 E-mail: trunyon@seedburo.com	x	x	
Cheryl Tew North Carolina Dept. of Agriculture & Consumer Services, Stds Division	NCDA, Standards Division PO Box 27647 Raleigh, NC 27611	Phone: 919-733-4411 Fax: 919-733-8804 E-mail: Cheryl.Tew@ncmail.net	x	x	x
Robert Wittenberger Missouri Dept. of Agriculture Div. of Weights & Measures	P.O. Box 630 Jefferson City, MO 65102	Phone: 573-751-3440 Fax: 573-751-0281 E-mail: bob_wittenberger @mail.mda.state.mo.us	x	x	x
Will Wotthlie Maryland Department of Agriculture Weights & Measures Section	50 Harry S. Truman Parkway Annapolis, MD 21401	Phone: 410-841-5790 Fax: 410-841-2765 E-mail: wotthlrw@mda.state.md.us	x	x	x

National Type Evaluation Technical Committee (NTETC)
Grain Moisture Meter (GMM) Sector
August 22-23, 2001 - Kansas City, MO

Meeting Summary

Agenda Items

☆ 1. New Sector Chairman Appointed by NCWM, Inc.
☆ 2. Report on NCWM, Inc.
   a) Plans to Reduce Number of State Public Sector Members Eligible for Travel Reimbursement
   b) Registration Fees for Non-NCWM Members Attending Sector Meetings
3. Report on Proposed Revisions to OIML IR 59 "Moisture Meters for Cereal Grains and Oilseeds"
4. Update on Field Evaluation of Proposed Test Weight per Bushel Tolerances
5. Review Latest Draft of Evaluation Procedure Outline (EPO) and Test Procedures for the Field Evaluation of NTEP GMM Devices (air-oven method)
6. Review Results of Air-Oven Collaborative Study
☆ 7. Criteria for Like Type
8. Report on the 2001 NCWM Interim and Annual Meetings
9. Update on NTEP Type Evaluation and OCP (Phase II) Testing
10. Definitions of Recently Introduced Terms
☆ 11. Time and Place for Next Meeting

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

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1. New Sector Chairman Appointed by NCWM, Inc.

In late March 2001, Richard "Will" Wotthlie asked to be replaced as Chairman of the NTETC Grain Moisture Meter and Near Infrared Protein Analyzer Sectors. Diane Lee, representing NIST/OWM and Jack Barber, Sector Technical Advisor, recommended Cassie Eigenmann-Pierson for this post. Subsequently, Wes Diggs, who at the time was Chairman of the NTEP Committee, sent Cassie a formal letter of appointment. Steve Patoray, NTEP Director, explained to the Sector that since the transfer of the National Type Evaluation Program (NTEP) from NIST OWM to the NCWM, Inc., NCWM administrative procedures have been revised. The new procedures stipulate that NTETC Sector Chairs are appointed by the NTEP committee chair and serve for an indefinite term. At the 2001 Annual Meeting of NCWM, Inc., Louis Straub, Maryland Department of Agriculture, became the new NTEP committee chair.

2. Report on NCWM, Inc.

2.a. Plans to Reduce Number of NTETC State Public Sector Members Eligible for Travel Reimbursement

At a recent NCWM, Inc. NTEP Lab meeting, Lou Straub reported that NCWM, Inc., as a cost reduction measure, plans to limit the number of NTETC State public sector members that will be reimbursed for travel expenses incurred in connection with participation in Sector meetings. Present State public sector members may continue as voting GMM/NIR Sector members, but reimbursement for travel expenses will be limited to two or three people per meeting.

2.b. Registration Fees for Non-NCWM Members Attending Sector Meetings

NCWM, Inc is now charging a $75.00 registration fee to all non-NCWM members who attend a Sector meeting.

Steve Patoray, NTEP Director, reminded the Sector that the NCWM is now incorporated and should be referred to as NCWM, Inc. He explained that annual maintenance fees on Certificates of Conformance (CCs) are the main source

of funding for Sector meetings, training, etc. These funds are limited. The need to keep expenditures in line with income is the driving force behind the changes mentioned in agenda items 2.a. and 2.b.
Mr. Patoray explained how the National Type Evaluation Program is administered. NCWM, Inc. now issues all certificates of conformance. The NCWM, Inc. Board of Directors is the policy-making body of NCWM, holding responsibility for the overall operation of the organization. Additionally, an ad *hoc* committee, called the NTEP Advisory Committee, advises the NTEP Committee, making recommendations on policy and long range planning. The NTEP Committee is responsible for the operation of NTEP. It ratifies NTEP policy and procedures; resolves policy, technical and appeals issues; sponsors technical subcommittees (NTETC Sectors) to develop technical test procedures and evaluation criteria; and it oversees the activities of the NTEP Director. NCWM, Inc. has no paid employees. They have hired a management company, Management Solutions, to handle administrative details. Mr. Patoray is employed by Management Solutions and serves as NTEP Director. The NTEP Director is responsible for the day-to-day management of NTEP. His duties include: reviewing Sector agendas before they are distributed; recommending procedures developed by Sectors; training NTEP evaluators; authorization of NTEP Labs; reviewing and recommending CC's; and managing conformity assessment.

The NTEP Sector meetings are open to all NCWM members and to registered non-members. Issues before the Sector are decided by general consensus or by formal vote. Voting rights depend on the type of NCWM membership held by the individual. These are summarized below:

- Associate Membership (Industry, Association and Academic members):
  - one vote per parent company/organization/institution
- Active Membership (State and Municipal members)
  - one vote per jurisdiction
- NCWM non-member:
  - no voting rights
  - nominal registration fee per meeting
- Federal Agencies (other than NIST):
  - one vote per agency, if they choose
- NIST/OWM:
  - one vote per agency, if they choose
- Foreign Agencies:
  - no voting rights

Mr. Patoray reported that all active CC's are now available for downloading from the NCWM, Inc. web site: http://www.ncwm.net. Information on the current NTEP fee structure can also be found on the web site.

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

Background:

[Additional information on OIML, can be found at the OIML web site http://www.oiml.org.]
The International Organization of Legal Metrology (OIML) was established in 1955 in order to promote the global harmonization of legal metrology procedures. Since that time, OIML has developed a worldwide technical structure that provides its Members with metrological guidelines for the elaboration of national and regional requirements concerning the manufacture and use of measuring instruments for legal metrology applications. OIML is an intergovernmental treaty organization whose membership includes Member States, countries that participate actively in technical activities, and Corresponding Members, countries that join OIML as observers. OIML develops model regulations, International Recommendations (identified as an IR or R and an associated number, i.e., R 60), which provide Members with an internationally agreed-upon basis for the establishment of national legislation on various categories of measuring instruments. Given the increasing international implementation of OIML guidelines, more and more manufacturers are referring to OIML International Recommendations to ensure that their products meet international specifications for metrological performance and testing.

An international consensus in the legal metrology community is reached through the technical committees, the composition of which includes representatives from Member States, international standardization and technical organizations, manufacturers' associations and regional regulatory bodies. Under the coordination of a secretariat, experts establish international technical guidelines for the metrological performance and testing procedures of measuring instruments subject to legal controls. Cooperative agreements are established between OIML and certain

institutions, such as International Organization for Standards (ISO) and International Electrotechnical Commission (IEC), with the objective of avoiding contradictory requirements; consequently, manufacturers and users of measuring instruments, test laboratories, etc. may apply simultaneously OIML publications and those of other institutions. OIML Draft Recommendations and Documents are developed by technical committees (TC) or subcommittees (SC) that are formed by the Member States. Certain international and regional institutions also participate on a consultation basis.

The Technical Standards Activities Program (TSAP) at NIST is responsible for U.S. participation and representation in the technical activities of the International Organization of Legal Metrology (OIML). TSAP received the 1st Committee Draft Revision of OIML Recommendation IR59 "Moisture Meters for Cereal Grains and Oilseeds" from the Peoples Republic of China. As Secretariat of OIML Technical Committee 17/Subcommittee 1 (TC17/SC1) China circulated the draft for review and comment by the member states of the subcommittee. To ensure that U.S. manufacturers and other interested parties had an opportunity to participate in this effort, TSAP established a U.S. National Working Group (NWG) to solicit comments and to assist in conducting a technical review of this document. The U.S. comments to the document from China were primarily editorial in nature to improve the language, but it was apparent that a significant change in direction of the document was necessary for the U.S. to support a new IR59 and bring it in line with U.S. practice.

Report on OIML TC17/SC1 Meeting of June 22, 2001:
OIML TC17/SC1 met at the Physikalisch-Technische Bundesanstalt (PTB), Berlin, Germany on June 22, 2001 for further review of the draft revision. Representatives of China, Germany, United Kingdom, Japan , Poland, France, the USA and BIML were in attendance. Dr. Ambler Thompson, NIST/TSAP and U. S. Technical Advisor to OIML TC 17, Dr. David Funk, GIPSA/FGIS, and Dr. Peter Huang of the NIST CSTL represented the U.S.

Dr. Thompson briefed the Sector on the U.S. position and the outcome of the meeting. To overcome the shortcomings of the draft document, the U.S. put forth the following series of proposals for consideration at the meeting:

Document Purpose – The purpose of the revision of IR59 is to define technical and metrological requirements for type approval and verification of measuring instruments using physical principles to determine the moisture content of cereal grains and oil seeds. These type-approved instruments are intended to be used for moisture measurements in commercial transactions.

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

Document Direction – The document should be developed for fully automatic direct indicating moisture meters. This means instruments for which all necessary measurements are internal and are self-calculating. Directions for dealing with instruments of comparable accuracies but a lesser degree of automation would be contained in an annex. This would define a direction for future instruments without precluding existing instruments.

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

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

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

Dr. Thompson will prepare the draft and will consult with the NTEP committee before forwarding electronic copies of the U.S. documents to the IWG.

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

Background:

At the Sector's September 1999 meeting, tolerances of +/− 0.8 pounds per bushel for corn and oats; +/− 0.5 pounds per bushel for all classes of wheat; and +/− 0.7 for soybeans, barley, rice, sunflower, and sorghum were proposed for further study. At the Sector's August 2000 meeting, several state metrology representatives agreed to participate in a field evaluation of the proposed tolerances and test methods. States that agreed to participate include:

Arkansas	North Carolina
Illinois	Maryland
Nebraska	Missouri

Subsequently, Darryl Brown of the Iowa Department of Agriculture, Bureau of Weights and Measures also expressed interest in participating in the field evaluation.

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

Phase 1. Standardization of Quart Kettle Test Weight Apparatus -

To initiate the study, the USDA/Grain Inspection Packers and Stockyards Administration (GIPSA) sent one portion of a hard red winter wheat HRW standardizing sample to each of the participating State Laboratories. Participating laboratories were asked to verify that the quart kettle used in the standard test weight per bushel (TW) apparatus met the requirements spelled out in GIPSA's volume test. They were also to verify that the apparatus was set up according to GIPSA standards before testing the HRW standardizing samples. Test results on standardizing samples were to be returned to GIPSA no later than 5 days after they had been received by the participating laboratory.

Wheat samples were sent to the states in late September 2000. With the exception of one State, the test weight apparatuses were within tolerance. GIPSA has since worked with the State to correct the test weight apparatus that was out of tolerance.

Current Status of Phase 1: Dr. Charles Hurburgh, Jr., ISU Agricultural Extension Service, supplied GIPSA with corn and soybean samples that were to be split and tested by GIPSA on their standard quart kettle test weight per bushel apparatus before being sent to the participating laboratories. The purpose of this round of samples is to obtain base-line performance data on the standard quart kettle test method for corn and soybeans. Dr. Richard Pierce, GIPSA, has prepared the corn and soybean samples, and will be sending them to participants by the end of September 2001 with a brief description of the Phase I study and a worksheet for recording the corn and soybeans test weight results. Tests are to be run on each State's standard quart kettle TW apparatus and on any NTEP model Grain Moisture Meter with TW capability that the State may have in its laboratory. It is not intended that these samples be used for field-testing. **Participants are urged to return completed worksheets to Rich Pierce promptly.**

Phase 2. Field Tests of Test Weight per Bushel Capability -

Participating laboratories will be responsible for obtaining their own samples for this test. Samples must be stable and dry. The participating laboratory will make an initial determination of the test weight per bushel of each sample portion with the standard quart kettle apparatus before sending it to the field. The surface condition of these samples will have an effect on the TW measurements. To minimize surface effects, the following was recommended: 1) do NOT refrigerate samples, and 2) test no more than 20 instruments with each sample portion. Tests should be run on both the facility's grain moisture meter and on the kettle test weight apparatus used at that facility. The operator who normally makes test weight per bushel determinations at that location should perform the kettle test. No instruction should be given to the operator on how to perform the test. The participating laboratory will make a final determination of test weight per bushel when the sample is returned to the lab. Data is to be collected on as many meters as possible in the designated time period.

Current Status of Phase 2: The Sector reviewed the data sheet and set of instructions that had been drafted by Diane Lee. It was suggested that the sample volume for Phase 2 tests should be increased to 1500 – 2000 grams.

Revised instructions and data sheets were sent to the seven states that agreed to participate in the field test on October 9, 2001. **Field test data is to be returned to Diane Lee at NIST no later than November 15, 2001.**

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

Background:

At the March 1998 GMM/NIR Sector meetings three working groups were established to develop Examination Procedure Outlines (EPOs) and Field Evaluation Test Procedures (Inspection Procedures) for GMM and NIR devices to provide guidance to States on implementing NIST HB 44 as it applies to these devices. Templates were developed to assist the working groups with their assignments in documenting the EPOs and field evaluation test procedures. The output of the working groups was first reviewed at the Sector's September 1999 meeting.

At the Sector's August 2000 meeting Revised drafts of the Grain Moisture Meter (GMM) Field Evaluation Test Procedures for the air oven reference method and the meter-to-meter method were distributed for review. Because of time limitations, only the meter-to-meter method was reviewed in detail. The latest draft of the GMM EPO was not available at that meeting.

Discussion:

In the latest round of editing, the GMM Inspection Procedure – Air-oven Reference Method has been split into two separate procedures: The first based on NIST Handbook 44 (HB44), §5.56(a), which is applicable to all NTEP meters as well as any meters manufactured or placed into service after January 1, 1998; and the second based on HB44, §5.56(b), which is applicable to all other meters. A similar change was made in the corresponding EPOs.

The latest drafts (dated May 2001) of the GMM EPO and Inspection Procedure based on HB44, §5.56(a) were reviewed by the Sector.

Recommended:

Sector members were in agreement that the May 2001 draft EPO should be re-worked and re-organized into a more "user friendly" form. Specific suggestions included:

- Remove all references to requirements that cannot be tested or determined in the field.
- Separate items to be checked on initial examination of a device from those to be routinely checked in subsequent examinations of the same device.
- Express requirements in the form of simple questions (e.g., G-S.7. Are markings and instructions distinct and easily readable?)
- Arrange requirements in a logical sequence, not necessarily in Handbook 44 order.
- Place "Safety" requirements in a separate document. Include it in the EPO by reference.

Rich Pierce, GIPSA, was concerned that requirements for grain temperature limits would not be checked in the field. He believed that this is the one parameter most likely to be extended, although to do so (at least for some meters) requires that a security seal be broken and new parameters be downloaded (via modem or direct connection) from a computer equipped with the appropriate software and communication package. Because a security seal is provided for, most of the devices do not employ audit trails.

Sector members were asked to submit marked up copies of the draft EPO to Diane Lee by the end of the meeting, identifying items that: 1) should be checked on initial examination, 2) should be checked on subsequent examinations, and 3) should never be checked (or tested) in the field. She will use this information in preparing a new draft.

The Sector had these comments on the draft Inspection Procedure:

§6.x.x – Add requirement to check samples against all meter types in the lab, selecting as official samples only those for which the maximum difference between the air oven moisture and the moisture indicated by the lab meters does not exceed 0.3 percent in moisture.

[Selection of samples is needed to prevent failing a properly functioning meter by using an atypical sample.]

§6.1.7. – Test Weight. Remove this item. It does not apply to grain moisture testers. (Also remove §3.1.12 required by this test.)

§6.2.4. – Change to read: A minimum test of a grain moisture meter shall consist of tests with samples (~~typically in pint glass jars –~~ need not exceed three) of each grain or seed for which the device is used an with samples having at least two different moisture content values within the operating range of the device. Samples shall be of sufficient size to test any type meter that may be in place in the jurisdiction.

[Some meters require more than one pint of sample for measurement.]

Ms. Lee mentioned that it was NIST/OWM's intention to develop "Field Manuals" which would include the information in the EPOs and the Field Test Procedures. Several members questioned why the Sector was spending time reviewing EPOs and Test Procedures instead of working directly on a Field Manual.

[**Note:** OWM has discussed formatting for EPOs considering what would be best for field inspectors. During these discussions it was noted that EPOs are in outline form so that an inspector has a quick reference to code requirements while testing is being performed, therefore an EPO should remain relatively short. In contrast to EPOs, field manuals will contain more detail to include more instructions for testing and pictures of the device. A field manual will be very useful as a teaching tool.]

6. Results of Air-Oven Collaborative Study

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-OWM'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 the1995 harvest. Results of that study were reported at the Sector's March 1996 meeting.

Discussion:

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. A proposal to initiate another structured air-oven collaborative study appeared on the Sector's August 2000 agenda, but because of time limitations, this item was not discussed. Subsequent to the August 2000 Sector meeting John Fecht of the Nebraska Public Service Commission and Charles Hurburgh of Iowa State University offered to provide and distribute samples for an air-oven collaborative. NIST, OWM agreed to cover the cost of shipping the samples. In response to an e-mail announcement sent to the States by Diane Lee of NIST, OWM, 17 States, GIPSA and Iowa State University agreed to participate in the air oven collaborative (intercomparisons). Wheat samples provided by John Fecht were shipped to participants in December 2000. Charles Hurburgh shipped the corn and soybean samples to 18 Laboratories on July 5, 2001.

Results of the Study:

Corn and Soybeans – As of the date of the Sector meeting, 14 labs had provided corn data and 11 labs had provided soybean data. Dr. Hurburgh, who had compiled the data, reported that within-laboratory precision, as measured by the standard deviation across replicates, was very good for all labs in both grains. Interlaboratory agreement is measured by the standard deviation across laboratories on individual samples. The generally accepted value for this statistic is 0.2 percentage points; this group of laboratories was significantly better.

The interlaboratory agreement in 2001 was better than that reported in 1996, in a similar study. In the 1996 study, the interlaboratory standard deviation, for 3 samples each of corn and soybeans tested by 17 labs was 0.25% pts. and 0.20% pts. for corn and soybeans, respectively. This compares to 0.12% pts. and 0.11% pts., respectively, in the 2001 study.

In corn, the USDA GIPSA values were extremely close to the average of all labs. In soybeans, it appeared that USDA GIPSA was getting slightly (about 0.1 percentage point) lower moisture results than the average of all labs. This is not a large difference, although in terms of typical tolerance levels for moisture meters, it is detectable.

There was some variation in laboratory conditions. The reported differences were not large enough to cause significant moisture measurement errors; the oven method is relatively insensitive to environmental parameters (as opposed to test procedure parameters like oven temperature or time).

Wheat – As of the date of the Sector meeting, 14 labs had provided wheat data. Diane Lee, NIST, reported separately on the low moisture and high moisture sample results that had been compiled by Richard Gonzales, Oklahoma Weights and Measures Laboratory.

For the low moisture samples, all laboratory air oven results with the exception of one were within 2 standard deviations. Excluding the outlier, the standard deviation across laboratories was 0.05 %. Review of test information that was provided by the State whose result exceeded 2 standard deviations, revealed that the time for the laboratory oven to reach the designated temperature after the samples were inserted was 14 minutes which was at least twice the time reported by most of the States, and the oven used by this State was of a different brand than that used by most of the other laboratories.

For the high moisture samples, all laboratory air oven results with the exception one result were within 2 standard deviations. The standard deviation across laboratories was 0.08 % excluding the outliers. The laboratory whose result exceeded 2 standard deviations on the high moisture wheat sample, ran the sample twice but did not run the second test for over a week after the sample had been stored in the laboratory. This sample lost moisture. The same laboratory, whose results exceeded 2 standard deviations for the low moisture wheat, was close to exceeding 2 standard deviations for the high moisture wheat result. Again, the time for the laboratory oven to reach the designated temperature after the samples were inserted was at least twice the time reported by most of the States (see note below).

The recent results compare favorably with the collaborative sturdy conducted in 1996. In that study, the standard deviation of the state air oven results for wheat was 0.10 %.

[**Note:** During the sector meeting it was reported that two laboratories exceeded the 2 standard deviation limits for high moisture wheat. It was also noted that for the low moisture wheat more than one laboratory appeared on the graph to be outside the 2 standard deviation limit lines. Upon further review of the data it was found that the 2 standard deviation limit lines were incorrectly recorded on the graphs. The corrected graphs are attached.]

7. Criteria for Like Type

[**Note:** This item first appeared on the Sector's August 2000 agenda, but because of time limitations it was not discussed at that time.]

Background:

A National Type Evaluation Program (NTEP) Certificate of Conformance (CC) represents conformance of a designated model (or models) to a single type or pattern. NCWM Publication 14 defines "Type" as:

> A model or models of a particular measurement system, instrument, element or a field standard that positively identifies the design. A specific type may vary in its measurement ranges, size, performance, and operating characteristics as specified in the Certificate of Conformance.

When a manufacturer introduces a new model which is similar to a type for which a CC has been issued, a decision must be made as to whether the new device is subject to a full evaluation, or whether it can be considered as a "like type" to the existing unit and thus eligible to be added to the existing CC without testing. Publication 14, offers the following guidelines for making this decision:

> 1. Superficial Differences Between Devices
> Types that are identical in design, materials, and components used, and measurement ranges, but that differ superficially in their enclosures, detailed size, color, or location of non-metrological appointments (function lights, display

location, operational key locations, etc.) will usually be submitted to a single evaluation.

2. Component Variations
Types produced by the same manufacturer with nominally identical components or materials procured from different suppliers can usually be regarded as the same type. They will be covered by a single evaluation if the different components or materials are not likely to affect the regulated metrological characteristics, reliability, or life of the types.

If changes in components or materials are likely to affect the performance or operational characteristics of a device, separate evaluations will generally be required. A type is considered MODIFIED if a change alters a metrological or technical characteristic.

Discussion:
The Sector addressed the following questions in response to a request from Dr. Charles Hurburgh, Jr., Iowa State University - Agricultural Extension Service:

1. What constitutes like type (the criteria for being like type) for NTEP CC purposes?
2. If data from non-like type devices (or non-approved and approved devices) were combined into a new calibration, how would GIPSA, NTEP, and State Weights and Measures officials treat the new calibration? (e.g., Is the new calibration permissible if it passes the tests?)
3. Is the Official GIPSA system bound by the same definitions of like type as NTEP? (e.g., Will the Official system consider instruments equal and interchangeable even if NTEP has separate CCs because they were judged not to be of like type?)

Dr. Hurburgh reported that these questions arose from the recent introduction of modifications to NIR instruments that may make them not of like type, even though they use the same calibrations or use a calibration derived from a database containing data from both original and modified instruments. The trend to worldwide neural networks and local regression databases may result in the development of calibrations based on data from instruments that are not of like type. He cited the new Foss Infratec 1241, submitted as a separate unit from the Infratec 1227 and 1229 units (which are both listed on Certificate 95-063A4) as a case in point. He expressed the belief that more specific guidance is needed to determine when a new instrument is or is not of "like type" to an existing instrument.

Some Sector members were of the opinion that existing guidelines were very clear in what constituted "like type" for NTEP CC purposes. In their view, although a calibration is a metrologically significant element, the fact that two devices use the same calibration has no bearing on determining if the devices are of "like type." Conversely, if the two devices use different calibrations, they cannot be considered to be of "like type." If other metrologically significant elements of a new device are significantly mechanically or physically different from those in an earlier model, then the device must be evaluated as a new type even if both devices use the same calibration.

Steve Patoray, NTEP Director, explained that manufacturers normally determine what is metrologically significant. If they have any questions, they can consult with the NTEP Laboratory.

Rich Pierce, GIPSA, representing the NTEP Laboratory, said the question is not, "Do they provide equivalent results?" It is, "Can they be expected to pass NTEP tests?" He pointed out that NTEP is designed around testing a *type* to a *specification*. It involves testing to a performance specification, not to equivalence of results.

Addressing the question, "Is the Official GIPSA system bound by the same definitions of like type as NTEP?" Dave Funk, GIPSA, reminded the Sector that NTEP and GIPSA are separate entities. GIPSA's criteria for "like type" will be based on the needs of the Official System and may or may not be different from NTEP's.

Grain Industry representatives stressed that it was important that NCWM not take any action that would preclude the commercial system from using devices of the type or types used in the Official System. This came out of concern over what would happen to a grain elevator using a device of a type, still used by the Official System, if the

manufacturer allowed the CC to lapse for that type. Weights and Measures members pointed out that under present rules, the older device may continue to be used as long as it passes field inspection.

Recommended:
The Sector supported the concept that the NTEP Laboratory should make the final determination of like type (subject to the NTEP appeal process.) When a manufacturer submits a request to have a model added to a certificate, if there is any doubt whether or not the changes are metrologically significant, the device should be tested.

8. Report on the 2001 NCWM Interim and Annual Meetings

Four items of interest to the GMM Sector were reviewed by the Committee on Specifications and Tolerances (S&T) at the NCWM Interim Meeting January 14-17, 2001:

356(a)-1	**N.1.1. Transfer Standard and N.1.2. Minimum Test, Footnote 1**
Source:	GMM Sector
Recommendation:	Delete all references to Footnote 1 from the Grain Moisture Meters Code 5.56.(a) paragraphs N.1.1. and N.1.2.
356(a)-2	**Recognize Meter-to-Like-Type Meter Method Transfer Standards**
Source:	GMM Sector
Recommendation:	Modify 5.56(a) Grain Moisture Meter Code to recognize Meter-to-Like-Type Meter Method Transfer Standards and add table of maintenance and acceptance tolerances for Meter-to-Like-Type Meter Method
356(b)-1	**N.1.1. Transfer Standard, Footnote 1**
Source:	GMM Sector
Recommendation:	Delete all references to Footnote 1 from the Grain Moisture Meters Code 5.56.(b) paragraph N.1.1.
356(b)-2	**Recognize the Meter-to-Meter Method Transfer Standards**
Source:	Central Weights and Measures Association
Recommendation:	Modify 5.56(b) Grain Moisture Meter Code to recognize Meter-to-Like-Type Meter Method Transfer Standards and add table of maintenance and acceptance tolerances for Meter-to-Like-Type Meter Method.

With the exception of item 356(b)-2, which was withdrawn, the S&T Committee forwarded these items as voting items for the 2001 Annual Meeting, July 22-26, 2001, where they were subsequently accepted by the Conference. They will appear in the next issue of Handbook 44 and will become effective January 1, 2001. For additional background on these items refer to *Committee Reports for the 86th Annual Meeting*, NCWM Publication 16, April 2001.

Discussion:
Following the Interim Meeting, OWM studied the Sector's recommendation, Item 356(b)-1, to remove Footnote 1 from section 356(b) of Handbook 44. Footnote 1 outlines the criteria for a meter to like-meter test program and emphasizes that such a program should not be operated without the necessary calibration support. Section 5.56(b) addresses non-NTEP meters for which there is no on-going calibration program. Therefore, OWM proposed that the footnote should be amended rather than removed from NIST Handbook (HB) 44 Section 5.56(b) and solicited comments from Sector members on proposed re-wording. Comments on the proposal were generally negative, saying that the Sector had not had an opportunity to discuss revising the footnote, so OWM decided to allow Item 356(b)-1 to go forward as originally recommended by the Sector. At this Sector meeting, members were asked if wording needed to be added to Section 5.56(b) to indicate that meter to like-meter testing cannot be used unless it is traceable to the national system. One Sector member expressed the opinion that this would eventually become a non-issue as the population of non-NTEP meters was decreasing each year.

Recommended:
The Sector decided to stand by its decision of the previous meeting recommending that Footnote 1 be removed from section 356(b)-1 and not amended.

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

Rich Pierce of the Grain Inspection, Processors and Stockyards Administration (GIPSA, formerly FGIS), the NTEP Participating Laboratory for Grain Moisture Meters, reported that draft certificates for the 2001 crop year had been sent to all manufacturers for review about three weeks prior to the Sector meeting, and, with one exception, manufacturers have completed their reviews. Two certificates have been forwarded to NCWM, Inc.

Phase II calibration data are being collected for 2001 crop samples on the following five meter types.

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

Seedburo Equipment Company has withdrawn the GMA-128 from the on-going calibration program for 2001 and will allow their CC to become inactive.

With only five types in the OCP (Phase II), the cost to manufacturers has dropped from last year's $5,250 per type to $3,600 per type. Billing statements have been prepared and will be forwarded to the USDA National Finance Center (NFC) around September 1, 2001. NFC will then bill for participation in the calibration program. The Type Evaluation Laboratory will send a summary of billing information to contact individuals listed on respective certificates of conformance when billing statements are sent to NFC.

Dr. Pierce expressed concern that he was not receiving information back from manufacturers in a timely manner. Steve Patoray, NTEP Director, cautioned manufacturers that NCWM, Inc. would not be chasing them to get their applications and information in on time.

10. Definitions of Recently Introduced Terms

Discussion:

The Sector reviewed several new terms that had been used in its recent proposals to determine if definitions of these terms [see list below] should be recommended for addition to Appendix D of NIST Handbook (HB) 44. A letter from Don Onwiler, Nebraska Dept. of Agriculture, Weights & Measures Division, pointed out that the changes to HB44 Grain Moisture Meter Code §5.56(a) adopted in July 2001 by NCWM, Inc. adequately defined "air-oven reference method" and "meter-to-like-meter method." Additionally, a proposal, which might have included the term "National Sample Set," was withdrawn by the Specifications and Tolerances (S&T) Committee so the term does not appear in HB44. He suggested that "like-type" has been used for years in reference to NTEP and was commonly understood to refer to devices covered by a common NTEP Certificate of Conformance.

air-oven reference method. [Sometimes referred to as: air-oven method.] A method for the field evaluation of Grain Moisture Meters in which grain samples are used as the official transfer standards with moisture content values assigned by the oven drying methods specified by the USDA GIPSA.

meter-to-like-type-meter method. [Sometimes referred to as: meter-to-like-meter method or, simply, meter-to-meter method.] A method for the field evaluation of Grain Moisture Meters in which properly standardized field standard meters using National Type Evaluation Program approved calibrations are used as transfer standards with grain samples as a comparison medium. This test method is valid only when the field standard meter and the meter under test are of like-type. In this method, precise knowledge of the air-oven moisture content of the grain samples used for field-testing is not required.

like-type. Grain Moisture Meters are considered to be of like-type if they are covered by the same National Type Evaluation Program (NTEP) Certificate of Conformance (CC). See NCWM Publication 14 for further definition of "Type."

National Sample Set. Grain samples used in Phase II (On-Going Calibration Review) of the NTEP Grain Moisture Meter (GMM) program. To maintain an "active" NTEP Certificate of Conformance, grain moisture meters must be evaluated annually using data collected on grain samples from the three most recent crop years.

These samples represent wide diversity with respect to geographical source, kind, class, moisture content, maturity, etc.

Recommended:
The Sector agreed unanimously with Don Onwiler's comments and does not recommend adding the definitions to HB44.

11. Time and Place for Next Meeting

The next meeting is tentatively planned for the week of August 19, 2002 in the Kansas City, MO area. Meetings will be held in one of the meeting rooms at the NOAA Weather Training Center if available. A tentative schedule is shown below.

Wednesday, August 21	1:00 pm - 5:00 pm	GMM Sector Meeting
Thursday, August 22	8:00 am - 12:00 noon	GMM Sector Meeting
Thursday, August 22	1:00 pm - 5:00 pm	joint session GMM & NIR Analyzer
Friday, August 23	8:00 am - 12:00 noon	NIR Grain Analyzer Sector Meeting

National Type Evaluation Technical Committee (NTETC)
Near Infrared (NIR) Grain Analyzer Sector
August 23-24, 2001 - Kansas City, MO

Meeting Summary

Agenda Items

☆ 1. New Sector Chairman Appointed by NCWM, Inc
☆ 2. Report on NCWM, Inc.
   a. Plans to Reduce Number of State Public Sector Members Eligible for Travel Reimbursement
   b. Registration Fees for Non-NCWM Members Attending Sector Meetings
☆ 3. Criteria for Like Type
4. Report on the 2001 NCWM Interim and Annual Meetings
5. Type Evaluation Issues
   a. Basic Instrument Tests
   b. Sample Temperature Sensitivity
   c. Accuracy, Precision, and Reproducibility Requirements
6. Criteria for Phase II Testing – On-going Calibration Review
☆ 7. Time and Place for Next Meeting

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

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1. New Sector Chairman Appointed by NCWM, Inc.

In late March 2001, Richard "Will" Wotthlie asked to be replaced as Chairman of the NTETC Grain Moisture Meter and Near Infrared Protein Analyzer Sectors. Diane Lee, representing NIST/OWM and Jack Barber, Sector Technical Advisor, recommended Cassie Eigenmann-Pierson for this post. Subsequently, Wes Diggs, who at the time was Chairman of the NTEP Committee, sent Cassie a formal letter of appointment. Steve Patoray, NTEP Director, explained to the Sector that since the transfer of the National Type Evaluation Program (NTEP) from NIST OWM to the NCWM, Inc., NCWM administrative procedures have been revised. The new procedures stipulate that NTETC Sector Chairs are appointed by the NTEP committee chair and serve for an indefinite term. At the 2001 Annual Meeting of NCWM, Inc., Louis Straub, Maryland Department of Agriculture, became the new NTEP committee chair.

2. Report on NCWM, Inc.

2.a. Plans to Reduce Number of NTETC State Public Sector Members Eligible for Travel Reimbursement

At a recent NCWM, Inc. NTEP Lab meeting, Lou Straub reported that NCWM, Inc., as a cost reduction measure, plans to limit the number of NTETC State public sector members that will be reimbursed for travel expenses incurred in connection with participation in Sector meetings. Present State public sector members may continue as voting GMM/NIR Sector members, but reimbursement for travel expenses will be limited to two or three people per meeting.

2.b. Registration Fees for Non-NCWM Members Attending Sector Meetings

NCWM, Inc is now charging a $75.00 registration fee to all non-NCWM members who attend a Sector meeting.

Steve Patoray, NTEP Director, reminded the Sector that the NCWM is now incorporated and should be referred to as NCWM, Inc. He explained that annual maintenance fees on Certificates of Conformance (CCs) are the main source of funding for Sector meetings, training, etc. These funds are limited. The need to keep expenditures in line with income is the driving force behind the changes mentioned in agenda items 2.a. and 2.b.

Mr. Patoray explained how the National Type Evaluation Program is administered. NCWM, Inc. now issues all certificates of conformance. The NCWM, Inc. Board of Directors is the policy-making body of NCWM, holding responsibility for the overall operation of the organization. Additionally, an ad *hoc* committee, called the NTEP Advisory Committee, advises the NTEP Committee, making recommendations on policy and long range planning. The NTEP Committee is responsible for Operation of NTEP. It ratifies NTEP policy and procedures; resolves policy, technical and appeals issues; sponsors technical subcommittees (NTEPTC Sectors) to develop technical test procedures and evaluation criteria; and it oversees the activities of the NTEP Director. NCWM, Inc. has no paid employees. They have hired a management company, Management Solutions, to handle administrative details. Mr. Patoray is employed by Management Solutions and serves as NTEP Director. The NTEP Director is responsible for the day-to-day management of NTEP. His duties include: reviewing Sector agendas before they are distributed; recommending procedures developed by Sectors; training NTEP evaluators; authorization of NTEP Labs; reviewing and recommending CC's; and managing conformity assessment.

The NTEP Sector meetings are open to all NCWM members and to registered non-members. Issues before the Sector are decided by general consensus or by formal vote. Voting rights depend on the type of NCWM membership held by the individual. These are summarized below:

- Associate Membership (Industry, Association and Academic members):
  - one vote per parent company/organization/institution
- Active Membership (State and Municipal members)
  - one vote per jurisdiction
- NCWM non-member:
  - no voting rights
  - nominal registration fee per meeting
- Federal Agencies (other than NIST):
  - one vote per agency, if they choose
- NIST/OWM:
  - one vote per agency, if they choose
- Foreign Agencies:
  - no voting rights

Mr. Patoray reported that all active CC's are now available for downloading from the NCWM, Inc. web site: http://www.ncwm.net. Information on the current NTEP fee structure can also be found on the web site.

1. Criteria for Like Type

[**Note:** This item first appeared on the Sector's August 2000 agenda, but because of time limitations it was not discussed at that time.]

Background:

A National Type Evaluation Program (NTEP) Certificate of Conformance (CC) represents conformance of a designated model (or models) to a single type or pattern. NCWM Publication 14 defines "Type" as:

> A model or models of a particular measurement system, instrument, element or a field standard that positively identifies the design. A specific type may vary in its measurement ranges, size, performance, and operating characteristics as specified in the Certificate of Conformance.

When a manufacturer introduces a new model which is similar to a type for which a CC has been issued, a decision must be made as to whether the new device is subject to a full evaluation, or whether it can be considered as a "like type" to the existing unit and thus eligible to be added to the existing CC without testing. Publication 14, offers the following guidelines for making this decision:

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> Types that are identical in design, materials, and components used, and measurement ranges, but that differ superficially in their enclosures, detailed size, color, or location of non-metrological appointments (function lights, display location, operational key locations, etc.) will usually be submitted to a single evaluation.

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Types produced by the same manufacturer with nominally identical components or materials procured from different suppliers can usually be regarded as the same type. They will be covered by a single evaluation if the different components or materials are not likely to affect the regulated metrological characteristics, reliability, or life of the types.

If changes in components or materials are likely to affect the performance or operational characteristics of a device, separate evaluations will generally be required. A type is considered MODIFIED if a change alters a metrological or technical characteristic.

Discussion:
The Sector addressed the following questions in response to a request from Dr. Charles Hurburgh, Jr., Iowa State University - Agricultural Extension Service:

1. What constitutes like type (the criteria for being like type) for NTEP CC purposes?
2. If data from non-like type devices (or non-approved and approved devices) were combined into a new calibration, how would GIPSA, NTEP, and State Weights and Measures officials treat the new calibration? (e.g., Is the new calibration permissible if it passes the tests?
3. Is the Official GIPSA system bound by the same definitions of like type as NTEP? (e.g., Will the Official system consider instruments equal and interchangeable even if NTEP has separate CCs because they were judged not to be of like type?)

Dr. Hurburgh reported that these questions arose from the recent introduction of modifications to NIR instruments that may make them not of like type, even though they use the same calibrations or use a calibration derived from a database containing data from both original and modified instruments. The trend to worldwide neural networks and local regression databases may result in the development of calibrations based on data from instruments that are not of like type. He cited the new Foss Infratec 1241, submitted as a separate unit from the Infratec 1227 and 1229 units (which are both listed on Certificate 95-063A4) as a case in point. He expressed the belief that more specific guidance is needed to determine when a new instrument is or is not of “like type” to an existing instrument.

Some Sector members were of the opinion that existing guidelines were very clear in what constituted “like type” for NTEP CC purposes. In their view, although a calibration is a metrologically significant element, the fact that two devices use the same calibration has no bearing on determining if the devices are of “like type.” Conversely, if the two devices use different calibrations, they cannot be considered to be of “like type.” If other metrologically significant elements of a new device are significantly mechanically or physically different from those in an earlier model, then the device must be evaluated as a new type even if both devices use the same calibration.

Steve Patoray, NTEP Director, explained that manufacturers normally determine what is metrologically significant. If they have any questions, they can consult with the NTEP Laboratory.

Rich Pierce, GIPSA, representing the NTEP Laboratory, said the question is not, “Do they provide equivalent results?” It is, “Can they be expected to pass NTEP tests?” He pointed out that NTEP is designed around testing a *type* to a *specification*. It involves testing to a performance specification, not to equivalence of results.

Addressing the question, “Is the Official GIPSA system bound by the same definitions of like type as NTEP?” Dave Funk, GIPSA, reminded the Sector that NTEP and GIPSA are separate entities. GIPSA’s criteria for “like type” will be based on the needs of the Official System and may or may not be different from NTEP’s.

Grain Industry representatives stressed that it was important that NCWM not take any action that would preclude the commercial system from using devices of the type or types used in the Official System. This came out of concern over what would happen to a grain elevator using a device of a type, still used by the Official System, if the manufacturer allowed the CC to lapse for that type. Weights and Measures members pointed out that under present rules, the older device may continue to be used as long as it passes field inspection.

Recommended:
The Sector supported the concept that the NTEP Laboratory should make the final determination of like type (subject to the NTEP appeal process.) When a manufacturer submits a request to have a model added to a certificate, if there is any doubt whether or not the changes are metrologically significant, the device should be tested.

4. Report on the 2001 NCWM Interim and Annual Meetings

At the NCWM Interim Meeting held January 14-17, 2001, the Committee on Specifications and Tolerances (S&T) forwarded the following item as a voting item for consideration at the 2001 NCWM Annual Meeting, July 22-26, 2001. The Sector's recommendations were accepted by the Conference. This change to the tentative code will appear in the next issue of Handbook 44. For additional background information refer to *Committee Reports for the 86th Annual Meeting*, NCWM Publication 16, April 2001. .

357-1	**Near-Infrared Grain Analyzers, Indication of Additional Constituent Values**
Source:	Near-Infrared (NIR) NIR Grain Analyzer Sector (carryover item 357-2 from the S&T Committee's 1999 agenda.)
Recommendation:	Modify the Tentative NIR Grain Analyzer Code to include requirements for corn protein, oil, and starch; barley protein; and soybeans protein and oil; and to add criteria for moisture basis.

Discussion:
Sector members reviewed this issue with the intent of deciding if any changes should be made (such as removing retroactive dates) before forwarding a recommendation that the tentative code be made permanent. Grain industry representatives were not in favor of recommending that the tentative code be made permanent unless it applied only to wheat protein. From their viewpoint, constituent based trading in other grains is still a work in progress with the majority of trades based on contractual agreements between buyer and seller, often involving the use of proprietary calibrations and involving grain with specific genetic traits. In their view, regulation of devices was not necessary as the system was "working just fine." High-oil corn and high-lysine corn were mentioned as two grains that were being traded in this manner. A seed company geneticist expressed concern that proprietary genetics would be put at risk by allowing the code to become permanent, fearing that they would be asked to provide samples and release pedigree information on proprietary genotypes. One Sector member, speaking in support of the grain industry position, said that wheat was the only commodity that had an established constituent value program. He believed the NTEP objective should be to NOT do anything that restricts commercial use.

It was pointed out by other Sector members that NTEP calibrations are "generic" and are not intended to apply to specialty crops traded under contracts specifying the use of a proprietary calibration. Dave Funk, GIPSA, assured geneticists that GIPSA was not going to be requesting proprietary pedigree information for use in GIPSA calibrations. As for samples, he explained that GIPSA normally obtained samples from grain in the marketing stream. This is normally co-mingled grain. Recently, however, there have been instances where seed companies have volunteered samples of their new hybrids to ensure that GIPSA calibrations would not tag samples their new product as "outliers." Weights and Measures members were concerned about the growing number of farmer-to-elevator trades that involved the payment of a premium (or involved a dockage) based on specific constituent concentration. Soybeans traded on an oil basis were mentioned as one example in Missouri. Contracts are not the norm in these trades.

Dave Funk made a case for moving to permanent code that would allow the National Type Evaluation Program (NTEP) to apply to NIR analyzers. The purpose of the NTEP is to increase confidence in marketing channels. It does this by:

- increasing producers' confidence that they are getting fair value for their products
- increasing users' confidence that the device they have purchased is appropriate for the intended use
- increasing manufacturers' confidence that they are designing and building to a defined target

Recommended:
To clarify the Sector's intent and to address the concerns expressed by grain trade representatives, the Sector agreed that the scope section of the Tentative Code should be modified to make it clear that:

1. NTEP grain and oilseed calibrations are applicable to fungible commodities and are not intended to apply to specialty crops traded under contracts specifying the use of proprietary calibrations.
2. Proprietary calibrations applicable to specific specialty crops may be used on NTEP NIR Analyzers provided the calibration and its results are clearly differentiated from results obtained using corresponding NTEP calibrations. For example, when oil content in maize is being measured, it must be clear to both buyer and seller that a proprietary Hi-Oil Corn calibration is being used instead of the NTEP Corn calibration.
3. Field evaluation of NIR Analyzers will be conducted only on the NTEP grain and oil seed calibrations.

The Sector's Technical Advisors were asked to develop specific wording to reflect the above points. Sector members will be asked by means of a letter ballot to approve the amended scope of the Tentative Code and to recommend that the amended Tentative Code be made permanent.

5. Type Evaluation Issues

Background:

At its September 1997 meeting, the Sector decided that priority should be given to modifying the Tentative Code to cover additional grains. This decision was based on the facts that: (1) an increasing number of NIR analyzers were being used commercially for grains not presently covered by the code; and (2) the certification date for the NTEP Lab had been delayed for an indefinite period of time. Consequently, work on the draft of the Publication 14 checklist for NIR Analyzers was brought to a standstill until Code issues could be settled and until GIPSA received certification as the NTEP Laboratory for NIR Analyzers.

GIPSA is now certified as the NTEP Laboratory for wheat protein analyzers, and samples are available for evaluating devices as NIR wheat protein analyzers. Dr. Richard Pierce, GIPSA, indicated that the Lab is currently looking at the standardization (sloping) process described in Publication 14. Specifically, sets of 20 samples are to be used to slope and bias prototype instruments to the GIPSA CNA reference method. In subsequent accuracy tests, instrument predictions, the bias tolerance to CNA is 0.12 percent protein. This tight tolerance is dictating a rigorous process for selecting/matching slope and accuracy sample sets.

The current version (June 2001) of the Publication 14 checklist for NIR Analyzers has not been fully revised to cover the additional grains and constituents proposed by the Sector. Acceptance by NCWM, Inc. of voting item 357-1 at the 2001 Annual Meeting requires that major revisions be made to the checklist to include testing for additional grain types and to correct other deficiencies.

5.a. Basic Instrument Tests

Discussion:

As described in the June 2001 version, basic instrument tests (Power Supply, Storage Temperature, Leveling, Warm-up, Humidity, and Instrument Stability) are conducted using only HRW wheat samples and a calibration for HRW protein. This implies that an instrument designed for use on only one of the other grains (e.g., only for oil in soybeans) must also have a wheat protein calibration (at least for the basic instrument tests). In this regard, the Sector considered the following questions:

1) For devices designed for use on a single grain (other than HRW wheat), should basic instrument tests be allowed (in lieu of requiring a wheat calibration) or be required to be conducted with the grain intended for use?
2) Is a wheat protein calibration mandatory for instruments used only on barley or one of the other added grains or would a wheat moisture calibration be adequate?
3) Are devices required to have calibrations for all the constituents listed in the code for a given grain (e.g., if a device provides a calibration for oil in corn, must it also provide calibrations for protein and starch)?

It was pointed out that constituent values of test samples are more stable for wheat protein (expressed on a constant moisture basis) than for moisture. This allows the tolerances on basic instrument tests to be more stringent for NIR Analyzers measuring wheat protein than for NIR devices measuring moisture. Furthermore, wheat protein can be determined more precisely than constituents in most other grains.

Recommended:
Because of the above facts, the Sector decided:

1) [Editor's note: Although not discussed at the Sector meeting, the heading immediately above the section on Basic Instrument Tests should be changed, as shown, below to reflect added grain types and to be consistent with the wording in the title of Section2, Chapter 7.]

Type Evaluation Test Procedures and Tolerances
Near-Infrared ~~Wheat Protein~~ Grain Analyzers

2) Hard red winter wheat will be used for the Basic Instrument Tests. All NIR analyzers must be supplied with a hard red winter wheat calibration.
3) The following note will be removed from the Basic Instrument Tests of the NIR

~~*At the discretion of the NTEP Participating Laboratory, successful completion of the Basic Instrument Tests specified in NCWM Pub. 14, Grain Moisture Meters Code may be accepted in lieu of actual tests, as evidence that the device meets the Basic Instrument Test requirements of the Near Infrared Analyzer Code. This exception is intended to reduce the need to perform Basic Instrument Tests two times on an instrument that has previously been submitted for NTEP evaluation as a Grain Moisture Meter or on an instrument that is submitted for simultaneous approval as a Grain Moisture Meter and as a Near Infrared Analyzer.*~~

5.b. Sample Temperature Sensitivity

Discussion: The June 2001 version of the checklist applies only to wheat protein, with tests made on samples representing three protein ranges and two moisture ranges. The protein range is listed for each Class of Wheat in a table in Part III, *Accuracy, Precision, and Reproducibility Requirements*, of the checklist. Expanding the Sample Temperature Sensitivity test to cover additional grains and constituents requires that constituent ranges, moisture levels, and tolerances be added for each new grain type and its corresponding constituent.

Recommended:
The Sector agreed to add tables showing Constituent Ranges for Type Evaluation and Applicable Tolerances and to modify paragraph 2 of the Sample Temperature Sensitivity test as shown below. Table 2 will also be used to list tolerances for accuracy, repeatability, and reproducibility tests [see agenda item 5.c.]

[Note: Tolerances for grains other than wheat and tolerances for oil seeds are under investigation and will be considered by the Sector at its next meeting.]

Testing will be conducted using two sample sets from each ~~of the six wheat classes~~ grain type representing the low ~~(10%-11%)~~ and high ~~(13%-14%)~~ moisture ranges shown in Table 1. Each moisture set will consist of three samples, one from each of three ~~protein~~ constituent concentration ranges (the upper third, the middle third, and the lower third of the ~~protein~~ constituent concentration range for the ~~class~~ grain type). Separate bias analyses will be made for the low and high moisture sets. When high moisture samples are not available for any ~~protein~~ constituent concentration range in any ~~class~~ grain type, testing may be conducted using tempered (artificially moistened) samples. Three analyses will be made for each sample at room temperature, the hot temperature extreme, and the cold temperature extreme. The average ~~protein~~ constituent concentration for the 9 observations in each moisture set (1 moisture level x 3 ~~protein~~ constituent concentration levels x 3 replicates) run at each temperature extreme must agree with the average ~~protein~~ constituent concentration obtained for the room temperature runs within ~~± 0.35~~ the applicable tolerances shown in Table 2.

[**Note:** The Tables 1 and 2 represent an addition to the checklist. Underscoring has been eliminated to enhance legibility.]

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% - 11%	13% - 14%
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.		
Two-rowed Barley	Protein	8 – 17 at 0% M.B.	10% - 11%	13% - 14%
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.	12% - 13%	15% - 16%
	Oil	3 – 9 at 0% M.B.		
	Starch	67 – 73 at 0% M.B		
Soybeans	Protein	30 – 40% at 13% M.B.	10% - 11%	15% - 16%
	Oil	16 – 21% at 13% M.B.		

Table 2. Tolerances

Grain Type	Constituent	Sample Temperature Sensitivity Test Tolerance	Accuracy Tolerance	Repeatability Tolerance	Reproducibility Tolerance
Durum Wheat	Protein	± 0.35	± 0.30	± 0.15	± 0.20
Hard Red Spring Wheat	Protein				
Hard Red Winter Wheat	Protein				
Hard White Wheat	Protein				
Soft Red Winter Wheat	Protein				
Soft White Wheat	Protein				
"All-Class" Wheat Calibration	Protein				
Two-rowed Barley	Protein	± t.b.d.	± t.b.d.	± t.b.d	± t.b.d
Six-rowed Barley	Protein				± t.b.d
"All-Class" Barley Calibration	Protein				± t.b.d
Corn	Protein	± t.b.d.	± t.b.d.	± t.b.d.	± t.b.d
	Oil	± t.b.d.	± t.b.d.	± t.b.d.	± t.b.d
	Starch	± t.b.d.	± t.b.d.	± t.b.d.	± t.b.d
Soybeans	Protein	± t.b.d.	± t.b.d.	± t.b.d.	± t.b.d
	Oil	± t.b.d.	± t.b.d.	± t.b.d.	± t.b.d

5.c. Accuracy, Precision, and Reproducibility Requirements

Discussion:

As presently worded, this section applies only to wheat protein. Major editing is required to add additional grain types and constituents. The Sector also re-considered the intended purpose of Phase I Accuracy, Precision, and Reproducibility tests (see also Agenda item 6, *Criteria for Phase II Testing – Ongoing Calibration Review*.) It was suggested that the purpose of these tests should be to determine that the devices have a quality calibration; that scatter

will be within acceptable limits; and that they can be set to the correct slope and biased so like types give the same results.

Recommended:
The Sector decided that the bias test could be eliminated. Standardization against GIPSA standards will be required at time of installation. The Accuracy, Precision, and Reproducibility Requirements were modified as shown below. [See also **Table 2, Tolerances** in agenda item 5.a.]

III. Accuracy, Precision, and Reproducibility Requirements

~~Wheat protein~~ Grain analyzers will be tested for accuracy, repeatability (precision), and reproducibility over the applicable ~~protein~~ constituent concentration ranges shown in Table 1 ~~for Hard Red Winter, Hard Red Spring, Soft Red Winter, Durum, Hard White, and Soft White Wheat~~. Instrument and calibration performance will be individually tested for each ~~class of wheat~~ grain type and constituent.

~~**Protein Ranges for Type Evaluation**~~	
~~**Grain Type**~~ ~~**Grain Type**~~	~~**Protein Range at 12% moisture basis**~~
~~Durum Wheat~~	~~10 - 18~~
~~Hard Red Spring Wheat~~	~~10 - 19~~
~~Hard Red Winter Wheat~~	~~8 - 18~~
~~Hard White Wheat~~	~~9 - 16~~
~~Soft Red Winter Wheat~~	~~9 - 12~~
~~Soft White Wheat~~	~~8 - 15~~
~~"All Class" Wheat Calibration~~	~~8 - 19~~

Two instruments will be tested using test sets consisting of no less than 50 samples for each ~~wheat class~~ 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 ~~FGIS~~ GIPSA official ~~wheat protein~~ 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 ~~FGIS~~ GIPSA official instrument model and the reference method exceeds ~~0.30 (~~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 ~~total~~ minimum of 300 observations per ~~wheat class~~ 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) ~~and bias~~ for each instrument with respect to the reference method. Each instrument will be tested individually.

$$Bias = \frac{\sum^{n}(x_i - r_i)}{n}$$

delete formula

~~where,~~

~~x_i = predicted protein for sample I (replicate 1)~~

~~r_i = reference protein for sample I~~

~~n = number of samples in the test set (n=50)~~

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

where,

$y_i = x_i - r_i$ (see above)

y = average predicted constituent concentration ~~protein~~ minus average reference constituent concentration ~~protein~~

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

The tolerance for SEP is ~~one-half the Handbook 44 acceptance tolerance applied to individual samples~~ shown in Table 2. ~~Specifically, the tolerance is 0.30 for all classes of wheat. The tolerance for bias is 0.20 times the Handbook 44 acceptance tolerance applied to individual samples (± 0.12)~~.

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

Note 1: "All-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" 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 calibrations.*

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

$$SD = \sqrt{\frac{\sum_{i=1}^{n}\sum_{j=1}^{3}\left(P_{ij} - P_i\right)^2}{2n}}$$

where,

P_{ij} = predicted ~~protein~~ constituent concentration for sample I and replicate j

P_i = average of the three predicted ~~protein~~ 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 ~~0.25 x the Handbook 44 acceptance tolerance applied to individual samples.~~ shown in Table 2. ~~Specifically, the tolerance is 0.15 for each class of wheat.~~

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

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

where,

$d_i = P1_i - P2_i$

$P1_i$ = average of three replicates for sample I on instrument 1

$P2_i$ = average of three replicates for sample I on instrument 2

d = average of the 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 ~~repeatability~~ reproducibility is ~~one-third the Handbook 44 tolerance applied to individual samples~~ shown in Table 2. ~~Specifically, the tolerance is 0.20 for each class of wheat.~~

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

6. Criteria for Phase II Testing – On-going Calibration Review

Background:

This item first appeared on the Sector's agenda for its September, 1994 meeting. It was discussed again at length at two meetings in 1995, and again at the March 1996 meeting. In 1997, considering the fact that: (1) an increasing number of NIR analyzers were being used commercially for grains not covered by the code; and (2) the certification date for the NTEP Lab had been delayed indefinitely, the Sector decided to give priority to modifying the Tentative Code to cover additional grains. Deciding how to handle type approval was postponed indefinitely.

Although agreeing that participation in a monitoring program of some sort should be mandatory for NTEP instruments, the Sector had difficulty in reaching a consensus on the exact details of such a program. The Sector did agree that whatever program was finally decided upon, it should be reviewed at the end of each year to assess its value and to determine if it should be continued, modified, or abandoned.

To minimize annual costs to manufacturers, an on-going monitoring program that, to the greatest extent practical, could take advantage of GIPSA's procedures for monitoring the official system's performance over time was proposed. To that end, the Sector approved the addition of the following paragraph to Publication 14, Chapter 7, at the end of part IV**.** *Tolerances for Calibration Performance:*

> For the on-going review of calibrations, instrument protein results and calibration data will be collected on 100 samples per class each year on each model in the NTEP program. Eighty of these samples will be selected from the 100 calibration verification (C/V) samples on which GIPSA has obtained spectral data. The additional twenty will be selected from moisture survey samples. Existing combustion-nitrogen-analyzer (CNA) protein values will be used for the 80 C/V samples. CNA analysis will be obtained for the 20 moisture survey samples. Instruments will be required to simultaneously provide predicted proteins and spectral data. The required data will be collected over time as samples, instruments, and operators become available with the goal of providing optical and chemical data, along with a summary report comparing predicted protein values to the CNA reference analyses, to manufacturers by January 1 of each year.

At the Sector's March 1996 meeting, some Sector members were of the opinion that if a performance problem was addressed through a calibration change, a common, independent validation set (not part of the calibration set) should be used to verify that the desired objective had been achieved. One Sector member had suggested that manufacturers be allowed to contribute "golden" samples to the validation set. Another suggested that the validation set contain samples that had historically shown poor agreement with the CNA protein values.

Although originally recommending that recalibration of NTEP instruments be done using (as a minimum) data obtained on samples selected from the same sample pool from which GIPSA/FGIS selected samples for calibrating the Official instrument, it was later determined that this would not be possible in cases where GIPSA had used "historical" samples which now exist only as spectral data (obtained on the GIPSA Official instrument) and not as physical samples.

[Note: As used above, "monitoring" applies to tests performed on the instruments in the NTEP lab and not to devices in the field. "Recalibration" means derivation of a new set of calibration coefficients. Slope and bias adjustments are not considered "recalibration".]

After considering the practical aspects of obtaining the necessary samples and the cost of a validation program to manufacturers the Sector distilled the issue to the simple question of, "How should the NTEP lab evaluate a calibration change?" The Sector agreed that the answer was simply, "The same way they evaluated the calibration initially." The Sector also agreed that spectral and CNA data would be made available to manufacturers for re-predicting the results of calibration changes.

Discussion:

With the exception of the final paragraph, Part IV, *Tolerances for Calibration Performance,* in the Near Infrared Grain Analyzers chapter of Publication 14, consists of information copied directly from the Grain Moisture Meter chapter of Publication 14. Section IV, which deals mostly with an on-going calibration review program, requires major revisions before it can be used. Because many of the Sector's earlier decisions regarding validation and monitoring were based on devices measuring only wheat protein, and because it had been suggested that the rapid

evolution of calibration techniques, such as artificial neural networks, might materially change the way a maintenance program should be set up, the Sector reviewed its earlier decisions on this subject to see if they were still applicable. The earlier decisions included:

- Participation in a monitoring program of some sort should be mandatory for NTEP NIR analyzers.
- Data should be collected (and made available to manufacturers) annually by the NTEP laboratory on instruments in an on-going calibration review and maintenance program for NIR grain analyzers.
- Only reference method constituent data (corrected to the standard moisture bases specified in HB44) and basic instrument data (spectra, calibration IDs, and predicted values) would be provided (i.e., no moisture data would be provided).
- No more than 100 samples per year per grain type would be required for calibration review or monitoring purposes.
- The problem of capturing new crop problems in local areas would be up to the manufacturer to address [and need not be part of the monitoring program].
- The accuracy limits used for NTEP approval should also apply to the annual review of NTEP calibrations.

  Note: As presently worded, the tolerance for Standard Error of Performance (SEP) is one-half the Handbook 44 acceptance tolerance applied to individual samples, and the tolerance for bias is 0.20 times the Handbook 44 acceptance tolerance applied to individual samples. For type approval testing, data for these tests are collected on a specially selected sample set, and any sample result not within three standard deviations of the mean for the test instrument is deleted before analysis of the data. Although three replicates are run on each instrument for each sample, only the first replicate is used to calculate SEP and bias for each instrument. The suggested tolerances may be overly restrictive when applied to data collected on a random set of samples in an on-going monitoring program.

The Sector wrestled with the question of whether the purpose of Phase II was to acquire additional calibration data, to validate existing calibrations, or to align the system for National consistency. It was argued that the collection of additional calibration data was not an appropriate NTEP function. If a system was needed to acquire calibration data, it could be arranged as a contractual service possibly provided by GIPSA. In the case of grains with multiple constituent calibrations, it was pointed out that 100 samples might not exhibit sufficient range in value for all constituents to provide a meaningful test of all the calibrations. As for aligning the commercial system with the Official system, it was noted that the Tentative Code provides for adjustments of bias using Standard Reference Samples (SRS) traceable to GIPSA Master Instruments (see §UR.2.8. Slope and Bias Adjustments.) Differences between Grain Moisture Meters (GMM) and Near-Infrared (NIR) Grain Analyzers were cited as additional reasons that an on-going monitoring program (other than normal field evaluations) would not be needed for NIR Grain Analyzers: 1) The GMM program requires an on-going calibration review because the calibrations are unstable with time, while NIR calibrations are much more stable; 2) The GMM code does not allow bias adjustments, while the NIR Analyzer code provides a means for controlled bias adjustments.

Recommended:
The Sector agreed that a Phase II On-Going Calibration Review program would not be established for Near-Infrared Grain Analyzers. Changes to calibrations (other than slope and bias) will be considered metrologically significant and will require re-examination by the NTEP Laboratory and issuance of an amended CC. The degree of examination will depend on the nature of the change. In the simplest case, the manufacturer may be permitted to re-predict constituent results using spectral data from the original evaluation. In more complex cases, it may be necessary for the Manufacturer to re-submit the device for whatever testing is deemed appropriate by the NTEP Laboratory. Part IV, *Tolerances for Calibration Performance,* in the Near Infrared Grain Analyzers chapter of Publication 14, is to be deleted in its entirety.

7. Time and Place for Next Meeting

The next meeting is tentatively planned for the week of August 19, 2002 in the Kansas City, MO area. Meetings will be held in one of the meeting rooms at the NOAA Weather Training Center if available. A tentative schedule is shown below.

Wednesday, August 21	1:00 pm - 5:00 pm	GMM Sector Meeting
Thursday, August 22	8:00 am - 12:00 noon	GMM Sector Meeting
Thursday, August 22	1:00 pm - 5:00 pm	joint session GMM & NIR Analyzer
Friday, August 23	8:00 am - 12:00 noon	NIR Grain Analyzer Sector Meeting

ATTENDANCE LIST – NTETC GMM & NIR Grain Analyzer Sectors – Kansas City, MO.

Name	Affiliation	August 2001		
		22	23	24
Jack Barber	JB Associates	x	x	x
Randy Burns	Arkansas Bureau of Standards	x	x	x
Sidney Colbrook	Illinois Department of Agriculture	x	x	x
Bob Davis	Illinois Department of Agriculture	x	x	x
Cassie Eigenmann Pierson	DICKEY-john Corp.	x	x	x
Arnold Eilert	Bran+Luebbe	x	x	x
Rich Flaugh	GSF Inc.	x	x	x
David Funk	GIPSA	x	x	x
Victor Gates	Shore Sales	x	x	
Andrew Gell	Foss North America	x	x	x
Charles Hurburgh, Jr.	Iowa State University Agricultural Engineering Dept.	x	x	x
David Krejci	Grain Elevator & Processing Society	x	x	x
G. Diane Lee	Natl. Institute of Stds. & Technology Office of Weights and Measures	x	x	x
Steve Modiano	Monsanto Co.	x	x	x
Tom O'Connor	National Grain & Feed Association	x	x	x
Steve Patoray	NCWM, Inc.	x	x	x
Richard Pierce	GIPSA	x	x	x
James Rampton	GIPSA	x	x	
Cheryl Tew	North Carolina Dept. Of Agriculture & Consumer Services Standards Division	x	x	x
Ambler Thompson	NIST	x	x	
Diane Wise	Colorado Dept. of Agriculture Measurement Standards Section	x	x	x
Robert Wittenberger	Missouri Dept. of Agriculture Div. of Weights and Measures	x	x	x

National Type Evaluation Technical Committee (NTETC)
Grain Moisture Meter (GMM) Sector
August 20-21, 2003 - Kansas City, Missouri

Meeting Summary

Agenda Items

1. United States Department of Agriculture (USDA), Grain Inspection Packers and Stockyards Administration (GIPSA)/National Institute of Standards and Technology (NIST) Interagency Agreement Renewal
2. Update on NTEP Type Evaluation and Ongoing Calibration Program (OCP) (Phase II) Testing
3. Type Evaluation and OCP Issues
   a. Proposed Change to Publication 14 – Phase II Bias Tolerances
   b. Proposed Change to Publication 14 – Moisture Range for Hard White Wheat
   c. Correction to Grains Table in NTEP Application for Type Evaluation
4. Report on OIML IR 59 "Moisture Meters for Cereal Grains and Oilseeds"
5. Proposed Addition to OIML IR 59 to Address Influence of External Disturbances
6. Report on the 2003 NCWM Annual Meeting – GMM Issues
7. Proposed Changes and Additions to Publication 14 for Meters with Test Weight per Bushel Capability
   a. Additions to the "Type Evaluation Test Procedures and Tolerances" Section
   b. Changes/Additions to the Checklist Section

☆ 8. NTEP Committee Authorizes "Dual Certification"
☆ 9. Proposed Changes to Publication 14 to Improve Consistency between GMM and NIR Checklists
☆ 10. NTETC GMM/NIR Sector Support - Response to Sector's Letter to NCWM Chairman
☆ 11. Time and Place for Next Meeting

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

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1. GIPSA/NIST Interagency Agreement Renewal

The current five-year Interagency Agreement between GIPSA and NIST that provides funding for the Grain Moisture Meter On-going Calibration Program (OCP) will expire at the end of the Federal Government's Fiscal Year 2004 (September 30, 2004). 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 the cost of the program subject to an annual maximum of $18,000 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. The fee schedule has remained fixed since October 1, 1999. NIST and GIPSA have reviewed costs associated with the program and a revised fee schedule has been proposed. Implementation of the proposed fee schedule, which would become effective at the start of FY2005 (October 1, 2004), is subject to approval by both agencies. Rich Pierce, GIPSA, briefed the Sector on the proposed fee schedule, a draft of which is shown below.

Proposed NTEP On-Going Calibration Program Fee Schedule
For Fiscal Year 2005 to 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 mfg's)	(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

Explanation of columns in the Fee Schedule table:

Column	Explanation (or formula for calculating)
(1) Total Meters	The number of meter types (including the Official GIPSA meter) that will share in the NTEP calibration costs.
(2) Meters in NTEP Pool	The number of meter types other than the Official meter that will share in the NTEP calibration costs.
(3) Cost per NTEP Pool Meter	The cost associated with each pool meter in the program.
(4) Total Program Cost	A per meter type cost of $19,875 times the number of NTEP "pool" meters.
(5) NIST Contribution	One-third the total program cost up to a maximum of $26,500.
(6) GIPSA Contribution	One-third the total program cost up to a maximum of $26,500.
(7) Manufacturers Contributions (total funding from manufacturers)	Total Program Cost minus NIST Contribution minus GIPSA Contribution.
(8) Cost per Meter Type	Manufacturers' Contributions divided by Total Meters (including the Official meter.

Thus, if the current number of five meter types in the program (including the Official meter) remains constant, the annual cost per meter type under the proposed fee schedule will be $5,300 compared to the present annual fee of $3,600.

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

Cathy Brenner, GIPSA, the NTEP Participating Laboratory for Grain Moisture Meters, reported that no new grain moisture meters have been submitted for Type Evaluation in 2003. For the 2003 harvest, the following models will be enrolled in the OCP:
[Note: Models listed on a single line are considered to be of the same "type".]

DICKEY-john Corporation	GAC2000, GAC2100, GAC2100a
Foss North America	Infratec 1241
Foss North America	Infratec 1227, Infratec 1229
Seedburo Equipment Company	1200A [Change in ownership - formerly listed as Motomco 919ES]
The Steinlite Corporation	SL95

Since the inception of the OCP almost 10 years ago, results for each grain and each meter have been compiled using SAS software and returned to manufacturers in voluminous paper reports. Rich Pierce, GIPSA, reported that GIPSA has set a goal for next year to distribute these reports electronically, most likely as PDF files. This change is expected to require a number of minor changes in format, especially in those portions of the report where several graphs now appear on a single page.

3. Type Evaluation and OCP Issues

3.a. Proposed Change to Publication 14 – Phase II Bias Tolerances

Background: The NTEP Phase I program provides for calibration testing and approval of three or more grain types over a 6 percent moisture range determined by the Sector to be the most economically significant for each grain. Basic 6 percent moisture ranges are identified in the NTEP Application for Grain Moisture Meters. At the completion of Phase I testing, meters are typically biased close to the GIPSA, and NTEP laboratory, air oven reference. In the Phase II OCP, calibration performance is tested over a wider range of grain moisture content. Calibration performance is checked against both "Approved" (one-half of the Handbook 44 Acceptance and Maintenance Tolerance) and "Pending" tolerances ("Approved" tolerance plus a 95 percent confidence interval). The "Pending" classification is used to identify the operating moisture range for each grain for field instruments.

Proper application of "Pending" tolerances can prevent requiring calibration changes based on insufficient data. Conversely, these wider tolerances allow field use of calibrations that are biased as much as 0.4 to 0.6 percent moisture content away from the reference air oven and other NTEP meters. Situations currently exist where calibrations do not meet NTEP Approval Tolerances for a single 2 percent moisture interval, but do meet the wider tolerances of the "Pending" classification. These calibrations are still included on the NTEP Certificate of Conformance and are still being used in commercial transactions. In these instances, the calibrations no longer meet the criteria for NTEP Phase I calibration approval over the required basic 6 percent moisture range.

Discussion: The Sector considered a proposed change to Publication 14 that would require calibrations to meet Phase I tolerances (without the application of a confidence interval) over the basic 6 percent moisture range. A number of Sector members were concerned that different meter types were not as closely aligned as they could be. In the absence of a mandated change, some manufacturers haven't kept up with aligning their calibrations with the air oven.

Charles Hurburgh, Jr., Iowa State University, pointed out that if there is a statistically significant bias between two meters and both meet "Approved" tolerances, then the tolerance is too broad. It was suggested that statistics are needed to show that meters as a cluster are aligned with each other in addition to aligning with the air oven. Rich Pierce, GIPSA, reported that even though data from the most recent 3 years is considered in analyzing OCP results, the confidence intervals have not been greatly reduced. The problem is especially acute in the moisture regions outside the basic 6 percent moisture range. With only the most recent 3 year data available, many of the 2% moisture intervals at the moisture extremes have an insufficient number of samples to support continued use at these moisture levels unless the manufacturer supplies supporting historical data. Any interval supported by manufacturer-supplied data (even if it is historical OCP data) is automatically classified as "Pending" approval under NTEP. In more than one instance this has caused previously "Approved" moisture ranges to be reclassified as "Pending" ranges. Steve Patoray, NTEP Director, questioned the intent of the first sentence of the definition of "Pending" which states, "A new calibration will automatically be placed in this category." Sector members agreed that, as presently worded, this sentence confused the definition. It was intended to apply to calibrations that had not been validated in the OCP. It was also suggested that once a calibration range has been classified as "Approved" it should not be reclassified as "Pending" in the absence of data. The need to distinguish between "Approved" and "Pending" approval ranges was questioned. While all agreed that in practical day-to-day use the distinction between "Approved" and "Pending" had no significance, several members believed the distinction was important to prospective GMM buyers who could use this information in making informed comparisons between different GMM models.

Conclusion: The Sector reached the following conclusions on the issues raised in connection with this agenda item:

1. The Sector agreed to recommend the following change to Publication 14 to require calibrations to meet Phase I tolerances over the basic 6 percent moisture range (without the application of a confidence interval). In the GMM Checklist of Publication 14, section "**IV. Tolerances For Calibration Performance**:" revise paragraph three, and modify the definitions of "Approved" and "Pending" to read:

   In order for a calibration to remain on the certificate of conformance, the calibration must continue to meet "Approved" tolerances for all 2 percent moisture intervals in the basic 6 percent moisture range. This requirement is waived if a 2 percent moisture interval contains fewer than five samples. For 2 percent moisture intervals outside the basic moisture range, t~~T~~olerances used to require a change in calibrations will include the application of a 95 percent confidence interval

to the maximum tolerance for each 2 percent moisture interval. The intent of applying the confidence interval is to avoid forcing a calibration change based upon insufficient data. After only one year of data collection, the number of samples in some intervals will be small, and the confidence interval may be as large as the tolerance limit. In this instance, the calibration would have to be extremely poor before a calibration change would be mandated. After the instrument has been in the calibration program for several years, the confidence interval should be reduced to approximately 0.05 and recommendations can be made with greater certainty. The latest three years of data will be used to make decisions regarding the need to make a calibration update.

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Approved: Corn, HRW wheat, and soybean calibrations will be approved based upon performance over the 6 percent type evaluation moisture range and manufacturer supplied data. Continued approval requires acceptable performance as part of the ongoing national calibration effort.

Calibration data, collected as part of the national calibration program, must indicate that calibration performance meets the tolerances for each 2 percent moisture interval before additional grains will be approved. Continued approval again requires acceptable performance as part of the national calibration effort, (i.e., none of the average differences between predicted and reference values for the respective 2 percent moisture intervals exceed one-half the Handbook 44 acceptance tolerance within the basic 6 percent moisture range and one-half the Handbook 44 acceptance tolerance plus a 95 percent confidence interval outside the basic 6 percent moisture range).

Pending: A new calibration that has not been validated by ongoing calibration data collected as part of the national calibration program will automatically be placed in this category. This category also includes calibrations that have not yet met the criteria for approval, but that also have not performed badly enough to be listed as not approved. Such calibrations may be used on NTEP-approved meters.

2. The Sector agreed to recommend revising the first sentence of the definition of "Pending" to clarify its intent.
3. Although first agreeing to recommend changes that, in the absence of data, would not cause a calibration range originally classified as "Approved" to be reclassified as "Pending," the Sector subsequently rescinded their recommendation. Among the reasons for taking this action was the fact that it would not be applicable to a calibration that had been changed after the original approval if NTEP lab data were no longer available for the range in question. The Sector was in general agreement that ranges supported by manufacturer supplied data (even if it is historical OCP data) should automatically be classified as "pending" approval, because the NTEP lab had no way to validate the integrity of such data. Additionally, because Part V of the GMM checklist, which lists a set of well-developed rules for dealing with inadequately represented moisture intervals and for handling manufacturer supplied data, would require extensive revision if extended moisture ranges were granted permanent approval in the absence of data indicating otherwise, the Sector decided to defer action on this proposal until the issues of approval tolerances and uniformity among meters could be studied more thoroughly.

A subcommittee was formed to look at approval tolerances and uniformity among meters. Dr. Charles Hurburgh, Jr., Iowa State University, agreed to act as chair. Other subcommittee members include:

Jack Barber	JB Associates
Cassie Eigenmann-Pierson	DICKEY-john, Corp.
Andrew Gell	Foss North America
G. Diane Lee	NIST-WMD
Tom O'Connor	National Grain & Feed Association
Richard Pierce	GIPSA [NTEP Participating Laboratory]

3.b. Proposed Change to Publication 14 – Moisture Range for Hard White Wheat

Discussion: The NTEP Application for Grain Moisture Meter evaluation and the Table of Moisture Ranges and Tolerance for Sample Temperature Sensitivity in Appendix D of the GMM Checklist in Publication 14 specify a moisture range of 10 – 16% for Hard White Wheat. The NTEP required moisture ranges were initially selected to represent typical market ranges. In the last 3 years, however, GIPSA has not received any 14 – 16% moisture samples of Hard White Wheat for the Phase II ongoing calibration program. It appears that a moisture range of 8 – 14% would be more appropriate for Hard White Wheat.

Conclusion and Recommendation: The Sector agreed to recommend changing the "NTEP Required Moisture Range" for Hard White Wheat from "10-16%" to "8-14%" in the table on page 4 of NTEP Application form for Grain Moisture Meters (Issue - January 2003). The Sector also recommended changing the Hard White Wheat moisture range from "10-16%" to "8-14%" in the table in Appendix D of the GMM Checklist of Publication 14 as shown below. [Note: Missing quotation marks also need to be added in the table's heading. In addition, Medium Grain Rough Rice with a moisture range of 10-16% and tolerance limit of 0.45 as approved at the Sector's September 1997 meeting needs to be added; this entry to the table was inadvertently omitted from the 2001 and 2002 editions of Publication 14.]

Moisture Ranges and Tolerance for Sample Temperature Sensitivity (for the "Other 12" NTEP Grains)		
Grain Type	**Moisture Range for Test**	**Tolerance Limit (Bias at Temperature Extremes)**
Durum Wheat	10-16%	0.35
Soft White Wheat	10-16%	0.35
Hard Red Spring Wheat	10-16%	0.35
Soft Red Winter Wheat	10-16%	0.35
Hard White Wheat	~~10-16~~8-14%	0.35
Sunflower seed (Oil)	6-12%	0.45
Grain Sorghum	10-16%	0.45
Two-rowed Barley	10-16%	0.35
Six-rowed Barley	10-16%	0.45
Oats	10-16%	0.45
Long Grain Rough Rice	10-16%	0.45
Medium Grain Rough Rice	10-16%	0.45

3.c. Editorial Correction to Grains Table in NTEP Application for Type Evaluation

Discussion: Note 2 following the Table of Grain Types on page 4 of the NTEP Application for Type Evaluation states:

> Similar grain types are grouped within double lines above; testing of a meter with any grain in a given grouping will enable the evaluation to cover all grains in the grouping. For example, successful testing of a meter with two-row barley will result in the issuance of a Certificate which lists all of the other types of grain within the grouping, that is six-row barley and oats.

The "double lines" referred to in Note 2 are missing in the current edition of the Application.

Conclusion and Recommendation: The Sector recommended restoring double lines to the Table of Grain Types on page 4 of the NTEP Application for Type Evaluation to separate the grain types into seven groups as shown below:

group 1:	Corn
group 2:	Soybeans
group 3:	Hard Red Winter Wheat
	Durum Wheat
	Soft White Wheat
	Hard Red Spring Wheat
	Soft Red Winter Wheat
	Hard White Wheat
group 4:	Two-Row Barley
	Six-Row Barley
	Oats
group 5:	Sunflower Seed
group 6:	Long Grain Rough Rice
	Medium Grain Rough Rice
group 7:	Grain Sorghum or Milo

[**Editor's Note:** Recent modification of Section 5.56(a) Grain Moisture Meter Code in NIST Handbook 44 to recognize indications and recorded representations of test weight per bushel will require modification of Note 2 to stipulate that the groupings apply only to testing for moisture and NOT to testing for test weight per bushel. The Sector has not taken action on this issue, but suggested changes to Note 2 are shown below with the expectation that the change can be considered an editorial change not requiring a formal Sector ballot.]

> Similar grain types are grouped within double lines above; testing of a meter with any grain in a given grouping will enable the evaluation to cover the moisture calibrations for all grains in the grouping. For example, successful testing of a meter with two-row barley will result in the issuance of a Certificate which lists moisture calibrations for all of the other types of grain within the grouping, that is six-row barley and oats, provided supporting calibration data has been provided for six-row barley and oats.

4. Report on OIML IR 59 "Moisture Meters for Cereal Grains and Oilseeds"

Background: At an OIML TC17/SC1 meeting in Berlin, Germany on June 22, 2001 the U.S. Delegation put forth a series of proposals to revise OIML IR 59 "Moisture Meters for Cereal Grains and Oilseeds." These proposals were well received and it was requested that the U.S. prepare a draft based on the U.S. NTEP program. A rough draft of this document was reviewed at the August 2002 GMM Sector meeting. NIST, Weights and Measures Division (WMD) prepared a working draft, incorporating changes suggested by the Sector, and the draft was submitted to U.S. and International Working Groups in February 2003 for comment. NIST WMD, which is responsible for U.S. participation and representation in the technical activities of the OIML, compiled comments to the working draft for review by representatives of the U.S. National Working Group (USNWG). The working draft was modified to address comments where it was judged appropriate. The modified working draft and a table of responses to the comments received to the working draft were distributed to USNWG members May 28, 2003. Subsequently, the Secretariat (the Peoples Republic of China) distributed the revised working draft as the "First Committee Draft" to OIML TC17/SC1 for review and comment by the member states of the subcommittee. China has requested that any additional comments be submitted no later than August 31, 2003. To comply with this request, Diane Lee, WMD, asked USNWG members to submit their comments to her by August 18, 2003. The next OIML TC17/SC1 meeting is October 15-16, 2003 in Beijing, China.

Discussion: Diane Lee, WMD, reported that, as of August 19, she had not received any comments from the USNWG other than the recommendation covered by GMM Sector Agenda item 5. Sector members who are on the USNWG were urged to submit comments by an extended deadline of August 27 so they could be included in her submission to the Secretariat. One Sector member suggested removing the acidity index requirement of clause 5.4. The acidity index is a measure of fatty acids in oil seeds. The test is expensive and should not be necessary if care is taken to avoid using rancid/spoiled samples. Richard Cantrill, American Oil Chemists' Society (AOCS), noted that ISO TC-34/SC2, Oleaginous Seeds and Fruits, is working on a revision of ISO Standard 7700-2 *Checking the performance of moisture meters in use -- Part 2: Moisture meters for oilseed*, and that ISO 7700-2 makes reference to the previous version of OIML IR-59. He suggested that the Secretariat of OIML TC71/SC1 contact the Secretariat of ISO TC-

34/SC2 to make them aware that IR-59 was being revised. Diane Lee agreed to pass this suggestion on to the Secretariat of OIML TC71/SC1.

5. Proposed Addition to OIML IR 59 to Address Influence of External Disturbances

Discussion: OIML R59 (1984) includes the following requirement without specifying the details of the tests to be performed:

> **Influence of external disturbances**
> Additional tests are carried out on moisture meters containing electrical and electronic parts, to evaluate the disturbances caused by the external magnetic fields, electro-magnetic radiations, electrostatic discharges failures of the electric power supply (interruptions of short duration, transient over-voltages, etc.)

The First Committee Draft (May 2003) of OIML IR 59 includes no requirement covering the influence of external disturbances. At present, Grain Moisture Meters sold in the Europe must comply with the European Union's harmonized standard EN 61326 (incorporating amendments A1: 1998 and A2: 2001), *Electrical Equipment For Measurement, Control And Laboratory Use – EMC Requirements,* which specifies radio frequency emission limits as well as test requirements for immunity to external disturbances caused by external magnetic fields, electro-magnetic radiations, electrostatic discharges, surges, and failures of the electric power supply (interruptions of short duration, transient over-voltages, etc.). Including a reference to the influence tests of IEC 61326 (the equivalent of EN 61326) and specifying what constitutes a significant fault is suggested to correct this oversight.

Conclusion and Recommendation: The Sector agreed to submit recommendations for additions to sections of R59 as shown below to address the influence of external disturbances.

Add to the Metrological Requirements section:

5.9 Influence of external disturbances

5.9.1 When subjected individually to the disturbances specified in the immunity tests of IEC 61326 (latest revision) the meter shall not exhibit a significant fault as defined in 3.2.1.

Add to the Terminology section:

3.2.1 Significant fault
A fault the magnitude of which is greater than the magnitude of the maximum permissible errors in 5.3.1.

NOTE: The following faults are considered not to be significant.

a) Faults implying the impossibility to perform any measurement;
b) Transitory faults being momentary variations in the indication, which cannot be interpreted, recorded or transmitted as a measurement result; and
c) Faults giving rise to variations in the measurement results that are so large as to be noticed by all users of the instruments.

6. Report on the 2003 NCWM Annual Meeting

Background: Two items of interest to the GMM Sector were addressed as voting items by the Committee on Specifications and Tolerances (S&T) at the NCWM Annual Meeting on July 13-18, 2003.

356(a)-1	**Recognize Indications and Recorded Representations of Test Weight Per Bushel**
Source:	GMM Sector
Recommendation:	Modify Section 5.56(a) Grain Moisture Meter Code in NIST Handbook 44 to recognize indications and recorded representations of test weight per bushel.

356(b)-1	**T.3. For Test Weight Per Bushel Indications or Recorded Representations**
Source:	Central Weights and Measures Association (CWMA)
Recommendation:	Modify paragraph T.3. of Section 5.56(b) Grain Moisture Meter Code Section in NIST Handbook 44 to clarify that it applies to separate accessory devices (such as a beam balance test weight apparatus) used to determine test weight per bushel of grain samples for the purpose of making density corrections in moisture determinations.

For additional background refer to *Committee Reports for the 88th Annual Meeting,* NCWM Publication 16, April 2003.

Discussion: At the 88th NCWM Annual Meeting held July 13 – 18, 2003 the NCWM voted to adopt changes to NIST Handbook 44 proposed under **Agenda Item 356(a)-1** and **Agenda Item 356(b)-1**. The NIST Weights and Measures Division recommended that the proposal, Item 356(a)-1, include SI (metric) units of measurement. The S&T committee heard one comment that different methods are used for test weight measurements. The S&T committee made no decision to include the metric units and the original proposal from the Sector was accepted. In the U.S. the bulk density of grain is expressed in pounds per bushel and is based on a specific USDA test method. In Europe (and other countries using the metric system) bulk density is expressed in kilograms per hectoliter and is based on a specific ISO test method. A straight units conversion of lb/bu test weight to kg/hL using the USDA method does not equal the kg/hL result of the ISO test method. A slope and bias must be applied to the units conversion to account for the differences caused by using two different test methods. When export contracts for wheat require that bulk density be certified in kg/hL, GIPSA currently uses a special adjustment from a U.S. test weight (lb/bu) to an "ISO standard" test weight (kg/hL). For all other grains, a simple units conversion is used to obtain values in kg/hL test weight. Some Sector members thought that the inclusion of a metric tolerance was potentially confusing in the U.S. marketplace. Others were of the opinion that this was not an issue in the U.S., because U.S. grain standards are based on the USDA test method for bulk density and are expressed in lb/bu. Several GMM manufacturers indicated that their devices had the capability of expressing bulk density in either U.S. Customary or metric units based on a straight units conversion. However, they stated that a different bulk density calibration was used for devices sold in countries where bulk density was based on the ISO test method. The Sector took no formal action on this matter.

7. Proposed Changes and Additions to Publication 14 for Meters with Test Weight per Bushel Capability

7.a. Additions to the "Type Evaluation Test Procedures and Tolerances" Section

Background: A subcommittee prepared a draft of additions to the "Type Evaluation Test Procedures and Tolerances" Section of NCWM Publication 14 to cover the evaluation of GMMs incorporating test weight per bushel (TW) capability. In developing the draft, which was presented to the Sector at its August 2000 meeting, the subcommittee considered the following:

1. To minimize the cost of type evaluation testing and provide an existing database for manufacturers to use in evaluating the proposed procedures, the subcommittee initially considered structuring tests to parallel the tests already established for GMMs. While this approach was determined to be feasible for most of the basic instrument tests, the subcommittee felt that test procedures and sample set selection should be modified for some tests to place the emphasis on test weight effects rather than on moisture effects. This was a particular concern for the accuracy, precision, and reproducibility tests in Phase I.

   A related concern is that Phase II samples are the primary source of Phase I accuracy samples. By the time air oven portions (200 g) have been cut out of the samples, only one-half to two-thirds of the samples are large enough to obtain a test weight reference value for Phase I tests using the procedures specified by the standard quart kettle method; the standard method requires a 1000 - 1050 gram sample for all grains except oats and sunflower seed. Also, the TW values currently being supplied to participants in the GMM Phase II on-going calibration Program (OCP) cannot be considered "official" test weight results. Some of these TW values are obtained using samples just large enough to fill the TW kettle with very little overflow. Sample packing and TW results are typically reduced for these samples.

Because TW readings are influenced by test conditions that affect grain surface characteristics, for some tests it is not desirable to use the same procedures for GMM and TW evaluations. For example, it seems desirable to reduce the number of repetitions per sample to avoid "polishing" grain samples. Also, it may be necessary to conduct all TW testing in an environmental chamber in which relative humidity can be controlled.

For the above reasons (and for the reasons given in item 3, below), TW evaluations were not incorporated into the existing Phase I GMM tests; instead, addition of a new subsection containing only TW test procedures and tolerances was proposed.

2. The subcommittee proposed that display and printout of TW be confined to moisture measurements within the 6% minimum NTEP required moisture range specified in the Application for NTEP testing for the following reasons: 1) measurement of TW beyond the upper limit of the 6% range is going to be of questionable accuracy/precision; 2) the moisture region of greatest importance for TW is at or near normal moistures associated with storage or no-dockage-for-moisture levels which are included in the minimum NTEP required moisture range. The subcommittee's decision to limit TW to the "standard" 6% moisture ranges was not unanimous. Tom Runyon, Seedburo, favored using the same moisture range for both TW measurements and moisture measurements, because grains coming into the initial receiving stations at harvest exhibit moistures that are at the upper levels of the approved moisture ranges. When there is an issue of low test weight due to poor weather conditions or stress during maturation stages, grain elevators need to identify a Low Test Weight condition at first receipt, not just after the grain has been dried to the lower moisture levels.

3. The matter of sample selection for TW was given serious consideration. Samples currently selected for moisture testing may not be suitable for TW testing. Because of existing criteria for selecting samples for Phase I moisture accuracy tests, it is already difficult to assemble a set of test samples. Imposing additional selection criteria for TW may make it impossible. The following criteria were included in the initial draft proposal submitted to the Sector:
   a) a total of 12 samples will be used per grain type.
   b) no less than 8 samples should come from the lowest two-thirds of the 6 % moisture range.
   c) no less than 2 samples should come from the highest one-third of the 6 % moisture range.
   d) samples should represent a distribution of TWs (ranges to be determined).
   e) for the entire population of 12 samples, the correlation (R^2) between moisture and reference TW is to be less than 0.20.

4. The reference value for TW will be the average of 3 replicates on GIPSA's quart kettle apparatus. Samples will be dropped three times through each of two meters. The average of the initial and final reference values shall be used as the reference value in calculations of meter performance.

5. To have a sufficient number of measurements to determine TW accuracy, the subcommittee proposes that bias and Standard Deviation of the Differences (SDD) be calculated for each instrument using the entire sample set of 12 samples. In addition, a tolerance will be applied to the slope between measured TW (the average of the 3 TW measurements of a sample) and the reference TW (the average of 3 determinations as described above). Slope limits between 0.99 and 1.01 were proposed.

6. TW accuracy, repeatability, and reproducibility tests should be performed on all NTEP grains.

Discussion: In addition to reviewing the performance tests and tolerances in the Subcommittee's draft proposal, the Sector considered the following questions:

1. What TW range should be specified for Hard Red Winter wheat samples used in the instrument stability and instrument temperature sensitivity tests?
2. What TW range should be specified for samples used in accuracy, precision, and reproducibility tests?
3. Should the moisture range for TW measurements be restricted to a 6% range? If not, how should the moisture range be determined, and should tolerances be different at higher moistures?
4. Should Phase II testing be required for TW? If so, how should tolerances be applied and over what range of moistures?

The questions related to limiting moisture ranges for TW measurements were the subject of lengthy discussion. The Sector acknowledged that for practical reasons samples used in NTEP testing would have to be of a restricted moisture range. Sample stability and availability were the major limitations to expanding the moisture range of samples used in Phase I testing. On the other hand, it seemed equally impractical to have different upper limits on grain moisture for TW than for moisture measurements, because grains coming into the initial receiving stations at harvest exhibit moistures that are at the upper levels of the approved moisture ranges. When there is an issue of low test weight due to poor weather conditions or stress during maturation stages, grain elevators need to identify a Low Test Weight condition at first receipt, not just after the grain has been dried to the lower moisture levels. In addition, restricting the display and print out of TW information at higher moistures would unnecessarily prevent measurement of TW for operational use (such as binning and drying) as opposed to commercial use.

The suggestion to allow display and print out of TW beyond the 6% moisture interval provided the device gave a clear warning that the TW was "outside limits" was deemed impractical by device manufacturers who indicated that major firmware changes would be required to apply different moisture limits to moisture measurements and TW measurements for different grains. Other members expressed the opinion that different moisture limits would be confusing to producer and grain handlers alike.

One Sector member suggested that the issue should be viewed from the perspective of how TW affects the money paid for grain:

> **Corn** - TW becomes important only if TW is very low. Low TW occurs only infrequently. In years when it does, it is typically common to an entire growing region. There is a big difference between typical TW and unusually low TW. Even if accuracy and precision of the TW measurement is reduced at higher moistures, it is still possible to identify a low TW condition.
>
> **Wheat** - TW is important on wheat every day, but the proposed 10-16% moisture range is where most wheat is harvested.
>
> **Soybeans** - TW is somewhat important, but the proposed 6% moisture range includes normally harvested moistures.

This sector member concluded that allowing display of TW beyond the proposed limits was not a problem as there was no significant economic impact on TW accuracy beyond the proposed limits. Another member disagreed, citing the common harvesting of double-cropped soft red winter wheat in his area at moistures above 16%. He questioned how field-testing should be handled if TW results are allowed to be displayed on higher moisture grains. Would the same tolerances apply to TW at higher moistures? If so, should a device be failed if it passes tests using samples within the 6% interval but is out of tolerance on higher moisture samples? It was suggested that field-testing should be limited to moistures within the 6% range. Refrigeration of TW transfer samples is not recommended, and the ability to maintain the integrity of test samples at higher moistures without refrigeration is questionable. Also, the precision of the device under test and the precision of the standard method begin to suffer at higher moistures. The Sector concluded that field-testing at higher moistures did not seem practical.

To satisfy both the need to limit moistures for NTEP Phase I testing and the need to provide TW indications at moistures beyond those used in Phase I tests, it was decided that grain moisture meters would be allowed to use the same moisture range for both TW measurements and moisture measurements. On CCs, TW calibrations would be shown as "approved" over a 6% moisture range and "pending" over the remainder of the meter's moisture range. Participation in the Grain Moisture Meter Phase II calibration monitoring program would be required to verify performance over the TW "pending" range. Although the TW data available from the Phase II program may not be suitable for use in the basic instrument tests of Phase I, it was thought that the data would be acceptable for determining the degree to which TW measurements are a function of moisture over the device's operating moisture range. The Sector unanimously agreed to recommend that the following criteria be included in the checklist to address this concern:

- The slope of TW error with respect to TW shall not be significant at a 95% confidence level over the 6% moisture range.
- The slope of TW error with respect to percent moisture content shall not be significant at a 95% confidence level over the “Approved” and “Pending” moisture range of the device.

For all the proposed Publication 14 tests, the Sector was in full agreement that the range of sample TWs should be no less than the range that is grade determining. For example, for yellow dent corn the minimum test weight per bushel is: 56 pounds per bushel for grade #1; 54 pounds per bushel for grade #2; and 52 pounds per bushel for grade #3. Thus, the minimum range specified for corn will be 52 to 56 pounds per bushel. The Sector did not specifically address the cases of rice for which TW is not a grade factor, and sunflower, which uses a single minimum TW (25 pounds per bushel) for all three grades.

The Sector reviewed a proposed addition to Publication 14 that reflected changes made to the subcommittee's draft by the Sector at its August 2000 meeting. The Sector also considered the following three items that had not been fully resolved at that meeting.

1) Sample Volume Test. The angle of repose of wet corn (22%) is different than that of dry hard red winter wheat. If the device uses a sensor in the hopper to detect adequate sample size, it could conceivably pass the test on wheat but not detect insufficient volume when used with wet corn. Naturally moist wet corn may not be available at the time of year when a device is submitted for testing. It hasn't been determined that artificially moistened corn could be used for this test.

2) It was suggested that tolerances on some of the basic instrument tests were too tight. The subcommittee acknowledged that the tolerances were based on preliminary data and suggested that manufacturers be given the opportunity to see if they are appropriate. The Sector has received no comments from manufacturers to indicate that the tolerances are too restrictive. These limits remain in the draft as originally proposed.

3) What TW ranges should be specified for rice and sunflowers? TW is not a grade-determining factor for rice, and only a minimum TW of 25 lb/bu is specified for sunflower seed.

It was pointed out that the minimum TW ranges proposed for several of the grain types do not cover all the grades specified for those grains in the current U.S. Grain Standards. For example, the specified minimum TW for corn is 52 – 56 lb/bu. This covers only grades 1, 2, and 3. U.S. Grain Standards show requirements for 5 numbered grades with 46 lb/bu the minimum TW for corn. There was concern that expanding the ranges to cover the full range of TWs for all grades of a grain would make it difficult to obtain samples for testing. In many years very low TW samples are not available. The Sector agreed that the recommended ranges address the areas of economic significance.

Conclusions and Recommendation: The Sector decided to leave the Sample Volume Test as originally proposed. Corn will not be used for this test. The Sector has received no comments from manufacturers to indicate that the proposed tolerances are too restrictive, so the tolerances remain as originally proposed. Manufacturers are not required to have a TW calibration for rice, but the Sector agreed to a range of 42 – 46 lb/bu for Long Grain Rough Rice and 44 – 48 for Medium Grain Rough Rice for testing purposes if a calibration is provided for those grains. A TW calibration for sunflower seed will be tested over a range of range of 24 – 27 lb/bu. TW ranges were left as originally proposed. The Sector also decided that it would not be necessary to monitor TW calibrations in the OCP. Because TW depends on the direct measurement of mass and volume, TW calibrations are not expected to be subject to the same variations that affect moisture calibrations. It was reasoned that field inspection was adequate to verify TW. Consequently, the requirement for monitoring TW calibrations in the OCP was dropped from the proposed recommendation. TW data will still be collected routinely in the OCP and will be reported to manufacturers.

The Sector agreed to recommend adding the following new section (VII.) to the "Type Evaluation Test Procedures and Tolerances" section of the Grain Moisture Meter portion of NCWM Publication 14. [Editor's Note: Changes/additions involving equations have NOT been highlighted or underlined. The MS change-tracking feature does not mark changes or additions made using MS Equation Editor.]

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

A. Basic Instrument Tests:

Basic instrument tests will be conducted using a stable moisture (12%-14%) HRW wheat sample to check the effect of sample volume variations, power supply fluctuations, storage temperature, leveling, and warm-up time. Instrument stability tests will be conducted using HRW wheat samples selected from all three 2 percent moisture intervals in the 10 percent to 16 percent moisture range. All instrument tests will be conducted on each of the two instruments submitted by a manufacturer. For purposes of these tests, room temperature will be defined as 22 ºC " ±2 ºC.

Sample Volume. A single HRW wheat sample with a moisture content between 12 percent and 14 percent will be used for this test. A quantity of 500 grams (or the maximum amount that can be loaded into the instrument's sample hopper) will be measured 3 times. This quantity will be reduced by 10 grams and then measured 3 times. The sample will continue to be reduced by 10 grams for each set of 3 measurements until the instrument no longer displays and records a test weight per bushel result. The average of each set of 3 measurements will be calculated.

The maximum difference between any of the calculated averages shall not exceed 0.30 pounds per bushel.

Initial Precision. A single HRW wheat sample with a moisture content between 12 percent and 14 percent will be analyzed 10 times at room temperature and nominal line voltage.

Precision will be checked.

The maximum allowable standard deviation of 10 analyses (precision) is 0.20 pounds per bushel.

Power Supply. (Note: This test may be waived for instruments that have met the grain moisture meter test requirements provided that the instruments use the same volume and weight determining means for both moisture and test weight per bushel measurements.) A single HRW wheat sample with a moisture content between 12 percent and 14 percent will be analyzed 10 times with the meter operating at a voltage of 100 V. The voltage will be adjusted to 117 V. After 30 minutes, the HRW sample will be analyzed 10 times. The voltage level will then be increased to 130 V. After 30 minutes, the sample will be analyzed 10 more times.

Changes in bias and precision will be checked. Bias is defined as the change in the average test weight per bushel for 10 analyses made at both the reference and the respective test voltages.

The maximum allowable bias change from the reference voltage (117 V) is" ±0.20 pounds per bushel. The maximum allowable standard deviation of 10 analyses (precision), at any of the three voltage levels, is 0.20 pounds per bushel.

Storage Temperature. A single HRW wheat sample (12%-14% moisture content) is analyzed 10 times at room temperature prior to temperature cycling. The instrument is then powered down and placed in the environmental chamber. The chamber temperature is then increased to 55 ºC over a 1-hour period, and maintained at that temperature for 3 hours. Chamber temperature is then decreased to -20 ºC over a 1-hour period, and maintained at that temperature for 3 hours. The temperature cycle is then repeated. After letting the instrument equilibrate to room temperature for at least 12 hours, the instrument is turned on for the specified warm-up period and the test sample analyzed 10 more times.

The maximum bias shift allowed for the average of 10 drops before and after temperature cycling is " 0.20 pounds per bushel.

Leveling. (Note: This test will be waived for instruments that have met the grain moisture meter test requirements provided that the instruments are equipped with leveling indicators and use the same volume and weight determining means for both moisture and test weight per bushel measurements.) Tests for leveling will be conducted using a single HRW wheat sample (12%-14% moisture content). The leveling test will be conducted for a minimum of 2 orientations, front-to-back and left-to-right, at a tilt of 5 percent. Additional orientations will be tested as deemed appropriate.

The maximum allowable bias shift is " 0.20 pounds per bushel for the average of 5 readings.

Warm-up Time. (Note: This test will be waived for instruments that have met the grain moisture meter test requirements provided that the instruments use the same volume and weight determining means for both moisture and test weight per bushel measurements.) The following test procedures will be used to check warm-up times recommended by the manufacturer. If the manufacturer does not recommend a warm-up time, assume that accurate results will be provided immediately after turning the instrument power on.

The instrument will be powered off and stabilized at room temperature. The instrument will be powered on and after waiting the specified warm-up time a single wheat sample (12%-14% moisture content) will be analyzed 5 times. After waiting for a period of time equal to two times the manufacturer suggested warm-up time, the sample will again be analyzed 5 times. The minimum waiting period before retesting the sample is one hour. Thus, for an instrument where no warm-up time is specified, the sample would be tested immediately upon the instrument being powered up and then again after 1 hour.

The maximum allowable bias shift is 0.20 pounds per bushel for the average of 5 readings.

Instrument Stability. HRW wheat samples will be used to test instrument stability over a minimum 4-6 week period. A set of three samples, representative of the test weight per bushel range of 56 - 60 pounds per bushel, will be selected for testing. These samples may be a subset of the HRW test set for accuracy, repeatability, and reproducibility tests. Each of the 3 samples will be dropped 5 times through each of the two meters prior to running any other type evaluation tests, particularly before running the storage temperature test. The average test weight per bushel obtained for the 15 observations (3 samples x 5 replicates) will be recorded. The 3 samples will be retested once all other type evaluation testing has been completed (within 4 to 6 weeks).

The maximum allowable bias shift over the 4 to 6 week period is 0.20 pounds per bushel.

B. Accuracy, Precision, And Reproducibility Requirements:

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 a pending or higher 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%	52 - 56	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%	52 - 56	
Hard Red Winter Wheat	10-16%	56 - 60	
Durum Wheat	10-16%	56 - 60	
Soft White Wheat (except White Club)	10-16%	56 - 60	
Hard Red Spring Wheat (and White Club)	10-16%	55 - 58	
Soft Red Winter Wheat	10-16%	56 - 60	
Hard White Wheat	8-14%	56 - 60	
Two-Row Barley	10-16%	43 - 47	
Six-Row Barley	10-16%	43 - 47	
Oats	10-16%	30 - 36	
Sunflower Seed (Oil Type)	6-12%	24 - 27	
Long Grain Rough Rice	10-16%	42 - 46	
Medium Grain Rough Rice	10-16%	44 – 48	
Grain Sorghum or Milo	10-16%	53 - 57	

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)

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

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 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.

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:

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

where,

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

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

n = number of samples (n=12)

Tolerances for repeatability are 0.4 x the absolute value of the Handbook 44 acceptance tolerance. Specific tolerances are:

Grain Type	Tolerance
Corn, oats	0.32 pounds per bushel
All wheat classes	0.20 pounds per bushel
Soybeans, barley, rice, sunflower, sorghum	0.28 pounds per bushel

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:

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

where,

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

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

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

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

n = number of samples (n=12)

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

7.b. Proposed Changes/Additions to the Checklist Section

Conclusions and Recommendation: The Sector agreed to the following changes to the checklist section of the Grain Moisture Meter portion of NCWM Publication 14 to reflect recent additions/changes to NIST Handbook 44, Section 5.56(a) Grain Moisture Meter Code that recognize indications and recorded representations of test weight per bushel.

3. Indicating Elements, Recording Elements, and Recorded Representations

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

Note: Requirements cited for "test weight per bushel" indications or recorded representations are applicable only to devices incorporating an automatic test weight per bushel measuring feature.

3.1.	The meter shall be equipped with a digital indicating element.	**Yes**	**No**	**N/A**
3.2.	The minimum height for digits used to display moisture is 10 mm.	**Yes**	**No**	**N/A**
3.3.	The meter is equipped with a communications interface and can transmit the date, grain types, grain moisture results, test weight per bushel results, and calibration version identification.	**Yes**	**No**	**N/A**
3.4.	A digital indicating element or recording element shall not display any moisture content values or test weight per bushel values before the end of the measurement cycle.	**Yes**	**No**	**N/A**
3.5.	The meter shall indicate and/or record ~~only~~ in terms of percent moisture content wet basis. Test weight per bushel results shall be displayed and recorded as pounds per bushel. Subdivisions of ~~this~~ these units shall be in terms of decimal subdivisions (not fractions).	**Yes**	**No**	**N/A**
3.6.	Digital indicating and recording elements shall not display or record any values when the grain moisture content is beyond the operating range specified by the manufacturer, unless the moisture and test weight representations include~~s~~ a clear error indication.	**Yes**	**No**	**N/A**
3.7.	On multi-constituent meters (e.g., meters which also measure grain protein, starch and/or oil) provision shall be made for displaying and recording the constituent label (such as moist, prot., etc.) so as to make it clear which constituent is associated with each of the displayed and recorded values.	**Yes**	**No**	**N/A**

Code Reference: S.1.3. Operating Range

3.9.	A meter shall automatically and clearly indicate when the moisture content operating range has been exceeded. Meters shall not display a moisture result when operating temperature ranges are exceeded. In both instances, a clear error indication is required. A 5 °C tolerance is applied to temperature ranges when testing to verify that moisture results are not displayed or printed when the temperature range is exceeded.	**Yes**	**No**	**N/A**
3.10.	The operating range shall specify the following:			
3.10.1.	The ambient temperature range over which the meter may be used is specified and moisture results are neither displayed nor printed outside this range.	**Yes**	**No**	**N/A**
3.10.2.	The temperature range for each grain or seed for which the meter is to be used is specified and moisture results are neither displayed nor printed outside this range.	**Yes**	**No**	**N/A**
3.10.3.	The moisture range for each grain or seed for which the meter is to be used is specified. Moisture and test weight per bushel values may be displayed when the moisture range is exceeded and an error message is displayed when values are outside the moisture and test weight range.	**Yes**	**No**	**N/A**

3.10.4.	The maximum allowable difference in temperature between the meter environment (ambient temperature) and the sample for which an accurate moisture determination can be made is specified. Moisture results are neither displayed nor printed outside this range.	**Yes**	**No**	**N/A**

Code Reference: S.1.4. Value of Smallest Unit

3.11.	The value of the minimum moisture increment indicated or recorded shall not exceed 0.1 percent.	**Yes**	**No**	**N/A**
3.12.	Test weight per bushel values are determined to the nearest 0.1 pound per bushel	**Yes**	**No**	**N/A**
3.1~~2~~3.	A meter shall not record any usable values until the operating temperature necessary for accurate determination has been attained, **OR**	**Yes**	**No**	**N/A**
3.1~~3~~4.	the meter shall bear a conspicuous statement adjacent to the indication stating that the meter shall be turned on for a time period specified by the manufacturer prior to use.	**Yes**	**No**	**N/A**
	A meter shall meet all applicable tolerances when:			
3.1~~4~~5.	Operated in the temperature range of 10 °C to 30 °C (50 °F to 86 °F), or within the range specified by the meter manufacturer.	**Yes**	**No**	**N/A**
3.1~~5~~6.	If the manufacturer specifies a temperature range, the range shall be at least 20 °C (36 °F).	**Yes**	**No**	**N/A**

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Code Reference: S.2.6. Determination of Quantity and Temperature

4.7.	The meter does not require the operator to judge the precise volume or weight and temperature to make accurate moisture determinations.	**Yes**	**No**	**N/A**
4.8.	For meters that measure test weight, the determination of sample volume and weight are fully automatic.	**Yes**	**No**	**N/A**
4.9.	Means are available to determine that a sufficient sample size is available and there is no display of test weight per bushel when there is insufficient sample to provide accurate measurements.	**Yes**	**No**	**N/A**
4.~~8~~10.	External grinding, weighing and temperature measurements are not required for accurate moisture measurements.	**Yes**	**No**	**N/A**

Code Reference: S.3. Accessory Equipment

4.~~9~~11.	If accessory equipment separate from and external to the moisture meter is required, it is appropriate and complete for the measurement.	**Yes**	**No**	**N/A**

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

4.~~10~~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 moisture content shall be included.	**Yes**	**No**	**N/A**
	In addition, operating instructions shall include the following information:			
4.~~10~~12.1.	Name and address or trademark of the manufacturer.	**Yes**	**No**	**N/A**

4.~~10~~12.2.	The type or design of the device with which it is intended to be used.	**Yes**	**No**	**N/A**
4.~~10~~12.3.	Date of issue.	**Yes**	**No**	**N/A**
4.~~10~~12.4.	The kind or classes of grain or seed for which the device is designed to measure moisture content and test weight per bushel.	**Yes**	**No**	**N/A**
4.~~10~~12.5.	The limitations of use (e.g., moisture measurement range, grain or seed temperature, kind or class of grain or seed, instrument temperature, voltage and frequency ranges, electromagnetic interferences, and necessary accessory equipment).	**Yes**	**No**	**N/A**

8. NTEP Committee Authorizes "Dual Certification"

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

501-7	**Grain Moisture Meter (GMM) and Near Infrared (NIR) Instruments Dual Certification**
Source:	GMM and NIR Sectors
Recommendation:	The Sectors recommended that NCWM, Inc. authorize issuing a single CC for devices successfully type evaluated using two inter-related codes (e.g., a "Grain Moisture Meter CC with Near Infrared Grain Analyzer Certification" or, simply, "NIR Grain Analyzer with Dual Certification").

Steve Patoray, NTEP Director, outlined changes being considered for improvements in the database that NCWM maintains for CC's. In the improved database, devices would be classified first by a generic name and then by a secondary name or descriptor. For example, devices used to measure an attribute of grain, whether moisture or protein, would be classified generically as "grain analyzers." Proposed subclassifications under "grain analyzers" are: moisture only, moisture plus test weight, and multi-feature. A grain moisture meter successfully evaluated under both GMM and NIR Analyzer codes would be classified as Grain Analyzer/Multi-Feature.

9. Proposed Changes to Publication 14 to Improve Consistency between GMM and NIR Checklists

Discussion: The NTEP Laboratory has pointed out discrepancies between the Near Infrared Grain Analyzer (NIR) and Grain Moisture Meter (GMM) checklists in Publication 14 for several similar tests. The following changes are suggested to improve consistency between the two checklists, to remove ambiguity, and to correct errors.

Conclusion: The Sector agreed to all of the following recommendations.

9.a. Power Supply Tests

Recommendation: Modify the Power Supply paragraphs of the "Type Evaluation Test Procedures and Tolerances" sections of the checklists for Near Infrared Grain Analyzers (NIR) and Grain Moisture Meters (GMM) respectively as shown below to improve consistency and to explicitly define the reference voltage:

NIR Checklist:

Power Supply. A single HRW wheat sample will be analyzed 10 times with the instrument operating at a ~~nominal~~ voltage of ~~117v~~100 V. The voltage will be adjusted to ~~100v~~117 V. After 30 minutes, the HRW sample will be

analyzed 10 times. The voltage level will then be increased to 130 V. After 30 minutes, the sample will be analyzed 10 more times.

Changes in bias and precision will be checked. Bias is defined as the change in the average protein for 10 analyses made at both the reference and the respective test voltages.

The maximum allowable bias change from the reference voltage (117 V) is ± 0.10. The maximum allowable standard deviation of 10 analyses (precision), at any of the three voltage levels, is 0.10.

GMM Checklist:

Power Supply. A single HRW wheat sample with a moisture content between 12 percent ~~–~~and 14 percent will be analyzed 10 times with the meter operating at a ~~nominal~~ voltage of 100 V. The voltage will be adjusted to 117 V~~,~~. ~~and a~~After 30 minutes, the HRW sample will be analyzed 10 times. The voltage level will then be increased to 130 V~~,~~. ~~and a~~After 30 minutes, the sample will be analyzed 10 more times.

Changes in bias and precision will be checked. Bias is defined as the change in the average moisture for 10 analyses made at both the reference and the respective test voltages.

The maximum allowable bias change from the reference voltage (117 V) is ± 0.20 percent. The maximum allowable standard deviation of 10 analyses (precision) at any of the three voltage levels is 0.10 percent.

9.b. Leveling Tests

Recommendation:
Remove the redundant first sentence of the Leveling Test of the NIR Checklist, and modify the wording of the tolerance sentence to specify that bias is calculated from the average of 5 readings. The proposed changes are shown below. [Note: the Leveling Test from the GMM Checklist is shown below for reference.]

NIR Checklist:

Leveling. ~~Tests for leveling will be conducted for those instruments not equipped with a level indicator.~~ The leveling test will be conducted for a minimum of 2 orientations, front-to-back and left-to-right, at a tilt of 5 percent. Devices equipped with leveling indicators will be tested at the indicated limits of the level indicator rather than at a tilt of 5 percent. Additional orientations will be tested as deemed appropriate.

The ~~tolerance for bias~~ maximum allowable bias shift is ± 0.10 for the average of 5 readings.

GMM Checklist:

Leveling. Tests for leveling will be conducted using a single HRW wheat sample with a moisture content between ~~(~~12~~%~~ Percent and 14~~%~~ Percent~~moisture content)~~. The leveling test will be conducted for a minimum of 2 orientations, front-to-back and left-to-right, at a tilt of 5 percent. Meters equipped with leveling indicators will be tested at the indicated limits of the level indicator rather than at a tilt of 5 percent. Additional orientations will be tested as deemed appropriate.

The maximum allowable bias shift is ± 0.20 percent for the average of 5 readings.

9.c. Warm-up Time Tests

Recommendation: Modify the Warm-up Time tests of the NIR and GMM Checklists respectively as shown below to improve consistency:

NIR Checklist:

Warm-up Time. The following test procedures will be used to check warm-up times recommended by the manufacturer. If the manufacturer does not recommend a warm-up time, assume that accurate results will be provided immediately ~~upon having~~ after turning the instrument power~~ed~~ on.

The instrument will be powered off and stabilized at room temperature. The instrument will be powered on and after waiting the specified warm-up time a single ~~HRW~~ wheat sample will be analyzed 5 times. After waiting for ~~one hour~~ a period of time equal to two times the manufacturer's suggested warm-up time, the sample will be analyzed 5 more times. The minimum waiting period before retesting the sample is one hour. Thus, for an instrument where no warm-up time is specified, the sample would be tested immediately upon the instrument being powered ~~up~~ on and then again after 1 hour.

The maximum allowable bias shift is ± 0.10 for the average of 5 readings.

GMM Checklist:

Warm-up Time. The following test procedures will be used to check warm-up times recommended by the manufacturer. If the manufacturer does not recommend a warm-up time, assume that accurate results will be ~~immediately~~ provided immediately after ~~by~~ turning the instrument power on.

The instrument will be powered off and stabilized at room temperature. The instrument will be powered on and after waiting the specified warm-up time, a single wheat sample (12%-14% moisture content) will be analyzed 5 times. After waiting for a period of time equal to two times the manufacturer's suggested warm-up time, the sample will ~~again~~ be analyzed 5 more times. The minimum waiting period before retesting the sample is one hour. Thus, for an instrument where no warm-up time is specified, the sample would be tested immediately upon the instrument being powered on and then again after 1 hour.

The maximum allowable bias shift is ± 0.20 percent for the average of 5 readings.

9.d. Sample Temperature Sensitivity Test

Recommendation: Modify the first paragraph of the Sample Temperature Sensitivity Tests of the NIR and GMM Checklists respectively, as shown below, to improve consistency, to clarify the meaning, and to correct an error in the GMM checklist:

NIR Checklist:

II. Sample Temperature Sensitivity.

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

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GMM Checklist:

II. Sample Temperature Sensitivity:

~~Additional t~~Testing is required to verify that accurate results are provided when the sample and instrument are at different temperatures. This will be referred to as the sample temperature sensitivity test. ~~The purpose of this test is to verify that the instrument provides accurate results when the difference in temperature between the sample and the instrument is at the manufacturer specified difference (a minimum Δ of 10 °C is required).~~ The sample temperature sensitivity test will be conducted using corn, HRW wheat, and soybean samples. Tests will be conducted with the instrument at room temperature and the sample temperature varying from room temperature plus ΔT_H to room temperature minus ΔT_C, ~~(~~where ΔT_H is the magnitude of the manufacturer specified maximum difference for grain above room temperature and ΔT_C is the magnitude of the manufacturer specified maximum difference for grain below room temperature. In no case will room temperature plus ΔT_H be allowed to exceed ~~32~~45 °C, but ~~the two differences need not be equal.)~~ – ΔT_H need not equal ΔT_C. For purposes of these tests, room temperature will be defined as 22 °C ± 2 °C

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10. NTETC GMM/NIR Sector Support – Response to Sector's Letter to NCWM Chairman

Background: At the August 2002 meeting of the GMM and NIR Sectors, Don Onwiler, Nebraska Department of Agriculture, Division of Weights & Measures, representing the NCWM Board of Directors (BOD), informed the Sectors that the BOD believes that the major work of the GMM & NIR Sectors has been completed. The BOD questioned whether annual Sector meetings would be required in the future. Don pointed out that the GMM Sector contributes only $500 annually to NTEP. The BOD calculates the total staff costs associated with the GMM/NIR Sector is about $15,000. In an effort to reduce costs, the BOD has decided that public members will no longer receive funding for travel to attend the GMM/NIR Sector meetings.

The information that Don presented at the Sector meeting raised concerns among the sector members with the direction that NCWM, Inc. seems to be taking with regard to the GMM and NIR Sectors. Because of these concerns, Sector Chairman, Cassie Eigenmann-Pierson, DICKEY-john Corp., was urged to send a letter to Ross Andersen, NCWM BOD Chairman, to express the Sector's concerns, to request a breakdown of actual recent GMM/NIR Sector meeting costs, and to seek continued NCWM, Inc. support of future meetings. The letter was drafted and sent to Mr. Andersen in October 2002.

Discussion: Ross Anderson, NCWM Chairman, appeared at the Sector's August 2003 meeting to respond in person to the Sector's letter and to obtain feedback for the BOD to use in future planning. Ross said that the board understands the importance to commerce and the complexity of issues related to grain moisture meters and NIR grain analyzers. Equity in the system is a concern. He noted that the Sector's discussions relating to lack of alignment among meters seemed to indicate that the system was not resulting in the kind of equity expected. He recognized the importance of the Sector's work on standards, stating that when proper standards are met, the system will have uniformity. Unfortunately, the costs of supporting the Sector's activities exceed the income provided by the Sector. According to Ross, GMM/NIR Income and Expenses for the past 12 months resulted in a net loss of $9,831 as detailed below:

Income		
based on five active CC's		**$1,425.00**
Expenses		
Meeting Costs include: Planning, Copies, Faxes, FedEx, refreshments, etc.	$715.00	
NCWM Publication 14 updates	$4,425.00	
Staff and Admin costs to support Sector	$5,703.00	
NCWM Funding (2002) for Travel to Sector Meeting	$413.00	
Total Expenses (past 12 months)		**$11,256.00**
Net Income (loss)		**($9,831.00)**

In the BOD's view, assignment of a single official moisture meter dampens competition, so it is unlikely that the number of CC's would ever increase to the point where Sector expenses are fully funded by CC fees.

The BOD suggested three options to make up the GMM/NIR Sectors' budget shortfall:

> **Option 1:** Determine the actual cost for NCWM to support this program annually and request funds from GIPSA, NIST, and the active NTEP Certificate holders to fund the difference between annual revenues and annual costs.
>
> **Option 2:** Determine the actual cost, divide this equally among the active NTEP Certificate holders, and increase the annual renewal fee to cover these costs.
>
> **Option 3:** Discontinue the administrative support of this device type under NTEP.

Options 1 and 2 received little or no support from the Sector. One manufacturer reported that their annual costs to participate in the program are approximately $25,000. Citing the proposed increase in manufacturers' costs for the on-going calibration program (from $3,600 to $5,300 per meter type per year), manufacturers were generally opposed to further increases. GIPSA and NIST representatives were skeptical that their agencies would be receptive to providing additional monetary support to NCWM. There was general agreement that the Sectors were within one to three meetings of being essentially "through" with changes to Publication 14. As an alternative to Sector meetings, it was suggested that NIST might host "technical sessions" where manufacturers, W&M personnel, and grain industry representatives could develop issues and recommendations to forward to the NCWM. One Sector member questioned the costs associated with the maintenance and printing of the GMM/NIR portion of Publication 14 noting that the material was developed and written by the Sector. The revenue received from the sale of this publication is less than $500 annually. It was suggested that it would be more economical to make the publication available at no charge on the Internet. Ross noted that the costs of updating NCWM Publication 14 should decrease as things become smoother in the system. In closing, Ross stated that NCWM's budget for next year includes an allowance for a GMM/NIR Sector meeting in August 2004.

11. Time and Place for Next Meeting

The next meeting is tentatively planned for the week of August 23, 2004 in the Kansas City, MO area. Meetings will be held in one of the meeting rooms at the National Weather Service Training Center if available. A tentative schedule is shown below.

Wednesday, August 25	10:00 am - 5:00 pm	GMM Sector Meeting
Thursday, August 26	8:00 am - 4:00 pm	NIR Grain Analyzer Sector Meeting

Items of interest to both Sectors will be considered in joint session either at the end of the first day or at the beginning of the second day depending on the final agenda.

National Type Evaluation Technical Committee (NTETC)
Near Infrared (NIR) Grain Analyzer Sector
August 21, 2002 - Kansas City, Missouri

Meeting Summary

Agenda Items

☆ 1. NTEP Committee Authorizes "Dual Certification"
☆ 2. Recommended Changes to Publication 14 to Improve Consistency between GMM and NIR Checklists
☆ 3. NTETC GMM/NIR Sector Support - Response to Sector's Letter to NCWM Chairman
☆ 4. Time and Place for Next Meeting NIST/Office of Weights and Measures Reorganization
5. Report on the 2003 NCWM Annual Meeting – NIR Grain Analyzer Issues
6. NTEP Status Report - Recommended Change to Publication 14, Table 1
7. Recommended Change to Publication 14 – Accuracy
8. Recommended Changes and Additions to Publication 14
   a. Additional Printed Ticket Requirements
   b. Add Requirement for Calibrations to Be Clearly Distinguished from One Another
   c. Miscellaneous Editorial Changes
9. Forward-looking Issues

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

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1. NTEP Committee Authorizes "Dual Certification"

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

501-7	**Grain Moisture Meter (GMM) and Near Infrared (NIR) Instruments Dual Certification**
Source:	GMM and NIR Sectors
Recommendation:	The Sectors recommended that NCWM, Inc. authorize issuing a single CC for devices successfully type evaluated using two inter-related codes (e.g., a "Grain Moisture Meter CC with Near Infrared Grain Analyzer Certification" or, simply, "NIR Grain Analyzer with Dual Certification").

Steve Patoray, NTEP Director, outlined changes being considered for improvements in the database that NCWM maintains for CC's. In the improved database, devices would be classified first by a generic name and then by a secondary name or descriptor. For example, devices used to measure an attribute of grain, whether moisture or protein, would be classified generically as "grain analyzers." Proposed subclassifications under "grain analyzers" are: moisture only, moisture plus test weight, and multi-feature. A grain moisture meter successfully evaluated under both GMM and NIR Analyzer codes would be classified as Grain Analyzer/Multi-Feature

2. Recommended Changes to Publication 14 to Improve Consistency between GMM and NIR Checklists

Discussion: The NTEP Laboratory has pointed out discrepancies between the Near Infrared Grain Analyzer (NIR) and Grain Moisture Meter (GMM) checklists in Publication 14 for several similar tests. The following changes are suggested to improve consistency between the two checklists, to remove ambiguity, and to correct errors.

Conclusion: The Sector agreed to all of the following recommendations.

2.a. Power Supply Tests

Recommendation: Modify the Power Supply paragraphs of the "Type Evaluation Test Procedures and Tolerances" sections of the checklists for Near Infrared Grain Analyzers (NIR) and Grain Moisture Meters (GMM) respectively as shown below to improve consistency and to explicitly define the reference voltage:

NIR Checklist:

Power Supply. A single HRW wheat sample will be analyzed 10 times with the instrument operating at a ~~nominal~~ voltage of ~~117v~~100 V. The voltage will be adjusted to ~~100v~~117 V. After 30 minutes, the HRW sample will be analyzed 10 times. The voltage level will then be increased to 130 V. After 30 minutes, the sample will be analyzed 10 more times.

Changes in bias and precision will be checked. Bias is defined as the change in the average protein for 10 analyses made at both the reference and the respective test voltages.

The maximum allowable bias change from the reference voltage (117 V) is ± 0.10. The maximum allowable standard deviation of 10 analyses (precision), at any of the three voltage levels, is 0.10.

GMM Checklist:

Power Supply. A single HRW wheat sample with a moisture content between 12 percent ~~-~~–and 14 percent will be analyzed 10 times with the meter operating at a ~~nominal~~ voltage of 100 V. The voltage will be adjusted to 117 V~~;~~, ~~and a~~After 30 minutes, the HRW sample will be analyzed 10 times. The voltage level will then be increased to 130 V~~;~~, ~~and a~~After 30 minutes, the sample will be analyzed 10 more times.

Changes in bias and precision will be checked. Bias is defined as the change in the average moisture for 10 analyses made at both the reference and the respective test voltages.

The maximum allowable bias change from the reference voltage (117 V) is ± 0.20 percent. The maximum allowable standard deviation of 10 analyses (precision) at any of the three voltage levels is 0.10 percent.

2.b. Leveling Tests

Recommendation: Remove the redundant first sentence of the Leveling Test of the NIR Checklist, and modify the wording of the tolerance sentence to specify that bias is calculated from the average of 5 readings. The proposed changes are shown below. [Note: the Leveling Test from the GMM Checklist is shown below for reference.]

NIR Checklist:

Leveling. ~~Tests for leveling will be conducted for those instruments not equipped with a level indicator.~~ The leveling test will be conducted for a minimum of 2 orientations, front-to-back and left-to-right, at a tilt of 5 percent. Devices equipped with leveling indicators will be tested at the indicated limits of the level indicator rather than at a tilt of 5 percent. Additional orientations will be tested as deemed appropriate.

The ~~tolerance for bias~~ maximum allowable bias shift is ± 0.10 for the average of 5 readings.

GMM Checklist:

Leveling. Tests for leveling will be conducted using a single HRW wheat sample with a moisture content between ~~(~~12~~%~~ percent and 14~~%~~ percent~~moisture content)~~. The leveling test will be conducted for a minimum of 2 orientations, front-to-back and left-to-right, at a tilt of 5 percent. Meters equipped with leveling indicators will be tested at the indicated limits of the level indicator rather than at a tilt of 5 percent. Additional orientations will be tested as deemed appropriate.

The maximum allowable bias shift is ± 0.20 percent for the average of 5 readings.

2.c. Warm-up Time Tests

Recommendation: Modify the Warm-up Time tests of the NIR and GMM Checklists respectively as shown below to improve consistency:

NIR Checklist:

Warm-up Time. The following test procedures will be used to check warm-up times recommended by the manufacturer. If the manufacturer does not recommend a warm-up time, assume that accurate results will be provided immediately ~~upon having~~ after turning the instrument power~~ed~~ on.

The instrument will be powered off and stabilized at room temperature. The instrument will be powered on and after waiting the specified warm-up time a single ~~HRW~~ wheat sample will be analyzed 5 times. After waiting for ~~one hour~~ a period of time equal to two times the manufacturer's suggested warm-up time, the sample will be analyzed 5 more times. The minimum waiting period before retesting the sample is one hour. ~~-~~Thus, for an instrument where no warm-up time is specified, the sample would be tested immediately upon the instrument being powered ~~up~~ on and then again after 1 hour.

The maximum allowable bias shift is ± 0.10 for the average of 5 readings.

GMM Checklist:

Warm-up Time. The following test procedures will be used to check warm-up times recommended by the manufacturer. If the manufacturer does not recommend a warm-up time, assume that accurate results will be ~~immediately~~ provided immediately after ~~by~~ turning the instrument power on.

The instrument will be powered off and stabilized at room temperature. The instrument will be powered on and after waiting the specified warm-up time, a single wheat sample (12%-14% moisture content) will be analyzed 5 times. After waiting for a period of time equal to two times the manufacturer's suggested warm-up time, the sample will ~~again~~ be analyzed 5 more times. The minimum waiting period before retesting the sample is one hour. Thus, for an instrument where no warm-up time is specified, the sample would be tested immediately upon the instrument being powered on and then again after 1 hour.

The maximum allowable bias shift is ± 0.20 percent for the average of 5 readings.

2.d. Sample Temperature Sensitivity Test

Recommendation: Modify the first paragraph of the Sample Temperature Sensitivity Tests of the NIR and GMM Checklists respectively, as shown below, to improve consistency, to clarify the meaning, and to correct an error in the GMM checklist:

NIR Checklist:

II. Sample Temperature Sensitivity.

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

GMM Checklist:
II. Sample Temperature Sensitivity:

~~Additional t~~Testing is required to verify that accurate results are provided when the sample and instrument are at different temperatures. This will be referred to as the sample temperature sensitivity test. ~~The purpose of this test is to verify that the instrument provides accurate results when the difference in temperature between the sample and the instrument is at the manufacturer specified difference (a minimum Δ of 10 °C is required).~~ The sample temperature sensitivity test will be conducted using corn, HRW wheat, and soybean samples. Tests will be conducted with the instrument at room temperature and the sample temperature varying from room temperature plus ΔT_H to room temperature minus ΔT_C. ~~(~~where ΔT_H is the magnitude of the manufacturer specified maximum difference for grain above room temperature and ΔT_C is the magnitude of the manufacturer specified maximum difference for grain below room temperature. In no case will room temperature plus ΔT_H be allowed to exceed ~~32~~45 °C, but ~~the two differences need not be equal.)~~ – ΔT_H need not equal ΔT_C. For purposes of these tests, room temperature will be defined as 22 °C ± 2 °C

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3. NTETC GMM/NIR Sector Support - Response to Sector's Letter to NCWM Chairman

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5. Report on the 2003 NCWM Interim and Annual Meetings

Background: Two items of interest to the NIR Sector were reviewed by the Committee on Specifications and Tolerances (S&T) at the NCWM Interim Meeting January 12-15, 2003:

357-1	**S.1.1. Digital Indications and Recording Elements**
Source:	NIR Sector
Recommendation:	Amend paragraph S.1.1. (c) of the NIR Analyzer Code to include specifications for recording the "native" constituent value and moisture value along with the converted results and the manually entered moisture basis; amend paragraph S.1.1.(e) to recognize the need for moisture basis in determining the constituent mass; and add new paragraph S.1.1. (h) to include a specification that requires the printed information be arranged in a consistent and unambiguous manner.
357-2	**S.1.2. Selecting Grain Class and Constituent**
Source:	Carryover Item 357-1B (This item originated from the National Type Evaluation Technical Committee (NTETC) Near Infrared Grain Analyzer (NIR) Sector and first appeared on the Committee's 2002 agenda.)
Recommendation:	Add new text to paragraph S.1.2. of the NIR Analyzer Code to address specialty crop transactions where industry is concerned about the proprietary nature of calibration information. This is the same wording recommended by the S&T Committee in the 2002 NCWM S&T Agenda Item 357-1B.

The S&T Committee forwarded these items as voting items for the 2003 Annual Meeting. For additional background refer to *Committee Reports for the 88th Annual Meeting,* NCWM Publication 16, April 2003.

Discussion: At the 88th Annual Meeting held July 13 – 18, 2003 the Conference voted to accept **Agenda Item 357-1** and **Agenda Item 357-2**. In a comment on Agenda Item 357-1, the NIST Weights and Measures Division recommended adding a definition for "native moisture basis." The Sector noted that a definition for "native moisture basis" already appears in §A.3 of the NIR Code:

> **A.3. Calibrations. -** The National Type Evaluation Program Certificate of Conformance (CC) shall indicate the native moisture basis of each calibration. The "native" moisture basis is the default moisture basis of the sealable constituent calibration (or constituent calibration pair when a non-displayed moisture calibration is also involved) . . . .

6. NTEP Status Report – Recommended Change to Publication 14, Table 1

Background: At the 87th Annual Meeting held July 14 – 18, 2002 the Conference voted to accept **Agenda Item 357-1A**, elevating the Near Infrared Grain Analyzer Code to permanent status, effective January 1, 2003. At its August 2002 meeting, the NIR Grain Analyzer Sector recommended significant changes to the NIR checklist of Publication 14, agreeing on tolerance values for sample temperature sensitivity, accuracy, precision, and reproducibility tests for barley protein; corn protein, oil, and starch; and soybean protein and oil [wheat protein tolerances had been approved at an earlier meeting]. A number of editorial changes were also agreed upon. The NTEP Committee, at the January 2003 NCWM Interim Meeting in Jacksonville, FL, accepted the Sector's recommendations. The recommendations were published in the 2003 Edition of Publication 14 paving the way for the NTEP laboratory to accept NIR Grain Analyzer instruments for type evaluation testing.

Discussion: Cathy Brenner, Grain Inspection, Processors and Stockyards Administration (GIPSA), NTEP Participating Laboratory for NIR Grain Analyzers, reported that one application had been received for type evaluation testing. She also reported that restrictive sample set requirements have made it difficult to assemble the necessary samples for testing, even where sample re-wetting is allowed. Sample selection has been especially difficult where multiple constituents are involved for a single product. Of particular concern is the Sample Temperature Sensitivity Test, which requires two sample sets for each grain type representing the low and high moisture ranges shown in Table 1 - Constituent Ranges for Type Evaluation. Each moisture set, in turn, consists of three samples, one from each of three constituent concentration ranges (the upper third, the middle third, and the lower third of the constituent concentration range for the grain type). Cathy suggested that the moisture ranges in Table 1 be expanded.

Conclusion/Recommendation: To facilitate sample selection for testing, the Sector accepted, by consensus, the recommended changes widening the low and high moisture ranges in Table 1 of the NIR Checklist in Publication 14 as shown below:

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% - ~~11~~12%	13% - ~~14~~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.		
Two-rowed Barley	Protein	8 - 17 at 0% M.B.	10% - ~~11~~12%	13% - ~~14~~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.	~~12~~11% - 13%	~~15~~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% - ~~11~~12%	~~15~~13% - ~~16~~15%
	Oil	16 - 21% at 13% M.B.		

7. Recommended Change to Publication 14 - Accuracy

Discussion: In the NIR Checklist in the 2003 Edition of Publication 14 there is a discrepancy between the text describing how accuracy is to be computed and the definitions for the parameters used in calculating accuracy. The text states, "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." In contrast, the parameter x_i used in the calculation of SEP is defined as the *average* predicted concentration of the three replicates of each sample. In the June 2000 issue of Publication 14, both text and equations for calculating SEP are in agreement. The definitions of x_i and y_i in the NIR Checklist were mistakenly changed to agree with the definitions used in the GMM Checklist during editing of other changes in the NIR Checklist in preparation for the Sector's previous meeting.

Recommendation: The Sector recommended changing the Accuracy equations of the NIR Checklist of Publication 14 as shown below to agree with the text, which specifies that the SEP is calculated using only the first replicate of each sample. [Editor's Note: Changes/additions to the equations have NOT been highlighted or underlined. The MS change-tracking feature does not mark changes or additions made using MS Equation Editor.]

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,

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

~~$\bar{x}_i$~~ x_i = ~~average~~ predicted constituent concentration for the first replicate of ~~for~~ sample i ~~(3 replicates)~~

r_i = reference constituent concentration for sample i

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

$\bar{y}$ = 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.)

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8. Recommended Changes and Additions to Publication 14

Conclusions: The Sector agreed to the following changes to the checklist section of the NIR Grain Analyzer portion of NCWM Publication 14 to reflect recent additions/changes to NIST Handbook 44, Section 5.57. Near-Infrared Gain Analyzers. The Sector also agreed to the editorial changes discussed in Agenda Item 8.c.

8.a. Additional Printed Ticket Requirements

Recommendation: Change the NIR Grain Analyzer Checklist section of Publication 14 as shown below to reflect changes to NIST Handbook 44, Code Section S.1.1. (e) and the addition of Code Section S.1.1. (h). adopted at the 2003 NCWM Annual Meeting.

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

3.1.	The analyzer shall be equipped with a digital indicating element.	**Yes**	**No**	**N/A**
3.2.	The minimum height for digits used to display moisture is 10 mm.	**Yes**	**No**	**N/A**
3.3.	The analyzer is equipped with a communications interface that permits interfacing with a recording element and can transmit the date, grain type or class, constituent values, the moisture basis for each constituent value (except moisture), and calibration version identification. The printed ticket includes the "native" concentration and moisture basis in addition to the converted results and the manually entered moisture basis, if the analyzer is able to convert constituent results to a manually entered moisture basis.	**Yes**	**No**	**N/A**
3.4.	A digital indicating element shall not display, and recording element shall not record, any constituent value before the end of the measurement cycle.	**Yes**	**No**	**N/A**
3.5.	Constituent content is recorded and displayed as a percent of total mass at the specified moisture basis. The moisture basis is also displayed and recorded for each constituent content result (except moisture).	**Yes**	**No**	**N/A**
3.5.1.	If a whole grain analyzer that is calibrated to display results on an "as is" moisture basis does NOT display or record a moisture value, it clearly indicates that results are expressed on an "as is" moisture basis.			
3.5.2.	Ground grain analyzers must ALWAYS display and record a moisture measurement for "as is" content results (except moisture).			
3.6.	Digital and recording elements shall not display or record any constituent values beyond the operating range of the device unless the constituent value representation includes a clear error indication (and recorded error message with the recorded representation).	**Yes**	**No**	**N/A**

3.7	If an NIR analyzer is used to determine a moisture value, either to determine the moisture of an "as is" constituent content measurement or to convert from one moisture basis to another, the moisture measurement must be concurrent with the measurement of other constituents.	**Yes**	**No**	**N/A**
3.8	The information appearing on printouts of analyzers with built–in printers or accessory printers is arranged in a consistent and unambiguous manner.	**Yes**	**No**	**N/A**

8.b. Add Requirement for Calibrations to Be Clearly Distinguished from One Another

Recommendation: Add wording to the NIR Grain Analyzer Checklist section of Publication 14 as shown below to reflect changes to NIST Handbook 44, Code Section S.1.2. adopted at the NCWM 2003 Annual Meeting.

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

3.~~8~~9.	The means to select the kind and class of grain type or class and constituent(s) shall be readily visible and the type or class of grain and constituents selected shall be clearly and definitely identified in letters (such as HRWW, HRWS, SWW, etc. or PROT, etc.) or with symbols clearly defined adjacent to the display. The device shall be capable of indicating grain type using a minimum of four characters. Calibrations are clearly distinguished from one another, if more than one calibration is included for a given grain type.	**Yes**	**No**	**N/A**

8.c. Miscellaneous Editorial Changes

Discussion: Much of the NIR Grain Analyzer Checklist was developed by editing and modifying portions of the GMM Checklist. A review of the 2003 edition of the NIR Grain Analyzer Checklist revealed several instances where the word "moisture" was either not replaced by "protein" or "constituent" or "constituent value" or was not deleted. The changes proposed below are to correct this oversight.

Recommendations:

8.c.1. Replace "moisture" with "protein" in the last sentence of the Instrument Temperature Sensitivity Test as shown:

The maximum allowable protein bias will be ± 0.35 from the average ~~moisture~~ protein measured at 22 °C.

8.c.2. Delete the word "moisture" from the paragraph referring to remote displays in Section **1. General**.

1. General

Code Reference: G-S.1. Identification

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As a practical matter, remote ~~moisture~~ displays are not required to have serial numbers because they typically only repeat the ~~moisture~~ information received from the measuring element. Similarly, external printers are not required to have serial numbers because they do not alter the information received from the measuring element.
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8.c.3. Replace "moisture" with "constituent values" in NIR Checklist item 3.2. as shown:

3.2.	The minimum height for digits used to display ~~moisture~~ constituent values is 10 mm.	**Yes**	**No**	**N/A**

8.c.4. Replace "moisture" with "constituent" in NIR Checklist item 3.9. as shown:

3.9. An analyzer shall automatically and clearly indicate when the ~~moisture~~ constituent content operating range has been exceeded. Analyzers shall not display a ~~moisture~~ constituent result when operating temperature ranges are exceeded. In both instances, a clear error indication is required. A 5 °C tolerance is applied to temperature ranges when testing to verify that ~~moisture~~ constituent results are not displayed or printed when the temperature range is exceeded.	**Yes**	**No**	**N/A**

8.c.5. Replace "moisture" with "constituent" and re-number items under **Code Reference: S.4. Operating Instructions and Use Limitations** as shown below:

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

4.13. 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~~constituent content shall be included.	**Yes**	**No**	**N/A**
In addition, operating instructions shall include the following information:			
~~4.13.~~4.13.1. Name and address or trademark of the manufacturer.	**Yes**	**No**	**N/A**
~~4.14.~~4.13.2. The type or design of the device with which it is intended to be used.	**Yes**	**No**	**N/A**
~~4.15.~~4.13.3. Date of issue.	**Yes**	**No**	**N/A**
~~4.16.~~4.13.4. The kind or classes of grain or seed for which the device is designed to measure ~~moisture~~constituent content.	**Yes**	**No**	**N/A**
~~4.17.~~4.13.5. The limitations of use (e.g., ~~moisture~~constituent measurement range, grain or seed temperature, kind or class of grain or seed, instrument temperature, voltage and frequency ranges, electromagnetic interferences, and necessary accessory equipment).	**Yes**	**No**	**N/A**
~~4.18.~~4.13.6. The appropriate user selectable options or settings for each calibration installed in the device.	**Yes**	**No**	**N/A**

9. Forward-looking Issues

Discussion: Grain handling companies with multiple operating locations are increasingly interested in networking their NIR instruments to monitor performance, to ensure uniformity, and to facilitate simultaneous updating of calibration changes. The simplest networked systems utilize conventional NIR Grain Analyzer instruments with remote communication capability. When the CC holder issues new calibrations, they are transmitted simultaneously to all networked instruments. Type evaluation and field inspection of such devices can be identical to non-networked analyzers. Dr. Charles Hurburgh, Jr., Agricultural & Biosystems Engineering, Iowa State University, briefed the Sector on several emerging technologies with system configurations that may require new approaches to type evaluation and field inspection.

1 No resident calibration – For each sample measured, the instrument performs a local regression and develops a one-time-use calibration utilizing a "live" calibration database maintained off-site by an independent data service company. New calibration samples are added to the calibration database from time to time to make it more universally applicable.

2 All calculations performed off-site – The local instrument obtains optical data on the sample to be measured. Optical data is transmitted to an off-site computer that calculates the result and transmits the result back to the local instrument for display and print out. The off-site computer may use either a standard calibration or may develop a one-time-use calibration for each measurement as described above.

In both of the examples cited, the off-site data bank and computer may or may not be in the same jurisdiction as the local instrument.

On the surface, field inspection using standard samples would seem to be straightforward. However, with no fixed calibration on the local instrument and a changing database, the inspector has no way to insure that the instrument will give the same result the next day, the next month, or at any time in the future. As a partial solution, the instrument could be required to have the ability to query the remote computer and display the version number of the calibration algorithm and perhaps a database issue date. Similarly, type evaluation accuracy tests and sample temperature sensitivity tests, which are calibration dependent, could be verified at only one point in time with no assurance that acceptable results would be obtained at any future time. Type evaluation would seem to require not only a test of the instrument's hardware, but also an evaluation of the calibration algorithm. If a "live" database is involved, evaluation becomes even more problematic. If the database can affect the indicated value, it would seem that the database is a metrologically significant element in the system. Even if the integrity of the database could be assured by an audited quality system, determining the effect of the introduction of new samples on the performance of the instrument under type evaluation conditions would seem to require re-testing every time new calibration samples are added to the database.

Conclusion: The Sector took no action on this issue

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National Type Evaluation Technical Committee (NTETC)
Near Infrared (NIR) Grain Analyzer Sector
August 26-27, 2004 - Kansas City, Missouri

Meeting Summary

Agenda Items

Note: Because of common interest, items 1 through 5, above, were considered in a joint session of the NIR Grain Analyzer and the Grain Moisture Meter Sectors

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1. Report on NTEP Type Evaluations

Cathy Brenner of the Grain Inspection, Processors and Stockyards Administration (GIPSA, formerly FGIS), the NTEP Participating Laboratory for Grain Analyzers (Grain Moisture Meters and Near Infrared Grain Analyzers) reported on Type Evaluation activity. In addition to regular grain moisture meter calibration updates, two certificates were updated to add new features following successful evaluations:

1) CC 01-063A4 – Foss Infratec 1241
   added protein and oil for Corn and Soybeans
   added protein for the following wheats: Durum, HRS, HRW, Hard White, SRW, Soft White; and for both 6-row and 2-row Barley

2) CC 97-073A7 – Steinlite SL95 (only units with funnel sensor are approved for TW)
   added test weight per bushel for all grains except Oats

Evaluations are currently underway for two additional devices: one for test weight per bushel and one for protein and oil combined.

2. Should the Grain Moisture Meter Sector and the NIR Grain Analyzer Sectors Merge?

Discussion:

The Grain Moisture Meter Sector and the Near Infrared Grain Analyzer Sector (originally the Near Infrared Protein Analyzer) first met in Kansas City in December of 1991. Since their beginning, the two Sectors have met separately on successive days, often meeting jointly for part of that time to consider items of common interest. The advent of CCs listing multiple applications evaluated under either or both the Grain Moisture Meter Code and the Near Infrared Analyzer Code has increased the number of issues common to both groups. Furthermore, the Sector Chair, the Technical Advisors, and the vast majority of Sector members are common to both Sectors. These facts suggest that it would be more efficient for the two Sectors to merge into a single new Sector called the "Grain Analyzer Sector". In the past, when items required in-depth consideration of technical matters or development of detailed procedures, ad hoc subcommittees or working groups were formed to develop background and to suggest action for consideration by the Sectors. It is envisioned that such sub-committees or working groups can be of equal or greater importance to a merged Sector dealing with more mature issues.

A few of the benefits of merging into a single sector:

- One Meeting Agenda instead of two
- One Meeting Summary instead of two
- More flexibility in dealing with items of common interest
- Promotes consistency between GMM and NIR Code and Checklists

Recommendation:

By consensus the Sector agreed to recommend that the NCWM Board of Directors merge the Grain Moisture Meter Sector and the Near Infrared Grain Analyzer Sector into a new Sector to be called the Grain Analyzer Sector.

3. Report on the 2004 NCWM Annual Meeting

Background/Discussion:

The 89th Annual Meeting of the National Conference on Weights and Measures (NCWM) was held July 11 – 15, 2004 in Pittsburgh, Pennsylvania.

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 2004 Annual Meeting.

The National Type Evaluation Program (NTEP) Committee Interim Report contained an item relating to NTEP's work to establish bilateral and multilateral test data exchange agreements. Under such agreements and arrangements, manufacturers would be able to submit their equipment to any of the participating countries for testing to OIML recommended requirements. The resulting test data would be accepted by other participants, as a basis for issuing each country's own type approval certificate. One such agreement or arrangement is the Mutual Acceptance Arrangement (MAA) on OIML Type Evaluations recently adopted by the International Committee on Legal Metrology (CIML) at their November 2003 meeting. For additional background refer to *Committee Reports for the 89th Annual Meeting,* NCWM Publication 16.

By way of background, Steve Patoray, NTEP Director, explained that the U.S. and Canada have bilateral MAA covering weighing devices. Under this MAA, a U.S. NTEP test report on a weighing device can be sent to Canada where a Canadian Certificate of Approval will be issued without further testing (and vice versa). A bilateral MAA agreement covering retail motor fuel dispensers has been signed recently between the U.S. and Canada, but to date no dispensers have been evaluated under this MAA.

Steve also reported that progress was being made to establish an OIML MAA program. An additional International Bureau of Legal Metrology (BIML) staff member will be hired by January 1, 2005 undertake the new tasks resulting from the implementation of the MAA. Initially this MAA will cover R76 (Non-automatic weighing devices) and R60 (Load Cells). A four-year time plan has been set for implementation. This will be a multilateral agreement with many countries signing a declaration of mutual confidence. Much work has yet to be done to harmonize NTEP requirements with the OIML recommendations for these devices. A major issue in establishing MAA's is confidence in the data. Testing laboratories will be assessed either by accreditation or peer assessment using criteria that comply with ISO/IEC 17025.

With OIML International recommendations still in the draft stage for GMMs and NIR analyzers, it will be some time before MAA's are in place for these devices. This is, however, an issue that the Sector members may want to watch closely to see how MAA's might impact future type evaluation testing and certification of GMMs and NIR Grain Analyzers.

4. Multiple Application Certificates

Background:

During the 2003 NCWM Interim Meeting in Jacksonville, Florida the NTEP Committee reviewed the Sectors' recommendation to issue a single Certificate of Conformance to devices evaluated using two inter-related codes. Since that time there has been the possibility of dual certification for moisture plus protein and oil, and now test weight per bushel. The first dual certificates became effective July 1, 2004 (97-073A7 and 01-063A4). The two areas of change are in the "For:" box on page 1 and on the last page with the calibration information.

In the "For:" box, the certificates now identify the device as a Grain Analyzer instead of a Grain Moisture Meter or Near Infrared Grain Analyzer. The device type is then followed by the Application(s) that the device is approved for, in alphabetical order (Moisture, Oil, Protein, Starch, Test Weight). This information matches the current NTEP Certificate of Conformance searchable database.

The page for the calibration information also lists the applications in alphabetical order. For example, if a meter were approved for moisture, oil, protein, and test weight per bushel for corn, the calibration listing for corn would be listed as:

Corn
Designation: CORN
Moisture: ABC123
Moisture Range - Approved: 10 - 30%
Moisture Range - Pending: 8 - 40%
Oil: BCD234
Protein: CDE345
Native Moisture Basis: 0%
Test Weight per Bushel: Approved

Discussion:
The Sectors reviewed the new dual certificates. The Sector agreed that the revised certificates generally looked good and commended Cathy Brenner for a job well done. The following suggestions were made to clarify some of the information on the Calibration page:

a. Separate the moisture calibration information from the information on calibrations for other constituents (Protein, Oil, Starch), perhaps using a dotted line.
b. Make it clear that the Approved and Pending moisture ranges apply only to moisture measurements. An approved moisture range of 8-40% does NOT mean that accurate Protein measurements can be made on samples having 40% moisture.
c. Make it clear that the Intercept (Bias) note "Varies by instrument" applies only to calibrations for constituents other than moisture (e.g., Protein, Oil, Starch). It does NOT apply to the Moisture calibration. If a moisture bias term is used, it MUST be part of the grain moisture calibration and be the same for all instruments of like type. [Ref., Handbook 44, §5.56(a), Paragraph S.2.4.3.].

In a related matter, it was pointed out that the revised Application Form for NTEP testing is unclear. Steve Patoray, NTEP Director, suggested that information could be added to the "Evaluation Description" section to indicate which parts of the Form must be completed when a box was checked for the type of evaluation being requested.

Questions were also raised about fees involved in Phase I evaluations and Phase II (Ongoing Calibration Program). These fees (for NCWM Members) and their frequency are summarized in the table below:

			NTEP Laboratory fees	Frequency
Phase I NTEP Evaluation	Non-refundable application fee $800	Certificate processing fee $150	At NTEP Lab hourly rates based on actual hours. ($10,000 -$25,000 and up depending on tests involved.)	Once per type/pattern.
Maintenance fee	$350			Annually
Phase II Ongoing Calibration Program. (applicable to grain moisture meters only)		Certificate processing fee $150	Per Interagency Agreement. Depends on total number of meter types in the OCP	Annually

5. Time and Place for Next Meeting

The next meeting is tentatively planned for the week of August 22, 2005 in the Kansas City, MO area. Meetings will be held in one of the meeting rooms at the National Weather Service Training Center if available. The meeting room will be reserved for Wednesday, August 24 and Thursday, August 25. Sector members are asked to hold both these days open pending determination of exact meeting times and meeting duration. Final meeting details will be announced by late-April 2005.

If you would like to submit an Agenda Item for the 2005 meeting, please contact Steve Patoray, NTEP Technical Director, at spatoray@mgmtsol.com, G. Diane Lee, NIST Technical Advisor, at diane.lee@nist.gov, or Jack Barber, Technical Advisor, at jbarber@motion.net by April 1, 2005.

6. Report on OIML TC17/SC8 IR for Protein Measuring Instruments for Cereal Grain

Background:

OIML TC 17/SC8, charged with developing an International Recommendation (IR) for Protein Measuring Instruments for Cereal Grain, held its first meeting May 31 and June 1, 2004 in Sydney Australia. Representatives from Australia, Japan, New Zealand, and the United States attended the meeting. Australia, as the secretariat of the subcommittee, 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 Working Group (USNWG) for comments. The comments received from the U.S. and Germany were discussed at the TC17/SC8 meeting in Australia. The comments for the most part were accepted. Additionally, TC17/SC8 agreed to the following changes:

a. The scope will be expanded to include wheat, barley, corn, soybeans and rice

b. Maximum permissible errors (MPE) and Moisture Basis: Publication 14 will be used to establish the maximum permissible errors for wheat, barley, corn and soybeans. China will provide information for tolerances on rice. Moisture basis will be determined by the national measurement authority.

c. The section for sampling will be updated to address the U.S. comments.

d. The technology for protein measurements will not be specific.

e. The standard will incorporate appropriate sections of OIML D9

f. The instrument monitoring process will be left up to the national measurement authority.

g. The document will be updated so that the April 2004 Final Draft of the **International vocabulary of basic and general terms in metrology** (VIM) definitions are included.

h. The reference method will be determined by the national measurement authority.

i. The Recommendation on protein measuring instruments will be drafted as close as possible with the latest draft of OIML R59.

j. The document will include susceptibility to dust.

k. Decision to test non-indirect measuring devices will be at the discretion of the national measurement authority.

Discussion:

A revised draft incorporating the changes agreed upon at the Sydney meeting was distributed with the Agenda for the Sector's August 2004 meeting. Australia, the Secretariat of TC17/SC8 used portions of the NIR Grain Analyzer Chapter of Publication 14 in this draft outline recommendation. As of the Sector meeting, Diane Lee, NIST/WMD reported that comments had been received only from Randy Burns, Arkansas Bureau of Standards. Randy's comments were mostly editorial in nature. Dr. Charles Hurburgh, Iowa State University, mentioned that **NIR 2005,** the 12th International Conference on Near Infrared Spectroscopy, would be held April 10-15, 2005 in Auckland, New Zealand. He suggested that this would be an ideal time for TC17/SC8 to meet, because all the recognized names

in the field of Near Infrared Spectroscopy would be present. Dr. Hurburgh offered the following comments on the latest draft:

- There should be explicit mathematical descriptions in addition to statements for many terms.
- The MEPS in the table of tolerances are extremely tight for the U.S. where there is not variety release control and therefore much more variation in germplasm.
- There are many places where the basis of determination (i.e. the number of samples used) is not stated. The background statistics always are based on some number of observations.
- The draft defines a networked instrument as one that is linked, either electronically or manually under a quality system, to a certified measuring instrument and/or a whole grain certified reference material and/or the reference method of Annex A so that its performance may be monitored on a daily basis or according to a schedule set by the quality system administrator. I don't think the US is ready to accept that a company with a certified quality management system is metrologically the same as if the instruments are actually electronically linked. This would be a huge policy change/modification for the US. I think it is the way to move, but not sure we ready yet.
- The draft also states that networked instruments subject to a quality control system may be adjusted within the range of MPES to improve the accuracy of the instrument. This would not be consistent with U.S. metrological practice.
- The draft does not cover the case where calibrations have been derived on a moisture basis equal to Mref.
- Only one unit is required for type evaluation. One unit is not sufficient to verify that production meets type, nor does it allow testing for calibration transfer methods.

Dr. Hurburgh will be sending a complete write-up of his comments with detailed comments/suggestions to Diane Lee..

Because several of the members of TC17/SC8 are also members of TC17/SC1 (OIML R 59 Moisture Meters For Cereal Grain and Oilseeds), which met in Paris in September 20-21, 2004, it had been proposed that the next meeting of TC17/SC8 to discuss the latest draft of the "Outline of a Recommendation on Protein Measuring Instruments for Cereal Grain" be held in Paris the day following the TC17/SC1 meeting. The TC17/SC8 meeting was not held following the TC17/SC1 meeting.

National Type Evaluation Technical Committee (NTETC)
Grain Analyzer Sector
August 24-25, 2005 - Kansas City, Missouri
Meeting Summary

Agenda Items

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1. Report on GIPSA/NIST Interagency Agreement – Fee Increase

The Grain Inspection Packers and Stockyards Administration (GIPSA) and The National Institute of Standards and Technology (NIST) signed an updated Interagency Agreement in March 2005 that provides funding for the Grain Moisture Meter On-going Calibration Program (OCP) for fiscal years 2005 through 2009. Under the terms of the updated agreement NIST and GIPSA each will contribute one-third 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 the fee schedule shown below. Implementation of this fee schedule became effective at the start of FY2005 (October 1, 2004). The fee schedule shown below was developed about two years ago using a modest estimate of likely increases in GIPSA's costs. Dr. Richard Pierce, GIPSA, reported that GIPSA's hourly rate for NTEP evaluations has risen to $83.20 and the fee for air oven moisture determinations has increased to $13.00 each. In spite of these increases, the OCP Fee Schedule is expected to remain as shown below through FY 2009.

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 mfg's)	(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

2. Report on the 2005 NCWM Interim and Annual Meetings

The Interim Meeting of the 90th National Conference on Weights and Measures (NCWM) was held January 23 – 26, 2005, in Santa Monica, California. At that meeting, the NTEP Board of Directors accepted the Sector's recommendation to merge the Grain Moisture Meter Sector and the Near-Infrared Grain Analyzer Sector into a new Sector to be called the Grain Analyzer Sector. The NTEP Committee accepted the Sector's recommended amendments and changes to the 2004 Edition of the Grain Moisture Meter chapter of Publication 14. These changes appear in the 2005 Edition of NCWM Publication 14. For additional background refer to *Committee Reports for the 90th Annual Meeting,* NCWM Publication 16, April 2005.

Amendments and Changes to the 2004 Edition of the Grain Moisture Meter Chapter of Publication 14		
Section Number	**Amendment/Change**	**Page**
Section IV. Tolerances for Calibration Performance	Add item c. to establish an overall calibration bias requirement based on up to three years of available data. Change wording in paragraph preceding item a. and in paragraph following item c. to reflect addition of item c.	GMM-5 through GMM-6
Section VII.B. Accuracy, Precision, and Reproducibility	Change the Minimum Test Weight per Bushel Ranges in the Table in §VII.B. to facilitate selection of test-set samples.	GMM-11
Section VII.B. Accuracy, Precision, and Reproducibility	Change tolerances for repeatability (precision) for Corn and Oats to more realistic value.	GMM-13

The 90th Annual Meeting of the NCWM was held July 10 – 14, 2005, in Orlando, Florida. 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 2005 Annual Meeting.

Steve Patoray, NTEP Director, expressed concern about declining attendance at the NCWM Interim and Annual Meetings. He encouraged Sector members to attend future meetings. At least one state weights and measures representative related that a lack of state funds (and withdrawal of NCWM travel support) had severely limited out-of-state travel to meetings.

Steve reported that an electronic version of NCWM Publication 14 is now available in Adobe Acrobat PDF format on compact disk (CD). Single CD's are priced at $135 plus postage and handling. Because of copyright issues, the PDF file is locked so it is not possible to print a hard copy of the document. It is possible, however, to add comments and highlight text. All four sections of Publication 14 are included on the CD. Order forms can be found on the updated NCWM website, http://www.ncwm.net/. Search capabilities for NTEP certificates have been greatly improved on the updated site. Steve cautioned that users must delete existing "bookmarks" to the old certificate data base search page. The new certificate database cannot be reached using the old "bookmarks." The new database can be accessed easily from the new home page.

Steve briefed the Sector on the Verified Conformity Assessment Program (VCAP) under development for weighing devices or components of weighing devices. Initial verification will not repeat NTEP testing, but will involve field checking of model numbers and markings and will include some general testing to verify that the devices meet type. Additionally, there will be a third party assessment of the manufacturer's quality system. The manufacturer must have a sampling plan and documented evidence to show that it is being used. The manufacturer must also comply with a sub-set of ISO/IEC 17025, ***General requirements for the competence of testing and calibration laboratories***, demonstrating that all the factors that may contribute to errors in the calibration process have been taken into account.

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

Cathy Brenner, GIPSA, the NTEP Participating Laboratory for Grain Analyzers, reported on NTEP Type Evaluation activity. In addition to regular grain moisture meter calibration updates, evaluations are currently underway for three additional devices: one for test weight per bushel (an add-on to a currently approved grain moisture meter); one new grain moisture meter with test weight capability; and one new NIR grain analyzer for miscellaneous constituents including moisture. Cathy also reported that the following devices would be enrolled in the OCP (Phase II) for the 2005 harvest:

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

DICKEY-john Corporation GAC2000, GAC2100, GAC2100a, GAC2100b

Foss North America	Infratec 1241
Foss North America	Infratec 1227, Infratec 1229
Seedburo Equipment Company	1200A
The Steinlite Corporation	SL95

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

Background: 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. The following table illustrates this dependence. No changes were made to the meters between the tests using Sample Set 1 and Sample Set 2. The table also shows how those same meters compare against the most recent three crop years of Phase II test weight (TW) data.

		Test Weight per Bushel Bias				
Grain Type	GMM Model	Based on Phase II TW Data (3 crop-years)	Sample Set 1		Sample Set 2	
			Meter "A"	Meter "B"	Meter "A"	Meter "B"
Corn	1	-0.20	-0.02	+0.01	-0.36	-0.24
	2	+0.09	+0.79	+0.13	+0.82	+0.32
Oats	1	-0.27	-0.06	+0.04	-0.29	-0.24
	2	-0.14	-0.04	+0.03	-0.14	-0.16
Six-Row Barley	1	-0.21	-0.01	-0.05	-0.01	-0.02
Sunflower	1	-0.10	-0.02	-0.09	+0.10	+0.13

Because of the above-observed differences, 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 indicates that the meter is approved for Test Weight per Bushel measurements.

Discussion: The NTEP Lab proposed eliminating the bias tolerance requirement for test weight per bushel from the accuracy tests of the GMM Chapter of Publication 14. The test would still be conducted, and TW bias results would be provided to the manufacturer as is currently done with NIR grain analyzer protein and oil bias results.

Dr. Charles Hurburgh, Iowa State University, pointed out that, based on data taken on only 12 samples, the bias differences between Sample Set "1" and Sample Set "2" did not appear to be statistically significant and asked if this might be a reproducibility issue. For these tests Publication 14 specifies that samples will be dropped three times through each of two meters. He asked if more than three drops might be needed. He noted also that for corn there was an unusually large difference in biases between Meters "A" and "B" of Model 2 for both sets of samples. He suggested that the Sector consider adding a requirement to Publication 14 to specify that the difference in bias between the two instruments submitted for evaluation must not exceed the individual instrument tolerances for bias.

Dr. Richard Pierce, GIPSA, explained that there is a difference between the sample sets used for Phase I moisture evaluations and Phase I Test Weight per Bushel (TW) evaluations. Sample sets for moisture evaluations are carefully pre-screened. As a result, they have produced very similar results from year to year although the individual grain samples that comprise a set vary from year to year. Conversely, the process for selecting samples for TW evaluations is somewhat random (except for moisture distribution criteria and the requirement that samples represent a distribution of TW that minimizes the correlation between TW and moisture). There is no reason to expect two different sets of TW samples to agree and there is no way to determine if one set is better than another. Consequently, bias data obtained using a TW sample set is not suitable for determining what adjustment should be applied to minimize bias error on a large population of samples.

One Sector member asked if there might be a better way to pre-select TW samples to obtain a more reproducible sample set. Dr. Pierce replied that pre-screening is very difficult. Adding additional criteria to the selection of TW samples will make sample selection even more difficult. The fact that in many years very low TW samples are not available further contributes to this difficulty.

Sean Bauer, Steinlite Corporation, mentioning that TW can change with time, asked if there was a significant time interval between determination of TW by the standard kettle method and the measurement of TW on the meters. Cathy Brenner, GIPSA, stated that these tests were conducted on either the same day or the next day. She added that operator uniformity had been verified and that data obtained by check test operators had been compared with data taken on the same samples for Phase II tests. It was determined that the procedures used did not contribute to the observed differences between the two TW test sets.

Jack Barber, Co-Technical Advisor to the Sector, expressed concern about not listing grain-dependent bias adjustment coefficients on the CC. He pointed out that 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. [*Editor's note:* For further background on the Sector's original intent regarding calibration transfer between grain moisture meters of like type, see Agenda Item 9 in the Grain Moisture Meter Sector March 1997 Meeting Summary.] 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 proposed use of Phase II TW data raised several questions:

1. What grain-dependent bias correction coefficient should be specified before the meter has been in the OCP for at least one year?
2. Should a TW calibration that has not been verified in the OCP be classified as "pending?"
3. Should the most recent three years of available data be used to determine if a bias adjustment is necessary? If so, what tolerance should be applied?

In the ensuing discussion the Sector agreed that the manufacturer should specify the grain-dependent bias correction coefficients to be used initially, provided the devices could pass Phase I tests using those coefficients. Although no vote was taken, there wasn't enthusiastic support for classifying the initial TW calibration as "pending," and no one suggested what tolerance should be applied after the device had been in the OCP for a year or more.

Conclusion: The Co-Technical Advisor was requested to develop suggested wording for changes to Publication 14 to reflect the following:

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.
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.

If possible, the proposed changes will be submitted to the Sector by letter ballot for approval in time to forward the item to the NTEP Committee for consideration at the NCWM Interim Meeting in January 2006.

5. Comparative NTEP On-going Calibration Program (OCP) Performance Data

Source: Seedburo Equipment Company

Background: At the Sector's August 2004 meeting Dr. Richard Pierce, GIPSA (the NTEP Laboratory), presented graphical data showing the comparative performance of all NTEP meter types vs. the air oven. These data were based on the last three crop years (2001 – 2003) using calibrations updated for use during the 2004 harvest season. Because of the proprietary nature of OCP data, individual meters (including the Official Meter) were not identified by model or by manufacturer. There were lengthy discussions on these results, speculation about which instruments were which, and questions of whether calibration verification analysis was actually being conducted by some manufacturers. Some comments suggested that a meter manufacturer might not be aware of their relative position based on these comparisons. Examination of the comparative performance data led the Sector to recommend changes to the GMM Chapter of Publication 14 to set a limit on average calibration bias (with respect to air oven) to improve alignment between meter types.

Recommendation: To assist manufacturers in improving NTEP grain calibrations and to achieve better uniformity between meter types, the sector should annually review comparative OCP performance data identifying the USDA-GIPSA Official Meter and containing average bias data for each meter type on each grain.

Discussion: Some meter manufacturers have since expressed concern that the Official Meter was not identified in the presentation of comparative performance data. Even though the air oven is the standard reference against which NTEP meter performance is measured in the OCP, the Official Meter is the de-facto standard for the grain trade. Other manufacturers want to know how their meters compare with the Official Meter.

Regular review of comparative OCP performance data by the Sector has definite advantages:

- Calibration performance problems not addressed by existing requirements are exposed.
- Manufacturers can see how their instruments compare with others.

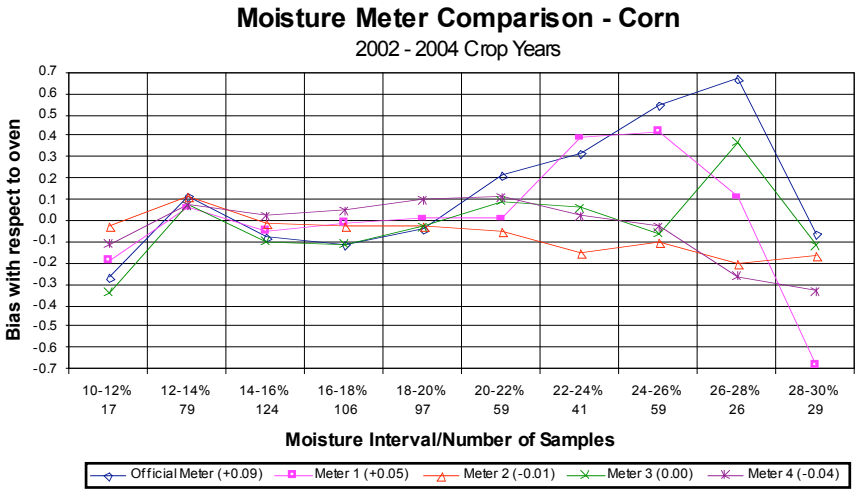
To be of greatest value to manufacturers, the comparative OCP performance data must identify the Official Meter and list the average bias for each meter type on each grain. Accuracy of the Official Meter (average differences between the GAC 2100 and Air Oven as percent moisture) based on the U.S. nationwide sample set, 3 years' data, and most recent review, is already being published annually by USDA GIPSA/FGIS in Directive 9180.61. This is the OCP performance data for the Official Meter, so there should be no proprietary/confidentiality issues regarding identifying the Official Meter in the presentation of comparative OCP performance data.

Conclusion: The Sector agreed that the proposed comparative performance data should be available for annual review by the Sector. In the event that the Sector does not hold a formal meeting in any year, the data for that period can be distributed by e-mail for review. Note: The OCP data presented in Agenda Item 6 for 2002 – 2004 does specifically identify the official meter.

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

Background: This item was included on the Sector's agenda to provide information to the sector on the OCP meter performance data with calibrations updated for the 2005 grain season. Cathy Brenner of GIPSA, the NTEP Participating Laboratory for Grain Analyzers, presented data showing the performance of NTEP meters compared to the air oven. These data are based on the last three crop years (2002 – 2004) using calibrations updated for use during the 2005 harvest season. The Official Meter is the only meter specifically identified. The numerical identifiers were assigned randomly to the remaining meters except for sunflowers where, because only three devices are approved, the remaining meters are identified by the letters A and B. Meter 1 is the same instrument for all grains, etc. The moisture range covered by these

graphs is the same moisture range listed on USDA GIPSA/FGIS in Directive 9180.61. As an example of the data presented, the graph for corn is shown below. The number in parentheses following the meter identification in the box beneath the graph indicates the average bias for that meter across the full moisture range represented by the graph. A PDF file with graphs of all NTEP grains is available from Co-Technical Advisor, Jack Barber. Send requests to jbarber@motion.net.



7. Effective Dates for NTEP and GIPSA Calibration Changes

Background: Grain Industry representatives have repeatedly stressed the importance of keeping NTEP calibration changes synchronized with GIPSA calibration changes. In the past, calibration changes for the Official Moisture Meter were made on a staggered schedule typically between May 1 and August 1, with dates chosen to coincide with the time at which stocks would be at their lowest level to minimize economic impact. Several years ago GIPSA reduced the number of dates for changing calibrations to two: May 1 for the NTEP grains wheat, barley, sorghum, rice, and oats; and August 1 for NTEP grains corn, soybeans, and sunflowers. These dates represent a compromise between making calibrations available prior to harvest and to ensure that grain stocks will be at their lowest levels. The present timeline for NTEP Phase II activities lists July 1 as the latest date for re-issuing annual Certificates of Conformance (CC's). However, because a July 1 date would miss the wheat harvest in many states, the CC for the Official Moisture Meter is now re-issued no later than May 1 for all NTEP grain calibrations. The CC notes the effective dates for the calibrations to indicate when they will be put into use in the Official System.

When this issue was discussed at the Sector's March 1998 meeting, one W&M representative wondered how to handle meter inspections performed in July, asking which calibration should be used, the one effective August 1 or the existing one. Opinions were divided on the best way to handle this situation. In one state, old calibrations may be used until the effective date of the new calibration, after which the device is re-inspected to verify that the new calibration has been installed. Others felt that this method of enforcement was not realistic, because it could result in requiring two or more trips per year to the majority of meters in their jurisdictions. They favored having the user install the new calibration at time of inspection. A manufacturing representative pointed out that the only purpose of specifying "effective dates" on a CC was to match the dates on which the new calibrations would be used in the official system. He suggested that W&M inspectors tell the user that the new calibration must be installed on the effective date if they want their meter to be in closer agreement with the official meter. It was recognized that the use of effective dates wasn't a new concept. Prior to the NTEP program, manufacturers had revised calibrations at various dates, sometimes without much warning, and often after a significant number of meters had already been inspected for the current season. States with inspection programs had already figured out how to deal with this situation. At that time, the Sector decided that the details of enforcement should be left to each state to decide based on their individual needs.

The issue of CCs showing only the current calibration details for calibrations with delayed (August 1) effective dates (when used on Official Meters) has come up again, this time in the case of cross-utilized meters. Under GIPSA's cross-utilization program, elevator or official agency-owned instruments can be "cross-utilized" between official inspection and commercial applications. Problems have arisen when such meters fail State inspections but fully comply with GIPSA directives and requirements. In April, an Illinois weights and measures inspector checked, and rejected, an official

agency meter. The inspector correctly used the most recent CC that had been re-issued in February to reflect the addition of test weight per bushel testing features. Although the moisture measurement calibration constants remained the same as on the previous version of the CC, constants relating to Test Weight had been revised. The official agency meter contained the constants from the previous certificate, matching the constants of the then current GIPSA Program Directive. Although this situation was unique arising from the addition of NTEP approval for test weight and a February CC revision, there is still a problem when there is a difference between the issue date of a CC and the implementation dates for calibration changes shown on the CC. For example, this year the new CC (issued prior to May 1, 2005) for the Official Meter listed constants for soybeans that weren't scheduled for implementation until August. The soybean calibration constants shown on the 2005 CC didn't agree with those shown on GIPSA Program Directive 9180.61 (dated May 1, 2005) until GIPSA reissued the Program Directive with the new soybean constants on August 1, 2005.

Recommendation: The CC for the Official Meter is issued on May 1, but GIPSA introduces changes (if required) in the official system on two different dates: May 1 (for all grains except corn, soybeans, and sorghum) and August 1 for corn, soybeans, and sorghum. Unnecessary rejections of cross-utilized meters could be avoided if State inspectors retained a copy of the previous CC that lists the calibration constants for corn, soybean, and sorghum approved for use prior to August 1. To eliminate the burden of having to retain copies of old certificates and the possibility of using an old certificate by mistake, the NTEP Laboratory proposed an addition to the Certificate showing the constants from the previous, superceded Certificate for any grains with an implementation date later than May 1 (corn, soybean, and sorghum). Rich Pierce, GIPSA, commented that the FGIS Technical Services Division had proposed that all changes to the official system affecting NTEP grains be complete by May 1, so that calibration changes for any NTEP grain on the Official Meter are issued at the same time the CC is issued for the Official Meter.

Conclusion: The Sector rejected the proposal. Weights and Measures representatives were of the opinion that this was not a big issue in practice, and that it may be a training issue.

8. "All-Class" Moisture Calibrations

Background: The Grain Moisture Meter type evaluation program is currently structured to deal with individual class calibrations for moisture. The NIR Grain Analyzer program allows for either individual class calibrations or "all-class" calibrations for constituents other than moisture. One currently certified grain moisture meter uses an "all-class" Barley calibration that is listed separately on the certificate under Two-Row Barley and Six-Row Barley with different approved and pending moisture ranges for each of those classes. Two other instruments currently certified for grain moisture list the barleys, rough rices, and wheats separately on the certificate and have the meters set up with individual class calibrations. These two meters have a single equation and bias term for all classes of barley; another equation and bias term for all classes of rough rice; and a third equation for all classes of wheat with separate bias terms for all soft classes, all hard classes, and durum.

A grain moisture meter currently being evaluated has a single wheat (excluding durum), which may be called an "all type" calibration because the calibration covers something other than all the grains in a class, single rice, and single barley calibration with a common equation and separate bias terms for each grouping. Another instrument being evaluated uses a single calibration and bias term for wheat (excluding durum).

Recommendation: Cathy Brenner, GIPSA (the NTEP Participating Laboratory for Grain Analyzers), asked the Sector to consider the following questions regarding the evaluation of Grain Analyzers using "all-class" or combined-grain moisture equations:

- How should such devices be evaluated?
- What should be placed on the Certificate for approved and pending moisture ranges?

For type evaluation purposes, she suggested treating "all-class" moisture calibrations in a manner similar to the way "all-class" calibrations for other constituents are handled on NIR Grain Analyzers. "All-class" moisture calibrations would have to meet the accuracy, precision, and reproducibility requirements for the test sets of each included class in addition to meeting the "all-class" accuracy requirement when the data from all the included classes is pooled. For example in the case of an "all-class" wheat moisture calibration covering 5 classes of wheat, the basic 6 % moisture range for evaluating a Hard White Wheat calibration is 8 – 14 % moisture content while the basic 6 % range for evaluating calibrations for the other classes of wheat is 10 – 16 %. Thus, an "all-class" wheat calibration would be tested over an 8 % moisture range of 8 – 16 % rather than the standard 6 % range.

The "approved" moisture range for an "all-class" moisture calibration would cover the range from the absolute lower to the absolute upper 2 % moisture interval for which the meter meets individual class tolerances. If an individual class does not have samples available in a given 2 % moisture interval to meet the approved tolerances, the meter must meet the pending tolerances in order for that moisture interval to be listed as "approved" on the certificate.

The "pending" moisture range for an "all-class" moisture calibration would cover the ranges from the absolute lower to the absolute upper 2 % moisture interval for which the meter meets the individual class tolerances. If an individual class does not meet either the approved or pending tolerances in a given 2 % moisture interval, then the next lower or upper moisture interval for which the meter meets either the "approved" or "pending" tolerances for each individual class is listed as the "pending" moisture range on the certificate.

Rich Pierce, GIPSA, reminded the Sector that Phase I testing was originally intended to evaluate basic meter capability– to check permanence, accuracy, repeatability and reproducibility. Soybeans, hard red winter wheat (HRWW), and corn were chosen as representative test media to demonstrate basic meter capability. These three grains could still be used to evaluate devices having an "all-class" or "all-wheat" calibration. NCWM Publication 14 stipulates that grains other than corn, soybeans, and hard red winter wheat will be checked for calibration bias before they can be listed on the Certificate of Conformance (CC). This implies that grains in an "all-class" or "all-wheat" calibration would be individually checked for bias against air oven prior to being listed on an original CC.

Discussion: The issue of "pending" and "approved" ranges for "all-class" or "all-type" calibrations led to a lengthy discussion. The Sector struggled with how to handle cases where Phase II data resulted in different approved or pending ranges on the individual grain types included in an "all-class" or "all-type" calibration. What range should appear on the CC? Again, the general opinion was that ranges should not be reduced due to lack of data. If one class of wheat had insufficient samples in a 2 % interval to support a "pending" rating for that interval while another wheat class had samples supporting a "pending" rating for the same 2 % interval, it seemed logical to allow the interval to have a "pending" rating in the "all-class" or "all-type" calibration. One member reasoned that the 2 % interval with insufficient Phase II samples to support a "pending" rating was also unlikely to see many market samples in that moisture interval.

In a related issue, Rich Pierce mentioned that the NTEP Laboratory is having problems increasing and decreasing ranges of the meter depending on the data available in the most recent 3-year period. Most Sector members agreed that it didn't seem reasonable 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.

Conclusion: A final decision on this issue was postponed until specific wording for Publication 14 could be developed to address the handling of cases where Phase II data resulted in different approved or pending ranges on the individual grain types included in an "all-class" or "all-type" calibration. The Sector agreed that existing Phase I test methodology was adequate for "all-class" and "all-type" calibrations. Phase I testing will be performed only with corn, soybeans, and hard red winter wheat (HRWW). If an "all wheat" (except durum) calibration is submitted, HRWW will be used for the Phase I tests. Until one or more years of Phase II data are available, grains other than corn, soybeans, and HRWW will be checked for calibration bias before they are listed on the Certificate of Conformance (CC).

Diane Lee, NIST, Co-Technical Advisor to the Sector, agreed to send manufacturers a request for additional suggestions/comments on this issue. Comments are due by the end of October. Co-Technical Advisor, Jack Barber, will consider these comments in developing wording for changes to NCWM Publication 14. A letter ballot on the final wording is to be circulated in time to be considered by the NTEP Committee at the NCWM Interim Meeting in January 2006.

9. Editorial Correction to GMM Chapter of Publication 14 – Table in Appendix D

Background: At its August 2003 meeting the GMM Sector recommended changing the Hard White Wheat moisture range from "10 – 16 %" to "8 – 14 %" in the table **Moisture Ranges and Tolerances for Sample Temperature Sensitivity** in Appendix D of the 2003 Edition of the GMM Chapter of Publication 14. The Sector also noted that missing quotation marks needed to be added in the table's heading and that Medium Grain Rough Rice with a moisture range of 10 – 16 % and tolerance limit of 0.45 (as approved at the Sector's September 1997 meeting) needed to be added to the table; this entry to the table was inadvertently omitted from the 2001 and 2002 editions of Publication 14.

The 2004 Edition of the GMM Chapter of Publication 14 incorporated the following changes to the Table in Appendix D:

- The missing quotation marks were added to the table heading in Appendix D

- The Hard White Wheat moisture range in the table was changed to "8 – 14 %".
- Medium Grain Rough Rice with a moisture range of 10 – 16 % and tolerance limit of 0.45 was added to the table.

However, the row for Long Grain Rough Rice was mistakenly deleted from the table. This error was addressed at the Sector's August 2004 meeting and the Sector was advised that because this was an editorial error, it could be corrected without making the issue a formal Agenda Item. Unfortunately, the error was not corrected in the 2005 Edition of the GMM Chapter of Publication 14.

Recommendation: Correct the **Moisture Ranges and Tolerances for Sample Temperature Sensitivity** Table on page 43 of Appendix D of the 2005 Edition of the GMM Chapter of Publication 14 by inserting a row for Grain Type Long Grain Rough Rice (with Moisture Range 10 – 16 % and Tolerance Limit 0.45) between the rows for Oats and Medium Grain Rough Rice.

Conclusion: The Sector agreed unanimously to the proposed correction as shown in the following table.

Moisture Ranges and Tolerance for Sample Temperature Sensitivity (for the "Other 12" NTEP Grains)		
Grain Type	**Moisture Range for Test**	**Tolerance Limit (Bias at Temperature Extremes)**
Durum Wheat	10 – 16 %	0.35
Soft White Wheat	10 – 16 %	0.35
Hard Red Spring Wheat	10 – 16 %	0.35
Soft Red Winter Wheat	10 – 16 %	0.35
Hard White Wheat	8 – 14 %	0.35
Sunflower seed (Oil)	6 – 12 %	0.45
Grain Sorghum	10 – 16 %	0.45
Two-rowed Barley	10 – 16 %	0.35
Six-rowed Barley	10 – 16 %	0.45
Oats	10 – 16 %	0.45
Long Grain Rough Rice	10 – 16 %	0.45
Medium Grain Rough Rice	10 – 16 %	0.45

10. Evaluating GMM Moisture Accuracy as a Continuous Function across the Entire Moisture Range

Source: Charles R. Hurburgh, Jr., Iowa State University

Background/Discussion: Section III of the Grain Moisture Meter (GMM) Chapter of *NCWM Publication 14* calls for testing device accuracy over a 6 %t moisture range using 10 samples selected from each 2 % moisture interval. The two tests for accuracy are bias (meter versus oven) and the Standard Deviation of the Differences (SDD) between the meter and the air oven for each of the 2 % moisture intervals. The bias of all samples in each 2 %t moisture interval of the full moisture range is also the basis for evaluating GMM calibration performance annually using data collected as part of the ongoing national calibration program.

The evaluation of accuracy (for moisture) in 2 percentage point intervals, with an independent evaluation in each interval, assumes that the performance of a device is not continuous and can be adjusted in each of the increments independently of the others. This is not a true assumption, and so the individual increment evaluations, particularly in cases where less than 20 samples (not enough to encompass the full 95 % confidence interval [CI] that the tolerances are based upon) become partially dependent on the properties of the samples in the increments. Naturally all samples cannot be tested in all increments, so there is automatically a nested design. Instrument performance is a continuous function. As an alternative to the present evaluation method, data interpretation (not the design of the lab work) could require that the overall bias (across all samples) not be statistically significant ($p = 0.05$) and that there be no significant slope (Δ error / Δ oven moisture) across the range of data. The variability test (sd of differences) could remain the same as it is now. The NIR program is essentially this way now, because there are no ranges for the constituents. A second alternative for consideration is to use a moving average (across ranges) to test bias and standard deviation.

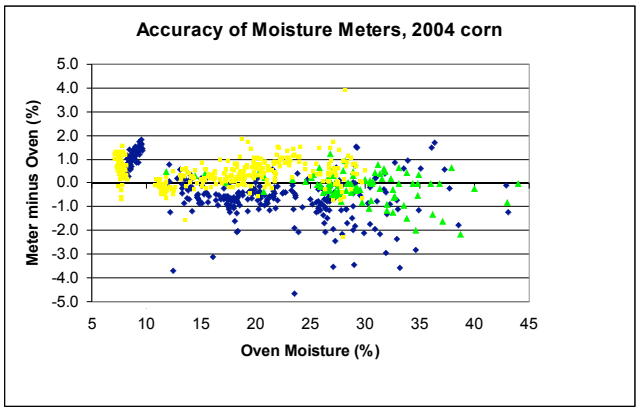


Figure 10.1 – Typical Error Patterns, 2004 Corn

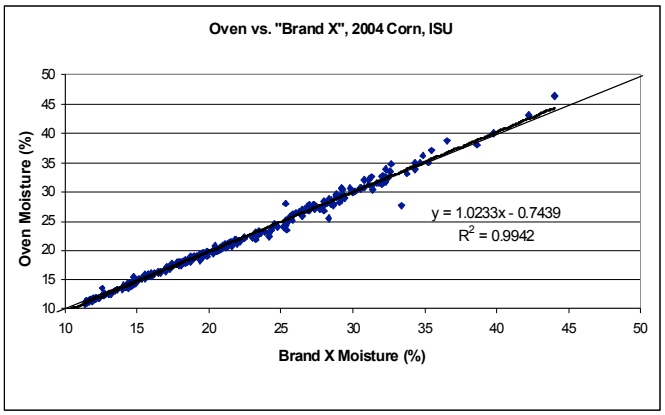


Figure 10.2 – Oven vs. Meter, Brand X

Figure 10.1 shows typical moisture error patterns (meter minus air oven) for three device types based on 2004 corn crop data. Figure 10.2 illustrates the continuous nature of meter performance when measured over the full range of operation.

Dr. Hurburgh commented that the study of error functions was mostly applicable to Phase II evaluations, but because of the small number of samples involved in Phase I testing, the study might provide suggested improvements for interpreting Phase I data.

Recommendation: The Sector was asked to review this issue and consider making it a work project for the coming year with formation of an *ad hoc* study group composed of interested Sector members and non-member statistician(s).

Conclusion: Dr. Hurburgh volunteered to chair an *ad hoc* study group to review the issues outlined in Agenda Items 10 and 11. He will send a questionnaire to Sector members and interested parties to determine who is interested in joining the group.

11. Prescreening Grain Samples for GMM Type Evaluation

Source: Charles R. Hurburgh, Jr., Iowa State University

Background: Grain samples used in the accuracy, precision, and reproducibility tests of Section III. **Accuracy, Precision, and Reproducibility Requirements** in the Grain Moisture Meter (GMM) Chapter of *NCWM Publication 14* are selected according to the following procedure:

> The sample set will be screened using the FGIS official meter model and the air oven. Samples where the official meter model disagrees from the air oven 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 FGIS official meter model and the air oven for the 10 samples in a moisture interval exceed one-half the Handbook 44 acceptance tolerance minus 0.1, (i.e., in the 12% -14% interval for corn, the standard deviation of the differences should not exceed (0.4 - 0.1) = 0.3). Finally, any sample that is not within three standard deviations of the mean for the test meter (for either the 2 % or 6 % moisture interval) will be dropped before analysis of the data.

Discussion: The prescreening of samples to eliminate poor predictors is an attempt to remove outliers in advance, so that the test lab does not have to make judgments about outliers. The problem is that samples prescreened on one device will likely have larger rather than smaller variability in the device under test. Error patterns of devices, even when accurately calibrated on average to the reference, will not be the same on individual samples and often will be in opposite directions. The effect is to increase the chances of outliers on the tested device and effectively lessen the chances of the second device passing. Multivariate NIR units are especially prone to this problem. In test categories that have few samples (10 or less) with low tolerances, the impact is quite large and drives calibrations to model the NTEP data rather than the universe of samples.

The following figures illustrate this problem. Figure 11.1 shows air oven moisture vs. meter moisture for two different device types based on data from the 2003 corn crop covering typical market-range moistures. Figure 11.2 shows the error patterns for the two devices, and Figure 11.3 shows that there is no relationship between the two devices on an individual sample error basis.

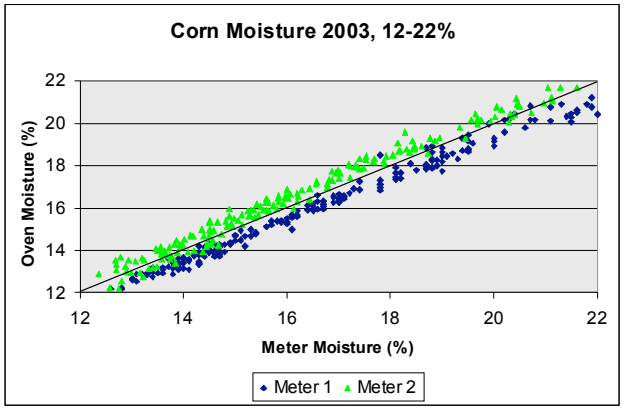


Figure 11.1 - Corn Moisture 2003 - Two Meters

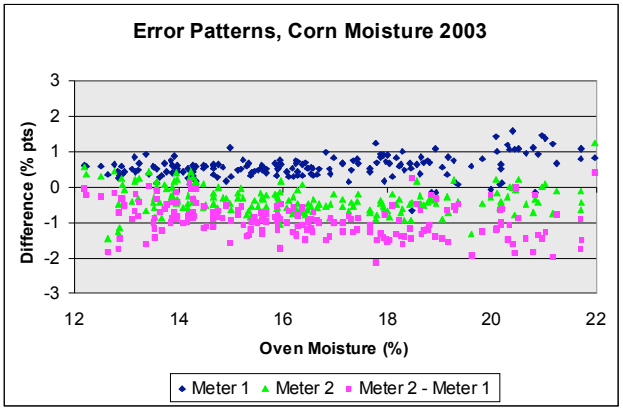


Figure 11.2 – Error Patterns

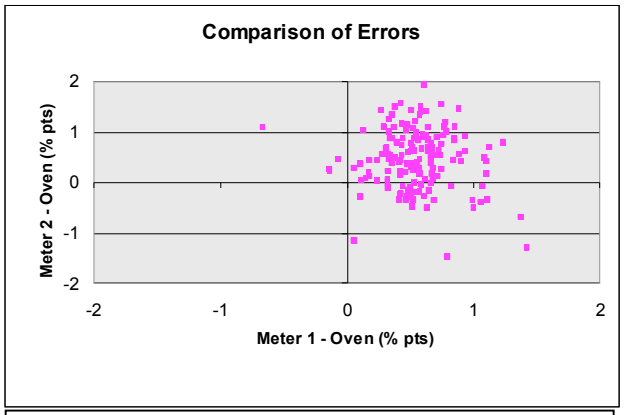


Figure 11.3 - Error Comparison

To overcome this effect, the following options might be considered, recognizing that there has to be a tradeoff between "fairness" and lab procedure complexity:

- Choose the test samples randomly and use statistical outlier tests that incorporate the variability of the reference method data as well as the device data.
- Choose the special set samples (temperature stability) after the accuracy test so these samples can be reasonable predictors on the device being tested. The purpose of temperature samples is to test response to temperature only.
- Choose field inspection samples based on all approved devices.

Dr. Hurburgh remarked that this is an emerging problem that will become more acute as more instruments of different technologies are introduced into the system.

Rich Pierce, GIPSA, reported that the present method of prescreening samples has worked well with test set results agreeing well over time. He said that virtually no samples can be found that will fit all instruments. He has concerns that the topics of Agenda Items 10 and 11 are too general and wonders what impact they might have on NTEP evaluation procedures.

Recommendation: The Sector is asked to review this issue and consider making it a study item for the coming year with formation of an *ad hoc* study group composed of interested Sector members. Because this issue has a major effect on type evaluation, especially when alternative technologies are involved, manufacturers are urged to seriously consider becoming an active participant in this *ad hoc* group should the Sector decide to form one.

Conclusion: Dr. Hurburgh volunteered to chair an *ad hoc* study group to review the issues outlined in Agenda Items 10 and 11. He will send a questionnaire to Sector members and interested parties to determine who is interested in joining the group.

12. Proposed Change to Publication 14 - Assigning Sample Data to Moisture Ranges for GMM Type Evaluation

Source: Charles R. Hurburgh, Jr., Iowa State University

Background: Many of the tests specified in the Grain Moisture Meter chapter of NIST Publication 14 require using a defined number of samples in each of three 2 % moisture intervals. For ease of selection, the samples are tested on the Official meter and are assigned to the 2 % moisture intervals based on the Official meter's moisture result. It is simpler to assign ranges in advance based on prescreening because the sample set is defined before the test; however, assignment of sample data to moisture ranges can be a critical item for device evaluation, in that one sample shifted from one range to another can actually affect the pass/fail status of the device in both ranges, depending on the performance of the device on the other samples in the two ranges. Assigning the samples to 2 % moisture intervals based on air oven moisture results (or, in the case of sample temperature sensitivity tests, based on moisture determined at room temperature by the device under test) will reduce sample set dependence and lessen the impact of individual sample properties resulting in a more realistic test of device characteristics. Assigning samples to 2 % moisture intervals based on their air oven moisture values also matches the basis on which sample data are grouped for analysis in the Phase II On-going Calibration Program.

Recommendation: Dr. Hurburgh proposed an amendment to the Grain Moisture Meter chapter of NIST Publication 14 to specify that test sample sets are to be selected based on air oven moisture values or, in the case of sample temperature sensitivity tests, based on moisture determined at room temperature by the device under test.

Discussion: A question was raised regarding what basis would be used to decide which samples to discard in the event that all extra samples were not needed. Dr. Hurburgh suggested that one possibility was to use only the first 10 samples that fell within the range.

Rich Pierce, GIPSA, was not in favor of changing the existing laboratory procedure. He explained that deliberately selecting samples that are distributed across each 2 % range provides for a better test set. The NTEP Laboratory was not eager to change a procedure that has worked well for years. Dr. Pierce did not see a problem with what is being done procedurally at the present time.

Conclusion: The Sector failed to reach a consensus on the proposed change.

13. 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. Since June 22, 2001, a TC17/SC1 work group has been meeting to review revision to OIML R59. The most recent meeting of the TC17/SC1 work group was held on September 20 – 21, 2004, at the Laboratory National D'Essais (LNE) in Paris, France.

Discussion: The most recent draft of OIML R59 is the 3rd Committee Draft of OIML R59 "Moisture Meters for Cereal Grain" dated April 2005. This has been submitted by the Secretariat to participating and observing countries for review, comment and approval of the changes. Copies of the 3rd Committee Draft of OIML R59 and the minutes of the TC17/SC1 September 2004 meeting can be found on the NIST Weights and Measures Division website at: http://ts.nist.gov/ts/htdocs/230/235/R59draft.htm.

Diane Lee, NIST Weights and Measures Division, reviewed some of the changes included in the draft and asked Sector members to forward comments to her by September 8, 2005. She reported that concerns relating to the temperature requirements were addressed by inserting the following sentence into Paragraph 5.7.1.:

> If the moisture meter is not able to measure sample temperature, then the operating temperature range shall be defined by national responsible bodies.

And Paragraph 5.7.2. was modified by inserting the sentences:

> The moisture meter shall be able to take into account a temperature difference of at least 10 °C.
> If the moisture meter is not able to measure sample temperature, the maximum allowable temperature difference between the meter and the sample shall be defined by national responsible bodies.

To address the concerns relating to sample size requirements, Paragraph 6.1.5. was modified to remove the explicit minimum sample size requirements leaving only the sentence:

> "Meters shall be designed to measure the moisture content of representative size grain samples."

A Test Section Check List has been added to the draft. It is not a detailed "check list" like the one in Publication 14.

Ms. Lee also reported that China (the Secretariat of TC17/SC1) has indicated that a meeting of TC17/SC1 would not be held in 2005. A date for a future meeting has not yet been set.

Steve Patoray, NTEP Director, answered Sector concerns that changes in the 3rd Committee Draft might ultimately allow approval of grain moisture meters that didn't meet current Handbook 44 requirements. Mr. Patoray stated that these differences could be dealt with when (and if) the U.S. enters into a mutual acceptance agreement (MAA) with OIML, the EU or other body.

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

Background: This item was included on the Sector's agenda to provide a summary of the activities of OIML TC5/SC2. In December 2004 the Secretariats, Germany and France, for OIML TC5/SC2 submitted a pre-draft of the OIML Document "General Requirements for Software-Controlled Measuring Instruments." The Document is intended as guidance for technical committees when addressing software requirements in future OIML Recommendations for software-controlled measuring instruments.

According to the Secretariat, the pre-draft was developed based on responses of OIML TC5/SC2 members to a questionnaire, the analysis of existing OIML Recommendations and Documents, the analysis of existing regional software requirements (including the European Measurement Instrument Directive and U.S. Food and Drug Guidance Documents), and ISO/IEC software standards.

Noting that Sections 7, 8 and 9 of the pre-draft document were incomplete, Wayne Stiefel, NIST, Weights and Measures Division, solicited comments on the pre-draft. U.S. interested parties were asked to review the document in terms of the general approach being proposed and what is practical and applicable in a type approval setting and to also provide detailed comments on specific sections. NIST was particularly interested in comments related to the general and specific requirements for measuring instruments in Section 5, and the type approval examination and evaluation procedures in Section 6. Comments were to be returned to Mr. Stiefel by February 1, 2005, to allow NIST to prepare a collated set of comments by February 28, 2005, for the Secretariat.

The pre-draft document prescribes in Section 5 general requirements for measuring instruments, including:

1. Information display;
2. Means of fraud protection;
3. Hardware features supporting fault detection and durability protection; and
4. Specific requirements for:
    a. Design of interfaces;
    b. Separation of software models performing functions subject to legal control from other functions;
    c. Display or printouts;
    d. Storage of data and transmission via communication systems;
    e. Compatibility of operating systems and hardware portability;
    f. Conformity of production-line devices and software with approved type;

g. Verification of software updates; and
h. Procedures for loading updated software and maintaining audit trail.

In addition, the document provides in Section 6 type approval procedures to be used in examination and evaluation of the software including the following items:

1. Software documentation to be supplied;
2. A set of validation methods for software examination, which a Recommendation may use to specify the details of the procedure to assure that the instrument complies with the Recommendation. Software specific validation methods include: examination of the Software documentation and specification and validation of design; functional testing of metrological features; functional testing of software features; data flow analysis; code inspection walk-through; and software module testing.

The pre-draft software document, the Secretariat's Response to TC5/SC2 Member Comments, and electronic forms for submitting comments are still available on the web at: http://ts.nist.gov/ts/htdocs/230/235/TC5-SC2.htm.

Discussion: Diane Lee, NIST/WMD, reported that a 1st working draft Recommendation is being prepared by the Secretariats to address comments received on the outline draft. Another meeting of TC5/SC2 has tentatively been scheduled for the end of 2005. Commenting on the possible impact of the proposed Recommendation, one manufacturer stated that his company would be opposed to the recommendation if it meant that calibration parameters would need to be made available. Sector members are asked to review this document, especially in terms of its possible impact on OIML R59 "Moisture Meters for Cereal Grain" and with emphasis on what is practical and applicable in a type approval setting.

15. 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, held its first meeting May 31 – June 1, 2004, in Sydney, Australia. Representatives from Australia, Japan, New Zealand, and the United States attended the meeting. Comments received from the U.S. and Germany were discussed at the TC17/SC8 meeting in Australia. The comments for the most part were accepted. The scope 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.

A revised outline of the Recommendation on Protein Measuring Instruments for Cereal Grain, incorporating the changes agreed upon at the 2004 meeting in Sydney, was distributed with the agenda for the Near-Infrared Grain Analyzer Sector's August 2004 meeting for further review and comment. The U.S. work group members provided limited comments to this draft. The comments that were provided to the Secretariat related to parts of the document that appeared to be in conflict with U.S. metrological practice and procedures.

Discussion: A meeting of TC17/SC8 was hosted by PTB in Berlin, Germany, June 27 – 28, 2005, to review the May 2005 version of the "Outline of the Recommendation on Protein Measuring Instruments." Diane Lee, NIST/WMD, reported that the first working draft may be available by end of September 2005. Diane will distribute the draft to the sector members along with a request for comments when the first working draft is available. Diane also requested that the Sector review the tolerances in the current draft and provide comments as soon as possible.

16. Naming Conventions for Near-Infrared Analyzer Calibrations

Background: Both the Grain Moisture Meters Code and the Near-Infrared Grain Analyzer Code of NIST Handbook 44 specify that a device must be capable of displaying either calibration constants, a unique calibration name, or a unique calibration version number. The relevant paragraphs are shown below:

Sec. 5.56.(a) Grain Moisture Meters

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

(Added 1993) (Amended 1995 and 2003)

Sec. 5.57. Near-Infrared Grain Analyzers

S.2.5.2. Calibration Version. - *An instrument must be capable of displaying either calibration constants, a unique calibration name, or a unique calibration version number for use in verifying that the latest version of the calibration is being used to make constituent determinations, and that the appropriate instrument settings have been made for the calibration being used.*
[Nonretroactive as of January 1, 2003]
(Amended 2001)

Because the constituent calibrations used on near-infrared (NIR) instruments typically consist of many multi-digit constants, manufacturers of these devices normally elect to identify the calibration version by means of "a unique calibration version number."

Some devices currently in use use a combination of terms to identify the calibration. For example, the Foss Infratec 1241 uses two levels of calibration identification. At the most basic level, a prediction model (PM) identifier is used for each individual constituent calibration. The PM contains the coefficients used to actually determine constituent content. Prediction models for various constituent calibrations are combined to form application models (AM). AM identifiers appear on the analyzer screen and are also the calibration identifiers used in the audit trail. The AM identifiers may be different for each instrument based on the customer's requirements (e.g., the AM may include constituents not covered by NTEP, such as wheat gluten, or possibly an alternate moisture basis.) The PM identifiers, which may be displayed by moving deeper into the menu system, are the same for all instruments.

Two other Foss instruments, Infratec 1227 and Infratec 1229, also make use of AM identifiers which may be different for each instrument depending on the specific combination of prediction models they contain. However, the PM identifiers cannot be displayed on these two instruments.

Discussion/Recommendation: GIPSA implemented the NTEP wheat protein calibration in May and the NTEP barley calibration in July. Foss Infratecs are being used in both the official system and the commercial system. Anticipating that the uniqueness of AM identifiers based on user requirements could lead to field inspection problems on cross-utilized instruments, GIPSA met with Foss last December to discuss how "unique calibration version numbers" might be listed to meet the needs of both the NTEP program and GIPSA, with the objective being to make it obvious that the current NTEP protein and moisture calibrations are being used. The proposed solution would first appear on Foss Certificates of Conformance: 95-063A9 and 01-063A5.

The solution proposed by GIPSA is to list the calibrations using the following code:

ABYYMMxx

where AB is the grain identifier
YY is the year the calibration is issued
MM is the month the calibration is issued
xx would be a "version" number from 00 to 99

The ABYYMM part of the calibration would be the unique identifier to ensure that the current calibrations listed on the Certificate of Conformance for moisture, oil, and protein are being used. The xx would then be customer specific and it could include constituents not covered by NTEP such as wheat gluten or possibly an alternate moisture basis.

For example, the calibration for durum wheat protein and moisture would be listed as WU050101. The unique identifier of the calibration would be WU0501 to let the field inspector quickly see on any Infratec 1227, 1229, or 1241 that it has the current NTEP moisture and protein calibrations. The 01 would be a version number that is assigned from 00 to 99 that is customer specific and it includes constituents not covered by the NTEP such as wheat gluten or possibly an alternate moisture basis.

The ABYYMMxx is the designation the user and field inspector would see when they walk up to the instrument. The field inspector could go into the instrument menu structure to see the specific moisture equation name, protein equation name, etc., that are bundled together to make up the ABYYMMxx calibration version on the Infratec 1241 with the xx suffix unique to each instrument.

The Sector was asked to consider if there would be any pitfalls or problems with using the above GIPSA proposal to list the calibrations on the CC by the AM number, using this scheme, e.g. WU0501xx, with the note that xx can be any number between 00 and 99.

One Sector member pointed out that the PM calibrations making up the bundle had been approved, not the AM bundle itself. Several members favored using the proposed naming convention, listing only PM identifiers on the CC for the Infratec 1241 and listing both the AM identifier and, if possible, the included PM identifiers on the CC for the Infratec 1227 and 1229. The Foss representative noted that the Infratec 1227 and 1229 were NTEP approved only for moisture and had not been available for sale for a number of years. It was also pointed out that the AM contains metrologically significant instrument set-up data (the number of replicates for example), so it must appear on the CC in addition to the PM's.

Conclusion: The CC for the Infratec 1241 will list both AM identifiers and the identifiers of all NTEP-approved PM's included in each AM. The CC for the Infratec 1227 & 1229 will list only the AM identifier (in this case called "Calibration Version"). For all of these models, the AM identifier will appear in the form proposed above with only the last two digits, shown as “xx,” varying. Examples of the listings for Hard Red Spring Wheat and Corn as they appear on the CC's are shown below.

From CC 01-063A5 (Infratec 1241)	**From CC 95-063A9 (Infratec 1227 & 1229)**
Hard Red Spring Wheat Designation: HRS WHEAT Application Model: WS0501xx Moisture Prediction Model: WBMO0024 Moisture Range - Approved: 8 - 20% Moisture Range - Pending: 6 - 24% Protein Prediction Model: WBPR0028 Native Moisture Basis: 0% Subsamples: 7 (or more) Slope: 1.0 for all instruments Intercept (Bias): Varies by instrument	**Hard Red Spring Wheat** Designation: HRS WHEAT Calibration Version: WS0501xx Moisture Range - Approved: 8 - 20% Moisture Range - Pending: 6 - 24% Subsamples: 10 Path Length: 18 mm Slope: 1.0 for all instruments Intercept (Bias): Varies by instrument
Corn Designation: CORN Application Model: CO0501xx Moisture Prediction Model: COMO0011 Moisture Range - Approved: 8 - 40% Moisture Range - Pending: 8 - 46% Oil Prediction Model: COOI0006 Protein Prediction Model: COPR0007 Native Moisture Basis: 0% Subsamples: 7 (or more) Slope: 1.0 for all instruments Intercept (Bias): Varies by instrument	**Corn** Designation: CORN Calibration Version: CO0501xx Moisture Range - Approved: 8 - 44% Moisture Range - Pending: 8 - 46% Subsamples: 10 Path Length: 30 mm Slope: 1.0 for all instruments Intercept (Bias): Varies by instrument

17. Time and Place for Next Meeting

The next meeting is tentatively planned for Wednesday, August 23, and Thursday, August 24, in the Kansas City, MO, area. Sector members are asked to hold both these days open pending determination of exact meeting times and meeting duration. Meetings will be held in one of the meeting rooms at the National Weather Service Training Center if available. Final meeting details will be announced by late April 2006.

If you would like to submit an agenda item for the 2006 meeting, please contact Steve Patoray, NTEP Technical Director, at spatoray@mgmtsol.com, G. Diane Lee, NIST Technical Advisor, at diane.lee@nist.gov, or Jack Barber, Technical Advisor, at jbarber@motion.net by April 1, 2006.

Change Summary

Recommended Amendments and Changes to the Grain Moisture Meters Chapter in the 2005 Edition of Publication 14			
Section Number	**Amendment/Change**	**Page**	**Source**
Appendix D	Correct the Table titled: **Moisture Ranges and Tolerances for Sample Temperature Sensitivity** by inserting a row for Grain Type Long Grain Rough Rice (with Moisture Range 10-16% and Tolerance Limit 0.45) between the rows for Oats and Medium Grain Rough Rice (see corrected Table).	GMM-43	08/05 Grain Analyzer Sector Item 9

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

Agenda Items

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1. Report on the 2006 NCWM Interim and Annual Meetings

The 91st Interim Meeting of the National Conference on Weights and Measures (NCWM) was held January 22 – 25, 2006, in Jacksonville, FL. Steve Patoray, NTEP Director, reported that 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 were presented for consideration by the NCWM at the 2006 Annual Meeting.

Steve Patoray also reported that the Board of Directors, on behalf of NCWM, Inc., had signed a Declaration of Mutual Confidence (DoMC) with the International Organization of legal Metrology (OIML) as a "utilizing participant" for OIML R 60 (Load Cells). He explained that a DoMC is an agreement, signed by various bodies in charge of legal metrology activities in different countries, by which they declare that they will voluntarily accept test results of type evaluations conducted according to the OIML Recommendations for a specific category of instruments. A “Utilizing Participant” accepts OIML Evaluation Reports validated by OIML Certificates but does not issue any OIML Test Reports or OIML Certificates under the DoMC. While this specific action does not directly affect grain analyzers, Steve pointed out it does show why the harmonization of International Standards (OIML) and U.S. Standards (NIST Handbook 44 and NCWM Publication 14) is increasingly important. Instrument manufacturers may eventually be able to facilitate the type approval of their instruments in various countries, using the "one-stop testing" concept.

2. 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, reported on NTEP Type Evaluation activity. In addition to regular grain moisture meter calibration updates, evaluations are currently underway for two additional devices: one for test weight per bushel (an add-on to a currently approved grain moisture meter); and one for a new grain moisture meter. She also reported that the following device types would be enrolled in the OCP (Phase II) for the 2006 harvest:

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

DICKEY-john Corporation	GAC2000, GAC2100, GAC2100a, GAC2100b
DICKEY-john Corporation	OmegAnalyzer G
Foss North America	Infratec 1241
Foss North America	Infratec 1227, Infratec 1229
Seedburo Equipment Company	1200A
The Steinlite Corporation	SL95

She noted that, because there are now six devices in the program as compared to the devices in 2005, the cost to manufacturers for Phase II has increased from $5,300 to $7,730 per meter type.

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 mfg's)	(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

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, presented data showing the performance of NTEP

meters compared to the air oven. These data were based on the last three crop years (2003– 2005) using calibrations updated for use during the 2006 harvest season. Noting that the X-axis for Durum Wheat covered a range of 8% to 18% moisture although no samples had been received in the 16-18% interval, Cathy explained that the moisture intervals (ranges) shown for each grain are the same as those listed on GIPSA Program Directive 9180.61 for the Official Meter. Using a fixed X-axis for individual grain types makes it easier to make meaningful visual comparisons in the results for successive three-year periods.

In response to a question of why the "sustained bias" rule hadn't been applied to the Official Meter's calibration for Corn, Dr. Richard Pierce, GIPSA, explained that as long as the meters are within the allowed tolerance for "sustained bias," there is no requirement to change the calibration.

The Sector acknowledged the effort that had gone into the compilation and presentation of the comparative performance data and thanked Cathy Brenner for a job well done.

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 information.

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 for each grain type 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 for each grain type verified for test weight.

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 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 grain-dependent TW coefficients as part of the moisture calibration. In that case, unless TW 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 TW calibration coefficients are not part of the moisture calibration coefficients then they must be listed on the CC.

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.

At their August 2005 meeting, 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 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.

The Sector's Co-Technical Advisor, Mr. Jack Barber was directed to draft proposed wording for the amendment for consideration by the Sector at its August 2006 meeting.

Discussion: The Sector reviewed the proposed amendments to Section VII of Publication 14 to address criteria for TW calibration, which was provided in the 2006 meeting agenda. Cathy Brenner, representing GIPSA, the NTEP Participating Laboratory for Grain Analyzers, reported that based on historical data, meters passing the existing Phase I Test Weight per Bushel (TW) test for Bias also passed the proposed test for ΔBias (see guideline 5 , above). Furthermore, the majority of the times a meter failed the existing test for TW Bias they passed the test for ΔBias. The few times when a meter also failed the proposed ΔBias test, there was a problem with one of the instruments. The Sector concluded that the proposed test for ΔBias was both redundant and ineffective. Portions of the proposed amendment related to ΔBias were deleted.

One Sector member questioned if it was really possible to identify how a meter was configured to measure TW or if there was an identifiable TW calibration on a meter. The Co-Technical Advisor, Jack Barber, explained that the steps involved in arriving at a TW value include: 1) measuring the weight of the grain in the meter's test cell (or separate test "cup"); 2) converting the measured weight into an equivalent pounds per bushel figure assuming that the test cell volume is constant. Unfortunately, the conversion step is grain specific. The packing density of grain is influenced by the size and shape of the kernels of grain; by the size and shape of the test cell; by the surface condition of the grain; by the distance the grain drops as it loads into the cell; and by the size of the sample being dropped. In addition, the effective volume of grain being weighed will vary by grain type due to the way the device "strikes off" or removes excess grain from the top of the test cell. As a result, meters use empirically determined grain specific constants to convert the measured weight into pounds per bushel. The constant is typically a "slope" term in the TW calibration. An additional grain specific constant, a "bias" or "intercept" term, is sometimes used to provide a "best fit" over the range of available samples.

Answering manufacturer's questions concerning how to handle device specific adjustments/parameters that were also grain specific, the Co-Technical Advisor, Diane Lee cited the following paragraphs from section 5.56.(a) of NIST Handbook 44, noting that the code differentiates between "grain calibrations" (typically the grain specific constants that are identical for all devices of like type) and "standardization adjustments" (the device specific adjustments or software parameters that make all devices of like type respond identically to the grain being measured when using the same calibrations.)

S.2.4. Calibration Integrity

S.2.4.1. Calibration Version. - A meter must be capable of displaying either calibration constants, a unique calibration name, or a unique calibration version number for use in verifying that the latest version of the calibration is being used to make moisture content and test weight per bushel determinations.
(Added 1993) (Amended 1995 and 2003)

S.2.4.2. Calibration Corruption. - If calibration constants are digitally stored in an electronically alterable form, the meter shall be designed to make automatic checks to detect corruption of calibration constants. An error message must be displayed if calibration constants have been electronically altered.
(Added 1993) (Amended 1995)

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.*

*[**Note**: Only the manufacturer or the manufacturer's designated service agency may make standardization adjustments on moisture meters. This does not preclude the possibility of the operator installing manufacturer-specified calibration constants under the instructions of the manufacturer or its designated service agency.] Standardization adjustments (not to be confused with grain calibrations) are those physical adjustments or software parameters which make meters of like type respond identically to the grain(s) being measured.*
[Nonretroactive as of January 1, 1999]
(Added 1994) (Amended 1998)

The Sector engaged in a lengthy discussion. One faction was of the opinion that the Type Evaluation for TW (Phase I) was a one-time evaluation and should not be extended into Phase II with a required annual report. They suggested that manufacturers be permitted to make TW calibration changes at their own discretion supported by existing Phase II or manufacturer supplied data. Field-testing of TW could be used to determine if individual devices were in compliance. The opposing faction was equally firm in believing if it was important enough for a manufacturer to change a TW calibration, it was important enough to set tolerance limits for performance based on the largest set of data available and to ensure that it could be verified in the field that the calibration changes have been made to all devices of like type in use.

An attempt was made to find a common ground between these two positions. The compromise proposal eliminated performance tolerances but retained the following paragraphs:

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.

Steve Patoray, NTEP Director, pointed out that as far as NTEP Publication 14 was concerned, Phase II TW data doesn't exist. [Editor's note: The TW data currently being supplied to manufacturers along with Phase II moisture results is being collected by GIPSA as an internal matter and is being provided to manufacturers as a courtesy.] Consequently, the compromise proposal can't refer to "Test weight per bushel data from Phase II." With that revelation the Sector agreed by consensus to the original proposal modified only by reducing the tolerances of paragraph III.C.b. to 0.40 for corn and oats; 0.25 for wheat; and 0.35 for all other grains.

It was suggested that CCs include a note telling field inspectors how to determine if the most recent TW calibration had been installed. For example, should the inspector be looking for a specific calibration identifier, or were TW calibration coefficients embedded in the listed moisture calibration coefficients?

Recommendation: Amend Section **VII. Additional Type Evaluation Test Procedures and Tolerances for Grain Moisture Meters Incorporating an Automatic Test Weight per Bushel Measuring Feature** of the 2006 Edition of the GMM chapter of *NCWM Publication 14* as follows, to define calibration performance requirements on the basis of data collected as part of the on-going national moisture calibration program.

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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A. Basic Instrument Tests:

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B. Accuracy, Precision, and Reproducibility

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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 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: 0.40 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 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 Section 5.56.(a) to Address Minimum Acceptable Abbreviations for Multi-Class Grain Moisture Calibrations

Discussion: ***NIST Handbook 44*, Section 5.56.(a)** Paragraph **S.1.2. Grain or 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" does not include "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.

Conclusions and Recommendation: The Sector decided that the originally suggested multi-class groups: soft wheat, hard wheat, red wheat, and white wheat were thought to be confusing and subject to potential misuse. Only the following multi-class groups should be considered for type evaluation:

All-class Wheat
Wheat excluding Durum
All-class Barley
All-class Rough Rice

A poll of manufacturers present revealed that increasing the four-character display requirement of Paragraph S.1.2. to eight-characters would not be a problem with instruments in current production, so up to eight characters could be used for multi-class group abbreviations. The Sector decided that the sentence specifying the display capacity was not needed, because the necessary display capacity was obvious from the number of characters in the longest minimum acceptable abbreviation listed in Table S.1.2.

The Sector agreed that the above multi-class groups should be added to Table S.1.2. and that Paragraph S.1.2. should be modified as necessary to accommodate multi-class grain moisture calibrations.

The Sector agreed to recommend the following modifications to Paragraph **S.1.2. Grain or Seed Kind and Class Selection and Recording** and **Table S.1.2.** of **Section 5.56.(a)** of NIST Handbook 44 to include minimum acceptable abbreviations for multi-class grain moisture calibrations.

> **S.1.2. Grain or Seed Kind and Class Selection and Recording.** - Provision shall be made for selecting and recording the kind and class *or multi-class group* (as appropriate) of grain or seed to be measured. The means to select the kind and class *or multi-class group* of grain or seed shall be readily visible and the kind and class *or multi-class group* of grain or seed selected shall be clearly and definitely identified. Abbreviations for grain types *and multi-class groups* indicated on the meter must meet the minimum acceptable abbreviations listed in Table S.1.2. ~~Meters shall have the capability (i.e., display capacity) of indicating the grain type using a minimum of four characters in order to accommodate the four-character abbreviations listed in Table S.1.2.~~
> (Amended 1993, ~~and~~ 1995, and 2008)

Table S.1.2. Grain Types and Multi-Class Groups Considered for Type Evaluation and Calibration and Their Minimum Acceptable Abbreviations

Grain Type	***Minimum Acceptable Abbreviation***	***Grain Type***	***Minimum Acceptable Abbreviation***
Corn	*CORN*	*Soybeans*	*SOYB*
Durum Wheat *Soft White Wheat* *Hard Red Spring Wheat* *Hard Red Winter Wheat* *Soft Red Winter Wheat* *Hard White Wheat* *All-Class Wheat** *Wheat excluding Durum**	*DURW* *SWW* *HRSW* *HRWW* *SRWW* *HDWW* *WHEAT* *WHTEXDUR*	*Two-rowed Barley* *Six-rowed Barley* *All-class Barley** *Oats*	*TRB* *SRB* *BARLEY* *OATS*
Sunflower seed (Oil)	*SUNF*	*Long Grain Rough Rice* *Medium Grain Rough Rice* *All-class Rough Rice**	*LGRR* *MGRR* *RGHRICE*
Grain Sorghum	*SORG or MILO*	*Small oil seeds (under consideration)*	

[Note: Grain Types marked with an asterisk (*) are "Multi-class Calibrations"]
[Nonretroactive as of January 1, 1998]
(Table Added 1993) (Amended 1995, ~~and~~ 1998, 2008)

[Editors Note: In preparing this item for the NCWM S&T review it was determined that the term "Multi-class" is not a widely used term. The sector may want to consider developing a definition for multi-class calibrations.]

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

Background: The GMM Chapter of NIST Publication 14 was recently amended to allow multi-class moisture calibrations. In conjunction with Agenda Item 5, the sector is recommending modifications 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.

Conclusions/Recommendation: The Sector agreed that modifications should be made to the NIR Grain Analyzer Code of Handbook 44 and the corresponding sections of Publication 14 to correspond with changes recommended in Agenda item 5, to handle multi-class moisture calibrations.

The sector agreed to recommend the following modifications to (a) Paragraph **S.1.2.** ***Selecting Grain Class and Constituent*** and **Table S.1.2.** of **Section 5.57** of NIST Handbook 44, and (b) Amend Section **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 Section 5.57 of NIST Handbook 44:

S.1.2. Selecting and Recording Grain Class and Constituent. - *Provision shall be made for selecting, and recording the type or class of grain and the constituent(s) to be measured. The means to select the grain type or class and the constituent(s) shall be readily visible and the type or class of grain and the constituent(s) selected shall be clearly and definitely identified in letters (such as HRWW, HRSW, WHEAT etc. or PROT, etc.). A symbol to identify the display of the type or class of grain and constituent(s) selected is permitted provided that it is clearly defined adjacent to the display. Minimum acceptable abbreviations are listed in Table S.1.2.* ~~*Meters shall have the capability (i.e., display capacity) of indicating the grain type using a minimum of four characters in order to accommodate the abbreviations listed in Table S.1.2.*~~
[Nonretroactive as of January 1, 2003]

If more than one calibration is included for a given grain type, the calibrations must be clearly distinguished from one another.
[Nonretroactive as of January 1, 2004]

Table S.1.2. Grain Types Considered for Type Evaluation and Calibration and Minimum Acceptable Abbreviations	
Grain Type	***Minimum Acceptable Abbreviation***
Durum Wheat	*DURW*
Hard Red Spring Wheat	*HRSW*
Hard Red Winter Wheat	*HRWW*
Hard White Wheat	*HDWW*

Soft Red Winter Wheat	*SRWW*
Soft White Wheat	*SWW*
*All-Class Wheat**	*WHEAT*
*Wheat excluding Durum**	*WHTEXDUR*
Soybeans	*SOYB*
Two-rowed Barley	*TRB*
Six-rowed Barley	*SRB*
*All-Class Barley**	*BARLEY*
Corn	*CORN*

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

[Nonretroactive as of January 1, 2003]

(Table Amended 2001 and 2008)

(Amended 2003 and 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.		
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				
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, for publication ~~"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.

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. However, 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.

Discussion: The Sector discussed 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.

Consideration of the above points prompted a lively discussion. Although most Sector members were generally in favor of either redefining or eliminating the "Pending" classification, this approach implied that another method had to be found to determine operating ranges, because "Pending" moisture ranges have traditionally been used to set the upper and lower moisture limits (operating range) for each calibration. Manufacturers objected to using a single fixed range for all types of devices, noting that some technologies were more accurate than others at high moistures. They preferred an option that would allow them to competitively extend the operating range and objected to being restricted by limitations in the Phase II sample collection system. The suggestion that CCs carry the notation, "Evaluated over the moisture range of ___% to ___%, and certified for use over the range of ___% to ___%," was rejected on the grounds that an NTEP certificate was not intended to be marketing tool. The Sector was also of the opinion that a 6% operating range was too restrictive for a new device.

The question of how operating limits should be determined was temporarily set aside to consider fixed ranges for certification/verification of moisture calibrations. There was general agreement that the ranges had be wide enough to encompass the moisture ranges used in the market, but there was concern that choosing ranges that were too wide would lead to the present problem of insufficient samples. Dr. Richard Pierce, GIPSA, distributed a page from the USDA/GIPSA Moisture Handbook that listed the moisture ranges supported by GIPSA for each grain type, suggesting that these moisture ranges might be considered for use as the fixed ranges for NTEP Phase II verification. Many Sector members believed that these ranges were too wide to be supported by 3-years (or even 5-years) of NTEP Phase II data. Durum Wheat, with a "GIPSA supported" range of 7% to 20%, had only 4 samples in the 6 to 8% moisture interval and only 1 sample in the 18 to 20% interval for the most recent 3-years of Phase II data. Similar sample shortages were noted for most of the other

NTEP grains. A decision on the specific fixed ranges to be used for certification/verification of moisture calibrations was left for further study.

Several "what if" questions were asked regarding how fixed certification/verification ranges might work under certain circumstances. These questions and the sector's response are outlined below.

Question: What "Certified/Verified" range should be listed for a new device?
Answer: New devices would be certified/verified over the basic 6% moisture ranges listed for Phase I tests.

Question: What happens if not enough samples are available to certify the new device for the full range after one year in Phase II?
Answer: The certified/verified range remains at 6% until enough samples have been collected in a 3-year period to certify the device for the full range.

Question: Will confidence intervals still be used?
Answer: Yes, a 95% confidence interval will be added to the maximum tolerance for each 2% moisture interval outside of the basic 6% moisture range.

Question: What happens if a meter is outside of tolerance (even with the confidence interval) on any of the upper 2% moisture intervals of the full range? Does the whole calibration get rejected?
Answer: Yes, the manufacturer must submit a new calibration with re-predicted moistures showing that tolerances are met for all 2% intervals in the full range.

Question: What happens to an existing calibration if not enough samples are available in any of the upper 2% intervals?
Answer: A previously verified calibration would not be forced to re-calibrate due to lack of samples.

With these questions answered, it was suggested that the manufacturer should specify the operating moisture range for each grain. This range would NOT be listed on the CC, but would be used to determine when warnings would be displayed and printed to indicate that the displayed/printed moisture content of a sample being measured was beyond the operating range of the device. [See NIST Handbook 44, Section 5.56.(a)., Paragraphs S.1.1.(f) and S.1.3.(c).] Steve Patoray, NTEP Director, noted that there was a precedent for evaluation ranges that differed from operating ranges. There are devices that are tested by the NTEP lab over one range of conditions but used over a wider range of conditions. The Sector agreed that allowing individual manufacturers to specify the operating moisture ranges for their devices would make adoption of fixed evaluation/verification ranges for all CCs more acceptable.

Conclusion: The Sector decided that additional study was needed before a final recommendation could be made on this issue. This item will be carried over to the Sector's August 2007 meeting. The following points summarize the Sector's thinking at the close of the August 2006 meeting:

1. The "pending approval" classification will be eliminated. Operating ranges (upper and lower moisture limits) will be specified by the manufacturer. Operating ranges will NOT be listed on CCs.

2. The three most recent years of Phase II data will continue to be used to evaluate calibration performance.

3. Certificates will list a single "standard" moisture range for each grain calibration. These ranges will not vary from year to year. They will be the same for all instruments (See exception for new instruments.) The "standard" ranges have to be to be wide enough to encompass the moisture ranges most commonly used in the market (to be determined) but narrow enough to assure that sufficient Phase II data will be available (over a three-year period) to:

    a. permit a new meter's calibrations to be "verified" over those ranges by the end of its third year in Phase II; and

    b. permit existing NTEP certified meters' calibrations to be "verified" over those ranges using the most recent three years of Phase II data when the new rules are first adopted.

4. Once a calibration has been "verified" a recalibration will not be forced due to lack of samples.

5. New instruments will be "evaluated" over the basic 6% moisture ranges for corn, soybeans, and hard red winter wheat. Certificates for new instruments will continue to list the 6% moisture ranges as the "evaluated" or "verified" ranges until sufficient Phase II data has been collected to allow the new instrument to achieve "verified" status for the full moisture range.

6. Outside the basic 6% moisture range, tolerances used to require a change in calibrations will continue to include the application of a 95 percent confidence interval to the maximum tolerance for each 2-percent moisture interval.

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

Background: Item (d) of paragraph S.4. in Handbook 44, Section **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.

Discussion: The Sector considered the amendments and changes proposed in the agenda. Ms. Cassie Eigenmann, Dickey-john, was concerned that the above requirements applied to the "Instruction Manual." A review of the Grain Moisture Meter code in Handbook 44 indicated that the Handbook mentions only "operating instructions" and makes no reference to an "Instruction Manual."

Conclusion: The Sector concluded that the "operating instructions" referred to in Handbook 44 could take many forms, including those displayed on the device's menu of installed calibrations. No change to Handbook 44 was deemed necessary.

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

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; and
- 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.

Dr. Richard Pierce, GIPSA, presented a brief 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.

Early test results on Corn found no major effect on either moisture or TW as up to 12% BCFM (broken corn and foreign material) was re-introduced in increments of approximately 2 percentage points to a clean sample from which the BCFM had been removed.

Soybeans were tested for the effects of added Splits (soybeans that are split/broken) and added FM (foreign material).

Effect on Moisture and TW

- Moisture results showed negligible change with up to 10% added Splits.
- Beyond 10% Splits, moisture increased with added Splits.
- At 35% Splits, percent moisture had increased by 0.8%.
- Moisture results appear to be more variable with added Splits.

- TW decreases (2.0 lbs/bu) with 35% added Splits.

Although moisture results seemed to be more variable with added FM, a recognizable pattern for moisture due to added FM was not found. Test weight decreased almost linearly with added FM to a loss of 5.5 lbs/bu at 10% added FM.

Wheat was tested for the effects of added SHBN (shrunken and broken kernels) and added DKG (dockage).

Effect on Moisture and TW

- Added SHBN below 3% had no major effect on either moisture or TW.
- Levels of SHBN above 3% were virtually nonexistent in the database.
- Percent moisture decreased with increasing DKG (-0.6 with 2% DKG,).
- Moisture results seemed to become more variable.
- TW also decreased with increased DKG to a loss of 2 lbs/bu at 2% added DKG.

Dr. Pierce stressed that this study was in the early stages. Test procedures will be refined and additional data will be obtained on the effects of testing un-cleaned grain samples. Although the early results seem to indicate that moisture results may not be greatly affected by moderate levels of dockage, the Sector agreed unanimously that clean samples must always be used for NTEP evaluations, calibration development, and state field testing.

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. Since June 22, 2001, an international working group of TC17/SC1 has been meeting to review revision to OIML R59. The most recent meeting of the TC17/SC1 work group was held on September 20 – 21, 2004, at the Laboratory National D'Essais (LNE) in Paris, France.

Discussion: Ms. Diane Lee, NIST/WMD, reported that the 4th CD, dated July 2006, along with U.S. comments on the 3rd CD had been distributed to the United States National Working Group (USNWG). The USNWG is for the most part is a subset of the NTEP Grain Analyzer Sector. She asked Sector members to review the changes included in the latest draft and forward comments to her by November 1, 2006. To assist in identifying and locating changes that have been made to the 3rd CD for inclusion in the 4th CD, a copy of the collated comments to the 3rd CD from all participating countries has been requested and will be forwarded to the USNWG upon receipt. [Editor's note: A copy of comments to the 3rd CD from all participating countries was emailed to the USNWG on September 5, 2006.] The USNWG Comments on the 4th CD of OIML R59 will be collated and forwarded to the TC17/SC1 Secretariat for inclusion in the next draft of the document

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, the subcommittee responsible for developing a Recommendation for Grain Protein Measuring instruments. Since May 2004, an international working group of TC17/SC8 has been meeting to develop a new OIML Recommendation for instruments that measure grain protein.

The most recent meeting of the TC17/SC8 work group was held in June 2005 in Berlin to discuss the latest round of comments on the 3rd Working Draft of the Recommendation.

Discussion: Diane Lee, NIST/WMD, reported that a 1st CD of "Protein Measuring Instruments for Cereal Grain and Oil Seeds" dated May 1, 2006, addressing comments received on the 3rd WD had been distributed to the USNWG and related parties for comment. A meeting of the IWG was held in Ottawa, Canada September 25-26, 2006, to address comments to discuss the comments to the 3rd WD and the resulting 1st CD. The TC17/SC8 secretariat will make changes to the 1st CD according to discussion during the September 2006 meeting and develop a 2nd CD that will be forwarded to the USNWG for comment when it is available.

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

Background: This item was included on the Sector's agenda to provide a summary of the activities of OIML TC5/SC2. 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 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, after which comments from U.S. interested parties were solicited. 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: After the report on OIML TC5/SC2, Steve Patoray, NTEP Director, called the Sector's attention to the recently formed NTETC Software Sector. This new Sector held its first scheduled meeting April 5, 6, and 7, 2006, in Annapolis, Maryland where several subcommittee working groups were formed to focus on various aspects relating to the use of software in today's weighing and measuring instruments. Steve mentioned that the Software Sector's work initially would not affect the Grain Analyzer Sector, because grain analyzers, at present, are "built for purpose" devices. Looking to the future, however, a system in which a local instrument obtains optical data on the sample to be measured, transmits it to an off-site computer that calculates the result and transmits the result back to the local instrument for display and print out would most likely have to comply with standards developed by the Software Sector. Interested parties wishing to participate in this sector should direct their requests to Steve Patoray who will see that they are forwarded to the appropriate individual for processing.

13. Time and Place for Next Meeting

The next meeting is tentatively planned for the week of August 20, 2007, in the Kansas City, MO area. Meetings will be held in one of the meeting rooms at the National Weather Service Training Center if available. The meeting room will be reserved for Wednesday, August 22 and Thursday, August 23. Sector members are asked to hold both these days open pending determination of agenda items, exact meeting times, and meeting duration. Final meeting details will be announced by late April 2007.

If you would like to submit an agenda item for the 2007 meeting, please contact Steve Patoray, NTEP Director, at spatoray@mgmtsol.com; G. Diane Lee, NIST Technical Advisor, at diane.lee@nist.gov; or Jack Barber, Technical Advisor, at jbarber@motion.net by April 2, 2007.

[Note: The following items were not on the original agenda, but were added at the meeting on an "as time permits" basis.]

14. Encouraging Participation by State Weights and Measures Personnel

Discussion: Noting that only one state W&M representative was able to attend the current Sector meeting, several Sector members wondered what could be done to encourage additional states to send representatives to Sector meetings. At present, six states are represented on the Grain Analyzer Sector: Arkansas, Nebraska, New York, North Carolina, and Missouri. Of those six states, only three participate on a regular basis. For the current meeting, family illness and travel budget restrictions cut the participation to one. Budget cuts and a significant increase in travel costs (gasoline, air fares, and lodging) seem to be the major underlying causes for the drop in participation. With limited personnel and limited budgets, State W&M Administrators have had to make hard choices on how best to utilize the people and dollars available.

It is current NCWM policy to provide funding for travel to a sector meeting to one participant from each state NTEP Laboratory active in evaluating the device type(s) which will be discussed at the particular sector meeting. Unfortunately, GIPSA is the sole participating NTEP laboratory for grain analyzers. GIPSA is a federal agency not a state agency, so no state W&M representative receives funding from NCWM, Inc. for travel to Grain Analyzer Sector meetings.

According to the 2002 Census of Agriculture the states of Illinois, Indiana, Iowa, Minnesota, and Nebraska grew 67% of the corn and 60% of the soybeans grown in the entire U.S. Only one of these states is listed as having a representative on the Grain Analyzer Sector, and it has been four years since that representative has attended a Sector meeting.

The Sector took no action on this issue.

15. Questions Regarding NIR Calibration for Enhanced Nutrient Corn

Discussion: Dr. Stuart Kaplan, BASF Plant Science, explained that BASF contracts with select area grain elevators to receive and store BASF Enhanced Nutrient corn grown by farmers who are also under contract with BASF. To verify that incoming BASF corn meets contract specifications, elevators test the corn using Foss Infratec 1241 NIR analyzers that BASF has placed in the elevators for this purpose. Because the present NTEP corn calibration for the Foss 1241 does not accurately measure the constituents of the BASF germplasm, BASF developed a calibration specifically for their enhanced nutrient corn. Dr. Kaplan was concerned that their NIR instruments might be "tagged" by state W&M field inspectors. He asked the Sector what might be done to avoid problems of this sort.

Sector members offered a number of suggestions. Steve Patoray, NTEP Director, suggested that Dr. Kaplan contact the director of each related state weights and measures division to see how this would be handled in that jurisdiction. A state W&M member explained that his state had an "Implied Use" regulation. If an inspector encountered a measuring instrument in a location where buying and selling took place, it was implied that the instrument was in "commercial use" and would be subject to test. Another member suggested that notice be placed on the instrument to indicate that it was the property of BASF and was to be used exclusively for testing corn grown under contract with BASF (Note: Although an instrument may be used for contract sales it is still commercial and subject to weights and measures regulation).

Noting that paragraph S.1.2. of Section 5.57 of Handbook 44 states, " If more than one calibration is included for a given grain type, the calibrations must be clearly distinguished from one another," Mr. Jack Barber, the Co-technical Advisor suggested that the BASF calibration be installed on the NIR instrument with a name that clearly differentiated their proprietary variety from common yellow dent corn. If the NTEP corn calibration is also installed on the instrument, normal regulatory field inspection of the instrument could be performed using the NTEP calibration. Nothing in Handbook 44 prohibits using proprietary calibrations for specialty crops grown under contract. Field inspection of the instrument with standard corn samples could offer BASF assurance that the instrument was functioning properly.

Dr. Kaplan thanked the Sector for its advice.

Change Summary

Recommended Amendments to the 2006 Edition of NIST Handbook 44			
Section Number	Amendment/Change	Page	Source
5.56.(a) Grain Moisture Meters	Modify Paragraph S.1.2. and Table S.1.2. to include minimum acceptable abbreviations for multi-class grain moisture calibrations.	5-28	08/06 Grain Analyzer Sector – Item 5
5.57. Near Infrared Grain Analyzers	Modify Paragraph S.1.2. and Table S.1.2. to add criteria applicable to "multi-class" calibrations.	5-42	08/06 Grain Analyzer Sector – Item 6(a)

Recommended Amendments/Changes to the Grain Moisture Meters Chapter in the 2006 Edition of NCWM Publication 14			
Section Number	Amendment/Change	Page	Source
VII. Additional Type Evaluation Test Procedures and Tolerances for Grain Moisture Meters Incorporating an Automatic Test Weight per Bushel Measuring Feature	Add paragraph C. Tolerances For Test Weight per Bushel Calibration Performance [Note: Paragraph C should immediately follow the table of tolerances for reproducibility on page GMM-16.]	GMM-16	08/06 Grain Analyzer Sector – Item 4

Recommended Amendments/Changes to the Near Infrared Grain Analyzers Chapter in the 2006 Edition of NCWM Publication 14			
Section Number	Amendment/Change	Page	Source
III. Accuracy, Precision, and Reproducibility Requirements	Amend to add criteria applicable to "multi-class" calibrations.	NIR-3 thru NIR-6	08 /06 Grain Analyzer Sector – Item 6(b)

National Type Evaluation Technical Committee (NTETC)
Grain Analyzer Sector
August 22-23, 2007 - Kansas City, Missouri
Meeting Summary

Agenda Items

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1. Report on the 2007 NCWM Interim and Annual Meetings

The Interim Meeting of the 92nd National Conference on Weights and Measures (NCWM) was held January 21 – 24, 2007, in Jacksonville, FL. At that meeting the NTEP Committee accepted the Sector's recommended amendments and changes to the 2006 Edition of NCWM Publication 14. These changes appear in the 2007 Edition. For additional background refer to *Committee Reports for the 92nd Annual Meeting*, NCWM Publication 16 - April 2007.

Amendments/Changes to the Grain Moisture Meters Chapter in the 2006 Edition of NCWM Publication 14			
Section Number	Amendment/Change	Page	Source
VII. Additional Type Evaluation Test Procedures and Tolerances for Grain Moisture Meters Incorporating an Automatic Test Weight per Bushel Measuring Feature	Add paragraph C. Tolerances For Test Weight per Bushel Calibration Performance	GMM-16	08/06 Grain Analyzer Sector – Item 4

Amendments/Changes to the Near Infrared Grain Analyzers Chapter in the 2006 Edition of NCWM Publication 14			
Section Number	Amendment/Change	Page	Source
III. Accuracy, Precision, and Reproducibility Requirements	Amend to add criteria applicable to "multi-class" calibrations.	NIR-3 thru NIR-6	08 /06 Grain Analyzer Sector – Item 6(b)

Two items of interest to the Grain Analyzer Sector were reviewed by the Specifications and Tolerances Committee (S&T) at the NCWM Interim Meeting and were forwarded as voting items for consideration at the NCWM Annual Meeting scheduled for July 8 -12, 2007 in Salt Lake City, Utah.

Conference Item Number	Handbook 44 Section Number	Recommendation	Source
356-1.1	5.56.(a) Grain Moisture Meters	Modify Paragraph S.1.2. and Table S.1.2. to include minimum acceptable abbreviations for multi-class grain moisture calibrations.	Grain Analyzer Sector
357-1	5.57. Near Infrared Grain Analyzers	Modify Paragraph S.1.2. and Table S.1.2. to add criteria applicable to "multi-class" calibrations.	Grain Analyzer Sector

Diane Lee, NIST/OWM, reported that both items were approved by the Conference and will appear in the 2008 Issue of Handbook 44.

Steve Patoray, NTEP Director, reported that the NCWM Board of Directors adopted a more detailed policy on the use of the NTEP logo which is a registered trademark of NCWM. All users of the NTEP logo will now be required to sign a license agreement regarding its use. Additional information regarding changes to the NCWM Publication 14 Administrative Policy, the License Agreement, and guidelines on the use of the NTEP Logo will be placed on the NCWM website.

Steve Patoray noted that conformity assessment does not affect Grain Analyzers at present. Conformity assessment remains an issue mostly of interest to the Weighing Sector.

2. 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. In addition to regular grain moisture meter (GMM) calibration updates, evaluation of the Perten AM5100 GMM was completed and a certificate of conformance (CC) was issued in December 2006. 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, GAC2100, GAC2100a, GAC2100b
DICKEY-john Corporation	OmegAnalyzer G
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 Seedburo Equipment Company's 1299A does not expire until July 1, 2008 Seedburo has elected not to enroll in Phase II for the 2007 harvest. Because there are still six devices in the program, the same as in 2006, the cost to manufacturers for Phase II will remain $7,730 per meter type.

3. 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. These data are based on the last three crop years (2004 – 2006) using calibrations updated for use during the 2007 harvest season.

Ms. Brenner pointed out that data on the DICKEY-john OmegAnalyzer G was not included in the comparisons because it had only been in the program for one year. Next year data on Perten's AM5100 will not be included for the same reason. 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.

She noted that no Durum samples in the 16 – 18% moisture range had been received since the 2002 harvest season. Dr. Richard Pierce, GIPSA, observed that Medium Grain Rough Rice data showed very few samples in the 14 – 16% moisture range while the adjacent ranges, both above and below, show nearly four to five times that number. No one was able to offer an explanation.

Cassie Eigenmann, DICKEY-john, offered the general comment that performance data appears to be getting much better; meters are closer to each other and closer to the air oven.

4. 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: This is a carryover item from the Sector's August 2006 meeting. This issue was first raised at the Sector's 2005 meeting when Dr. Richard Pierce, GIPSA (the NTEP Laboratory) mentioned that the NTEP Laboratory was 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.

At their 2006 meeting the Sector discussed guidelines for possible revisions to the GMM Chapter of Publication 14 to address this problem. Two of the most significant guidelines considered for revision were:

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 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.

Most Sector members were generally in favor of either redefining or eliminating the "Pending" classification; however, this approach implied that another method had to be found to determine operating ranges, because "Pending" moisture ranges have traditionally been used to set the upper and lower moisture limits (operating range) for each calibration. Manufacturers objected to using a single fixed range for all types of devices, noting that some technologies were more accurate than others at high moistures. They preferred an option that would allow them to competitively extend the operating range and objected to being restricted by limitations in the Phase II sample collection system. Subsequent discussion led to the suggestion that the manufacturer should specify the operating moisture range for each grain. This range would NOT be listed on the CC, but would be used to determine when warnings would be displayed and printed to indicate that the displayed/printed moisture content of a sample being measured was beyond the operating range of the device. [See NIST Handbook 44, Section 5.56.(a)., Paragraphs S.1.1.(f) and S.1.3.(c).]

The Sector decided that additional study was needed before a final recommendation could be made on this issue. The following points summarize the Sector's thinking at the close of their August 2006 meeting:

1. The "Pending Approval" classification will be eliminated. Operating ranges (upper and lower moisture limits) will be specified by the manufacturer. Operating ranges will NOT be listed on CCs.

2. The three most recent years of Phase II data will continue to be used to evaluate calibration performance.

3. Certificates will list a single "Standard" moisture range for each grain calibration. These ranges will not vary from year to year. They will be the same for all instruments (See exception for new instruments). The "Standard" ranges have to be wide enough to encompass the moisture ranges most commonly used in the market (to be determined) but narrow enough to assure that sufficient Phase II data will be available (over a three-year period) to:

   a. permit a new meter's calibrations to be "verified" over those ranges by the end of its third year in Phase II; and

   b. permit existing NTEP certified meters' calibrations to be "verified" over those ranges using the most recent three years of Phase II data when the new rules are first adopted.

4. Once a calibration has been "verified" a recalibration will not be forced due to lack of samples.

5. New instruments will be "evaluated" over the basic 6% moisture ranges for corn, soybeans, and hard red winter wheat. Certificates for new instruments will continue to list the 6% moisture ranges as the "evaluated" or "verified" ranges until sufficient Phase II data has been collected to allow the new instrument to achieve "verified" status for the full moisture range.

6. Outside the basic 6% moisture range, tolerances used to require a change in calibrations will continue to include the application of a 95 percent confidence interval to the maximum tolerance for each 2-percent moisture interval.

[For additional background see the Grain Analyzer Sector's August 23-24, 2006 Meeting Summary, Agenda Item 7.]

Discussion: To determine suitable "Standard" moisture ranges, the NTEP laboratory reviewed historical OCP data for the crop years 2000 through 2006, noting the total number of samples in each 2 percent moisture interval and each running 3 year period. Additionally, for each 2 percent interval, they compared the basic approval tolerance (one-half the HB44 acceptance tolerance) to the 95% confidence interval tolerance that is based on the number of samples. For an example of the data reviewed see Table 4.1 and Figure 4.1.

Table 4.1 – Number of Phase II Corn Samples

Moisture Interval	3 Year Totals				
	2000 – 2002	2001 – 2003	2002 – 2004	2003 – 2005	2004 – 2006
8 – 10	13	4	7	7	12
10 – 12	23	13	17	19	16
12 – 14	81	67	80	95	117
14 – 16	113	113	125	128	161
16 – 18	109	106	107	98	87
18 – 20	89	99	101	94	88
20 – 22	53	59	60	48	55
22 – 24	40	45	41	35	41
24 – 26	41	41	60	46	46
26 – 28	39	33	26	18	14
28 – 30	29	27	29	23	19
30 – 32	12	17	22	26	27
32 – 34	7	12	25	24	24
34 – 36	1	4	15	17	19
36 – 38	1	3	8	9	11
38 – 40	0	3	6	6	3
40 – 42	0	6	7	9	3
42 – 44	0	2	3	4	2
44 – 46	0	1	2	3	2
46 – 48	0	1	1	1	0

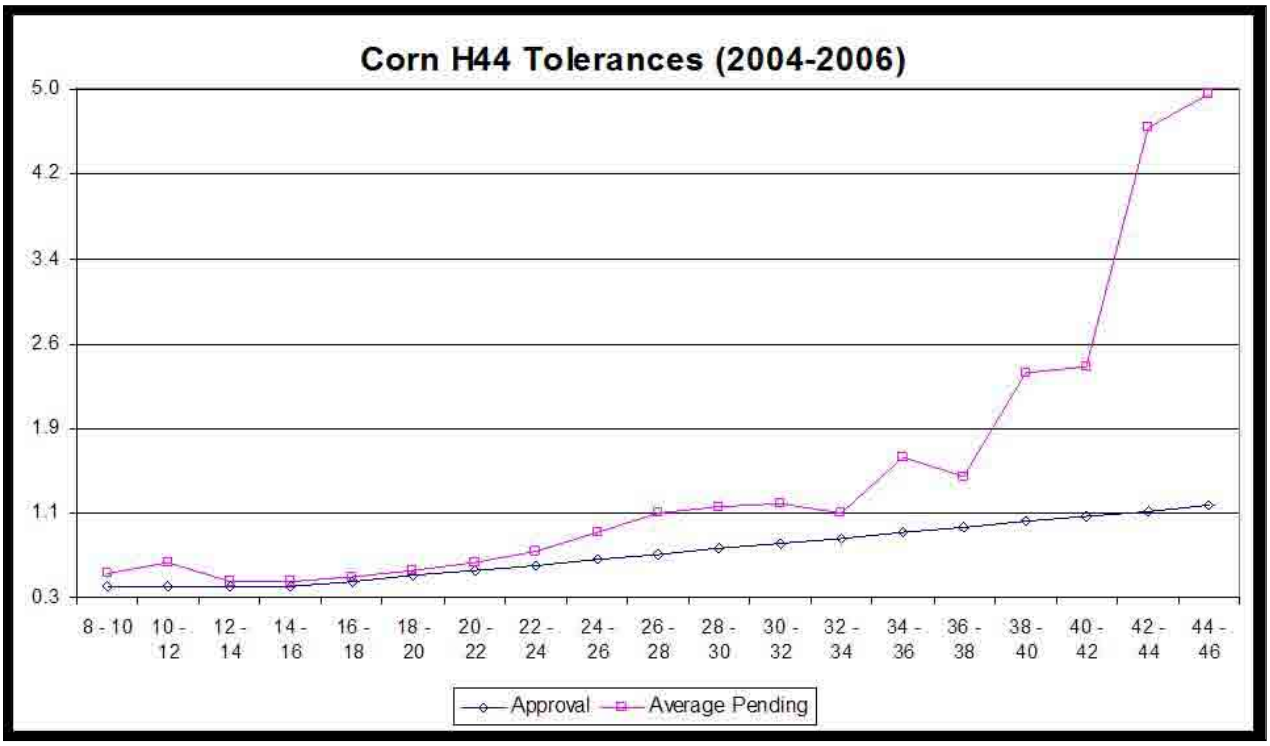

Figure 4.1 – Corn Moisture Tolerances

Recommendation (1): Based on the review of historical data, the NTEP laboratory proposed grain specific recommendations for the following moisture ranges and limits:

- **Basic 6-Percent Interval** - the moisture range used for Phase I Type Evaluation.
- **Standard Moisture Range** - the moisture range used for OCP Phase II calibration review.
- **Maximum Moisture Limit** - the upper moisture limit for calculating overall moisture bias in Phase II calibration review.

Grain specific "Standard" moisture ranges were selected to encompass the 2 percent intervals where the majority of samples have been available and where the basic approval tolerance (one-half the HB44 acceptance tolerance) was not significantly different from the tolerance that includes the application of a 95% confidence interval.

These ranges and the percent of samples represented in each proposed Standard Moisture Range are listed in Table 4.2 along with the corresponding GIPSA sample collection moisture range.

While reviewing the historical data, a trend was noticed in the data for Oats. The bulk of the Oats data is from the 8 – 14% moisture interval instead of the 10 – 16% moisture interval presently specified in Publication 14. The NTEP lab proposes that the Basic 6-percent Interval for Oats be changed to 8 – 14% moisture for both moisture and test weight per bushel evaluation.

Table 4.2 - Proposed Standard Moisture Ranges and Maximum Moisture Limits					
Grain	GIPSA Moisture Handbook Range	Basic 6-Percent Interval	Proposed Standard Moisture Range	Proposed Maximum Moisture Limit	% N
Corn	8 – 30%	12 – 18%	10 – 26%	36%	84
Grain Sorghum	8 – 25%	10 – 16%	10 – 18%	20%	89
Durum Wheat	7 – 20%	10 – 16%	8 – 16%	16%	89
Hard Red Spring Wheat	7 – 20%	10 – 16%	8 – 18%	20%	91
Hard Red Winter Wheat	8 – 20%	10 – 16%	8 – 18%	20%	95
Hard White Wheat	7 – 20%	8 – 14%	8 – 14%	16%	95
Soft Red Winter Wheat	7 – 20%	10 – 16%	10 – 18%	20%	91
Soft White Wheat	8 – 20%	10 – 16%	8 – 16%	18%	95
“All Class” Wheat	7 – 20%	10 – 16%	8 – 18%	20%	93
Wheat Excluding Durum	7 – 20%	10 – 16%	8 – 18%	20%	94
Long Grain Rough Rice	7 – 25%	10 – 16%	10 – 20%	24%	81
Medium Grain Rough Rice	7 – 25%	10 – 16%	10 – 20%	24%	80
“All Class” Rough Rice	7 – 25%	10 – 16%	10 – 20%	24%	85
Proposed change to Oats	8 – 20%	8 – 14%	8 – 14%	14%	89
Soybeans	8 – 20%	10 – 16%	8 – 18%	22%	95
Sunflower Seed	5 – 25%	6 – 12%	6 – 16%	20%	86
Six-Row Barley	8 – 20%	10 – 16%	8 – 16%	18%	90
Two-Row Barley	8 – 20%	10 – 16%	8 – 16%	18%	94
“All Class” Barley	8 – 20%	10 – 16%	8 – 16%	18%	91

Conclusion (1): The Sector accepted Recommendation (1) by consensus after the Proposed Standard Moisture Ranges for both Medium Grain Rough Rice and “All Class” Rough Rice were changed from 10 – 24% to 10 – 20% to agree with the Standard Moisture Range for Long Grain Rough Rice. [Note: Table 4.2, above, incorporates these changes.]

Recommendation (2): Ongoing Calibration Program (OCP) Calibration Review
The NTEP Laboratory proposed the following guidelines for OCP calibration review:

1. The most recent three years of data will still be used to determine if the calibration performance is acceptable.

2. For each of their device types, manufacturers will be provided with a report listing all available data in two-percent moisture intervals. The report will indicate whether the calibration meets or exceeds the appropriate NTEP tolerances for each two-percent interval within the Standard range and whether it meets or exceeds the overall moisture bias of $\pm$ 0.20 percent moisture for all available data up to the Maximum Moisture Limit. [*Note: The current report indicates whether a calibration is “Approved,” “Pending,” or does not meet either tolerance for all available 2-percent moisture intervals. The overall moisture bias in the current report is calculated using all available data.*]

3. The status of Approved, Pending, and Not Available would be removed from both the Certificate of Conformance (CC) and Publication 14. Instead, only grain moisture

calibrations that have passed Phase I or meet the tolerances for Phase II data will be listed on the CC. All other NTEP grains will be listed on the CC as "Calibration Not Available."

4. Manufacturer(s) will still be provided with all valid data collected during the OCP, even for samples exceeding the maximum limits.

Table 4.3 - Current Long Grain Rough Rice Report Example

Moisture Level	NO. of Samples	Avg. Bias	STD.	Approval Tolerance	Pending Tolerance	Status
8 – 10	42	0.04	0.31	0.40	0.48	*
10 – 12	90	0.04	0.17	0.40	0.43	*
12 – 14	50	0.11	0.20	0.40	0.45	*
14 – 16	70	0.12	0.34	0.40	0.47	*
16 – 18	190	0.07	0.31	0.45	0.49	*
18 – 20	140	0.11	0.37	0.50	0.55	*
20 – 22	68	0.03	0.39	0.55	0.63	*
22 – 24	44	0.15	0.56	0.60	0.74	*
24 – 26	8	0.24	0.54	0.65	1.01	*
26 – 28	5	0.87	0.97	0.70	1.62	**
ALL	707	0.09	0.35			

STATUS column:
* - meets the NTEP approval tolerance
** - does not meet NTEP approval tolerance, but meets Pending tolerance
*** - does not meet either tolerance

Table 4.4 - Proposed Long Grain Rough Rice Report

Moisture Level	NO. of Samples	Avg. Bias	STD.	One-half HB44 acceptance tolerance	Adjustment for 95% Confidence Interval	NTEP Phase II Tolerance	Status
8 – 10	42	0.04					
10 – 12	90	0.04	0.17	0.40	NA	0.40	*
12 – 14	50	0.11	0.20	0.40	NA	0.40	*
14 – 16	70	0.12	0.34	0.40	NA	0.40	*
16 – 18	190	0.07	0.31	0.45	.04	0.49	*
18 – 20	140	0.11	0.37	0.50	.05	0.55	*
20 – 22	68	0.03					
22 – 24	44	0.15					
To Max Limit	694	0.08	0.34			0.20	*
24 – 26	8	0.24					
26 – 28	5	0.87					

STATUS column:
* - meets the NTEP tolerance
** - does not meet NTEP tolerance

Conclusion (2): Recommendation (2) was accepted by consensus.

Recommendation (3): Certificate of Conformance
The NTEP Laboratory has proposed the following guidelines for preparing the Certificate of Conformance (CC):

The body of the CC will still report the moisture intervals used during the Phase I evaluation. It will no longer list either the "Approved moisture range" or the "Pending" moisture range. A grain will be listed only if it meets either of the criteria listed below:

Phase I – Passes either the Accuracy Test (corn, soybeans, hard red winter wheat) **or** the Moisture Bias Check (the "Other 12" NTEP grains) as currently specified in Publication 14.

Phase II – Meets both the NTEP Phase II tolerances applied to each two-percent moisture interval within the "Standard" moisture range **and** the NTEP Phase II tolerance for overall moisture bias for all available data up to the maximum moisture limits.

A comparison of the way a grain calibration appears on the current CC with the way it will appear on the proposed CC is shown in Table 4.5.

Table 4.5 - Certificate Calibration Table Comparisons

Current Table Example	**Proposed Table Example**
Corn Designation: Corn Calibration Version: 200705 Moisture Range – Approved: 8 – 28% Moisture Range – Pending: 8 – 28% Calibration Constants: K1 = 0001 K2 = 0020 K3 = 0300	Corn Designation: Corn Moisture Calibration Version: 200705 Calibration Constants: K1 = 0001 K2 = 0020 K3 = 0300

Discussion (3): Most of the discussion on the NTEP Lab's recommendations centered on the following questions:

1. Should the manufacturer be required to submit data to support the operating ranges (upper and lower moisture limits) claimed by the manufacturer?
2. Should the operating ranges (upper and lower moisture limits) claimed by the manufacturer be listed on the CC?
3. How should the "Standard" moisture ranges be specified on the CC?
4. If a meter fails a single 2 percent moisture interval outside the "Basic" interval does the entire calibration fail or does the approval fall back to the "Basic" interval?

Regarding question (1), some Sector members strongly favored requiring the manufacturer to submit some kind of data supporting the claimed upper and lower moisture limits for each grain, suggesting that big problems could result if data were not required to be submitted. There was concern that a manufacturer might use tempered grain to support an operating range. Others were opposed to requiring manufacturer data believing that it served no real purpose in that the Standard Moisture Ranges encompass the moistures over which the vast majority of grain is traded commercially. Furthermore, there would be no way that manufacturer data could be verified in the field (or in the

lab without expensive testing) and that mandating its submission (and implied review by the NTEP lab) would require more NTEP Lab effort than it was worth. Also, if the manufacturer decided to change a limit, modification of the CC would be required even if no changes had been made in the calibration. [Note: Manufacturers will still be required to submit data with their initial application for Type Evaluation.]

As for Question (2), the suggestion that CCs carry the notation, "Evaluated over the moisture range of ___% to ___%, and certified for use over the range of ___% to ___%," was previously rejected by the Sector on the grounds that an NTEP certificate was not intended to be marketing tool. It was pointed out that the functionality of displaying or printing a suitable warning message whenever a moisture limit is exceeded is verified by the NTEP lab in Phase I testing. Also, in practice when an elevator receives grain at harvest with an indicated "exceeds upper moisture limit" warning it typically ignores the warning message and receives the grain accepting the indicated moisture value.

Regarding Question (3), there was general agreement that the verified moisture ranges, whether "Basic" or "Standard" should be specified explicitly somewhere on the CC. The NTEP laboratory representative indicated that they were not overly opposed to including Standard Moisture Ranges in the body of the CC. They were, however, opposed to including <u>any</u> moisture ranges on the calibrations page. The central argument was that the "Basic" range would apply uniformly in year 1 and the Standard range thereafter, and that the table of these ranges would be identical for all manufacturer certificates and would not need to be changed or updated other than including a statement indicating which verified range applies, i.e., "Basic" or "Standard."

Question (4) was answered quite simply: The entire calibration fails. The manufacturer is obliged to revise the calibration and re-predict moistures using the most recent three years of available Phase II raw data. Concern that calibrations might be failed unjustly or might not be able to be revised to "fit" available data were addressed by pointing out that Publication 14 changes would be proposed to disregard any 2 percent interval containing less than 5 samples. Additionally, outside the "Basic" moisture range a 95% confidence interval will be added to the maximum tolerance.

Conclusion (3): With the understanding that manufacturer supplied calibration operating ranges would not be specified in the certificate, but that verified ranges would be included in the body of the certificate rather than in the calibration table, the Sector agreed to Recommendation (3) by consensus.

Final Conclusion/Recommendation: Having agreed to accept the recommendations/guidelines of the NTEP Laboratory, subject to the changes noted in the above three conclusions, the Sector agreed by a vote of 11 to 1 to accept the amendments/changes to Part IV of the Grain Moisture Meter Chapter of *NCWM Publication 14* as originally proposed. The deletion From Part V of "Special Cases Dealing with Inadequately Represented Moisture Intervals" (except for a portion of "Special Considerations for Multi-Class Calibrations"), was accepted by consensus. Details of the recommended amendments/changes, designed to avoid reducing a previously evaluated Approved/Pending moisture range due to lack of data in the On-going Calibration Program (Phase II), and the related changes to the 6-percent moisture interval for Oats in Part VII and Appendix D are shown below:

IV. Tolerances for Calibration Performance

Calibration performance must be tested against established criteria at the following stages of the type evaluation process:

1. Evaluation of the calibration data supplied by the manufacturer with the application for type evaluation.

2. Evaluating instrument and calibration performance over the 6 percent moisture range for corn, HRW wheat and soybeans (accuracy test discussed earlier).

3. Initial calibration approval for grains other than corn, HRW wheat, and soybeans.

4. Review of ongoing calibration data collected as part of the national calibration program (Phase II).

Calibrations for corn, HRW wheat and soybeans will be approved initially based upon type evaluation testing over a 6 percent moisture range~~ and manufacturer supplied data over the remainder of the calibration range~~. The bias of all samples in a 2 percent moisture interval may not exceed one-half of the Handbook 44 acceptance tolerance.

Calibrations for other grains will be approved initially based upon a bias check using a set of 10 to 12 samples referenced to the FGIS air oven laboratory and the FGIS official meter. "Multi-class" calibrations will be bias checked using 10 to 12 samples of each individual grain class included in the calibration. The maximum allowable overall bias between the meter under test and air oven is: ± 0.4 for this bias check. ~~data collected as part of the ongoing national calibration program. Approval tolerances will again be one-half of the Handbook 44 acceptance tolerance and will be applied in 2 percent intervals over the range of available data.~~ An overall bias will ~~may~~ be applied to the calibration in making approval decisions.

In order for a calibration to remain on the certificate of conformance, the calibration must continue to meet ~~"Approved"~~ tolerances for all 2 percent moisture intervals in the Standard ~~basic 6 percent~~ moisture range. This requirement is waived if a 2 percent moisture interval contains fewer than five samples. For 2 percent moisture intervals outside the basic 6 percent moisture range, tolerances used to require a change in calibrations will include the application of a 95 percent confidence interval to the maximum tolerance for each 2 percent moisture interval. The intent of applying the confidence interval is to avoid forcing a calibration change based upon insufficient data. After only one year of data collection, the number of samples in some intervals will be small, and the confidence interval may be as large as the tolerance limit. In this instance, the calibration would have to be extremely poor before a calibration change would be mandated. After the instrument has been in the calibration program for several years, the confidence interval should be reduced to approximately 0.05 and recommendations can be made with greater certainty. The latest three years of data will be used to make decisions regarding the need to make a calibration update.

Whenever a calibration update is made, the manufacturer shall re-predict moisture values using the three most recent years of available raw data collected by the Type Evaluation Laboratory.

~~New~~ Updated calibrations will be approved based upon the re-predicted moisture values. ~~Approval tolerances~~Tolerances will be one-half of the Handbook 44 acceptance tolerance and will be applied in 2 percent intervals over the Standard moisture range~~ of available data~~. Tolerances will include the

application of a 95 percent confidence interval to the maximum tolerance for each 2 percent moisture interval outside the basic 6% moisture interval.

Additionally, all calibrations must meet the following requirements for up to three years of available data:

a. The difference between the average bias to air oven for all samples up to the maximum moisture limit in a given year and the average bias to air oven for any other year shall not exceed: 0.90 for corn; 0.80 for rice, oats, sunflowers and sorghum; and 0.70 for wheat, soybeans, and barley.

b. The range of year-to-year differences in bias to air oven shall not exceed the H-44 tolerances for three or more consecutive 2% moisture intervals. Only moisture intervals consisting of five or more samples per year will be considered for this comparison.

c. The average calibration bias with respect to air oven shall not exceed 0.20 percent moisture, calculated using the most recent calibration and all available raw data collected within the last 3 years ~~for the entire~~ through the maximum moisture limit~~range~~.

Failure to meet the requirements in either item a., b., or c. above will cause a "No Longer Approved for Use" status to be assigned to the affected grain type(s) on the NTEP Certificate of Conformance (CC) for that instrument. Calibration coefficients will not be listed for any calibration failing these requirements.

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."

~~The status of all calibrations will be listed on the NTEP Certificate of Conformance. The categories are (1) approved, (2) pending, and (3) not available. The categories can be described as follows:~~

~~**Approved:** Corn, HRW wheat, and soybean calibrations will be approved based upon performance over the 6 percent type evaluation moisture range and manufacturer supplied data. Continued approval requires acceptable performance as part of the ongoing national calibration effort.~~

~~Calibration data, collected as part of the national calibration program, must indicate that calibration performance meets the tolerances for each 2 percent moisture interval before additional grains will be approved. Continued approval again requires acceptable performance as part of the national calibration effort, (i.e., none of the average differences between predicted and reference values for the respective 2 percent moisture intervals exceed one-half the Handbook 44 acceptance tolerance within the basic 6 percent moisture range and one-half the Handbook 44 acceptance tolerance plus a 95 percent confidence interval outside the basic 6 percent moisture range).~~

~~**Pending:** A new calibration that has not been validated by ongoing calibration data collected as part of the national calibration program will automatically be placed in this category.~~

~~This category also includes calibrations that have not yet met the criteria for approval, but that also have not performed badly enough to be listed as not approved. Such calibrations may be used on NTEP-approved meters.~~

~~**Not Available:** A calibration is not available for this grain included in the national calibration program. A calibration for this grain type shall not be used on NTEP approved meters.~~

~~For grains other than corn, soybeans, and hard red winter wheat, a calibration will not be listed on the Certificate of Conformance until it has had its calibration bias checked using a set of 10 to 12 samples referenced to the FGIS air oven laboratory and the FGIS official meter. "Multi-class" calibrations will be bias checked using 10 to 12 samples of each individual grain class included in the calibration. "Multi-class" calibrations must meet the overall bias requirements for the test sets of each individual class.~~

~~For this bias, check the maximum allowable overall bias between Meter under test and air oven is: ± 0.4.~~

~~During bias testing of such pending calibrations, if biases are detected which exceed the limits shown above, the Type Evaluation Laboratory shall immediately notify the manufacturer. The manufacturer shall then make changes or adjustments to the calibration which, in the manufacturer's best judgment, minimize the differences between the manufacturer's meter and the official air oven.~~

~~In support of such changes, the Manufacturer shall forward to the Type Evaluation Laboratory:~~

~~1. Detailed descriptions of the changes,~~

~~2. an explanation of how the changes affect the previous test results,~~

~~3. the calibration coefficients for the revised calibration, and~~

~~4. the unique identifier of the revised calibration.~~

~~The Type Evaluation Laboratory shall not forward a recommendation for certification to NCWM until the Manufacturer supplies this information or notifies the Type Evaluation Laboratory that it wants to amend the application for type approval to show the calibration in question as "NOT AVAILABLE." Testing of the revised calibration by the Type Evaluation Laboratory will not be required.~~

V. Criteria for NTEP Moisture Calibration Review

By grain, the Basic 6-Percent Moisture Interval, Standard Moisture Range, and Maximum Upper Limit for moisture calibration review are:

Grain Type or Class	Basic 6-Percent Moisture Interval	Standard Moisture Range	Maximum Upper Limit
Corn	12 – 18%	10 – 26%	36%
Durum Wheat	10 – 16%	8 – 16%	16%
Hard Red Spring Wheat	10 – 16%	8 – 18%	20%
Hard Red Winter Wheat	10 – 16%	8 – 18%	20%
Hard White Wheat	8 – 14%	8 – 14%	16%
Soft Red Winter Wheat	10 – 16%	10 – 18%	20%
Soft White Wheat	10 – 16%	8 – 16%	18%
All-class Wheat	10 – 16%	8 – 18%	20%
Wheat Excluding Durum	10 – 16%	8 – 18%	20%
Grain Sorghum	10 – 16%	10 – 18%	20%
Long Grain Rough Rice	10 – 16%	10 – 20%	24%
Medium Grain Rough Rice	10 – 16%	10 – 20%	24%
All-class Rough Rice	10 – 16%	10 – 20%	24%
Oats	8 – 14%	8 – 14%	14%
Six-Row Barley	10 – 16%	8 – 16%	18%
Two-Row Barley	10 – 16%	8 – 16%	18%
All-class Barley	10 – 16%	8 – 16%	18%
Soybean	10 – 16%	8 – 18%	22%
Sunflower Seed (Oil)	6 – 12%	6 – 16%	20%

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

~~**Special Cases Dealing with Inadequately Represented Moisture Intervals:**~~

~~**Case I.**~~

~~A single sample appears in a 2 percent moisture interval that is at the end of the calibration data range.~~

~~a. If the sample bias is outside the approval tolerance, the calibration is "not approved" in that moisture interval.~~

~~b. If the sample bias is within the approval tolerance, the calibration is "pending approval" in that moisture interval.~~

~~**Case II.**~~

~~The samples in a 2 percent moisture interval at the end of the calibration data range do not represent at least one-fourth of the moisture range. For example, there are no samples with a moisture content greater than or equal to 18.5 percent in the 18 to 20 percent moisture interval.~~

~~a. If the average bias for the samples is outside the approval tolerance, the calibration is "not approved" in that moisture interval.~~

~~b. If the average bias for the samples is within the approval tolerance, the calibration is "pending approval" in that moisture interval.~~

~~**Case III.**~~

~~There are two or more consecutive 2 percent moisture intervals at the end of the calibration data range that each contain only one sample. (Similar to Case I.)~~

~~a. If the bias for each 2 percent interval is within the approval tolerance, the calibration is "pending approval" for those moisture ranges.~~

~~b. If the bias for any of the inner intervals is within the approval tolerance, apply the criteria for Case I to successive intervals working in from the ends of the calibration range.~~

~~c. If the bias for the outer interval is within the approval tolerance but the bias for an inner interval is not, the calibration is "not approved" beyond (and including) the innermost interval that is determined to be "not approved" when applying the criteria for Case I.~~

~~**Case IV.**~~

~~A 2 percent moisture interval that contains no data points is bordered by intervals with data points.~~

~~The calibration approval status for the empty interval is the same as that for the outer bordering interval.~~

~~**Case V.**~~

~~A 2 percent moisture interval that contains one data point is bordered by intervals with more than one data point.~~

~~a. If the bias for the single point is within the approval tolerance and the bias for samples in the adjoining outer interval is within the approval tolerance, the calibration is "approved" for the interval with the single sample.~~

~~b. If the bias for the single point is within the approval tolerance and the bias for samples in the adjoining outer interval is within the pending approval tolerance, the calibration is "pending approval" for the interval with the single sample.~~

~~c. If the bias for the single point is within the approval tolerance and the bias for samples in the adjoining outer interval is outside the pending approval tolerance, the calibration is "pending approval" for the interval with the single sample.~~

~~d. If the bias for the single point is within the pending approval tolerance and the bias for samples in the adjoining outer interval is within the pending approval tolerance, the calibration is "pending approval" for the interval with the single sample.~~

~~e. If the bias for the single point is outside the approval tolerance and the bias for samples in the adjoining outer interval is outside the pending approval tolerance, the calibration is "not approved" for the interval with the single sample.~~

~~**General Considerations:**~~

~~**Case VI.**~~

~~All "approved" and "pending approval" calibration ranges listed on certificates of conformance will begin and end with even numbers.~~

~~**Case VII.**~~

~~Manufacturers may submit supplementary data to extend calibration "pending approval" ranges beyond available NTEP moisture ranges. All or a portion of the NTEP calibration data not included in the last three crop years may be submitted as manufacturer data. Only manufacturer data supplied in the standard data format, as defined in Appendix C, will be considered when determining calibration ranges and pending approval status.~~

~~a. An initial calibration report is prepared using the most recent three years of NTEP calibration data. "Approval" and "pending approval" moisture ranges are determined using the criteria in Section IV ("Tolerances for Calibration Performance") and Section V ("Special Cases Dealing with Inadequately Represented Moisture Intervals"). "Approval" ranges are determined solely on the basis of the most recent three years of NTEP calibration data and cannot be extended by including manufacturer data. "Pending approval" ranges can be extended through the use of manufacturer data.~~

~~b. The process described in (a) is repeated using a second calibration report prepared using the most recent three years of NTEP calibration data plus manufacturer submitted data. Moisture intervals listed as "not approved" on the initial calibration report can be upgraded to "pending approval" 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 approval ranges when manufacturer data is used.~~

Special Considerations for "Multi-Class Calibrations.

~~**Case VIII.**~~

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~~ and to determine the moisture ranges to be listed on the certificate for "multi-class" calibrations~~.

~~An "overall moisture range" will be defined and listed on the certificate for each "multi-class" calibration. The "overall moisture range" is intended to be used as the "Moisture Range of the Grain or Seed" referred to in NIST Handbook 44, Section 5.56(a), Paragraph S.1.3.(c).~~

~~The "pending" and "approved" moisture ranges for each individual class included in a "multi-class" calibration will also be listed on the certificate.~~

~~The "overall moisture range" for a "multi-class" moisture calibration normally covers the range from the lowest "pending" low-moisture limit of the included classes to the highest "pending" high-moisture limit of the included classes.~~ 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.~~the low and high moisture listed for the "overall moisture range." In addition, the data will be reviewed to determine that there is no moisture interval that does not meet either the approved or the pending tolerances but does contain an adequate number of samples. If a moisture interval contains an adequate number of samples and does not meet either the approved or the pending tolerances, then the "overall moisture range" will be adjusted to exclude that moisture interval.~~
~~See example below:~~

~~Example:~~

~~A "Hard Wheat" calibration including Hard Red Spring Wheat, Hard Red Winter Wheat, and Hard White Wheat, resulted in the following "approved" and "pending" limits for the included classes:~~

~~Hard Red Spring Wheat~~
~~Moisture Range - Approved: 8 - 20%~~
~~Moisture Range - Pending: 6 - 24%~~

~~Hard Red Winter Wheat~~
~~Moisture Range - Approved: 6 - 18%~~
~~Moisture Range - Pending: 6 - 18% (There are 20 samples in the 18 - 20% interval, but they do not meet either tolerance.)~~

~~Hard White Wheat~~
~~Moisture Range - Approved: 6 - 16%~~
~~Moisture Range - Pending: 6 - 18%~~

~~The lowest "pending" low-moisture limit is 6%. The highest "pending" high-moisture limit is 24%, but Hard Red Winter Wheat failed to meet either "approved" or "pending" tolerances in the 18 - 20 % interval. Thus, the "overall moisture range" for the Hard Wheat calibration must be reduced to 6 - 18% until a calibration change is made to correct the problem.~~

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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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B. Accuracy, Precision, and Reproducibility:

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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	
Two-Row Barley	10-16%	47-51	
Six-Row Barley	10-16%	43 - 47	
Oats	~~10-16%~~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	
Grain Sorghum or Milo	10-16%	58-62	

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Appendix D

Sample Temperature Sensitivity

(For grains/oil seeds other than corn, soybeans, & hard red winter wheat)

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Moisture Ranges and Tolerance for Sample Temperature Sensitivity (for the "Other 12" NTEP grains)		
Grain Type	**Moisture Range for Test**	**Tolerance Limit (Bias at Temperature Extremes)**
Durum Wheat	10-16%	0.35
Soft White Wheat	10-16%	0.35
Hard Red Spring Wheat	10-16%	0.35
Soft Red Winter Wheat	10-16%	0.35
Hard White Wheat	8-14%	0.35
Sunflower seed (Oil)	6-12%	0.45
Grain Sorghum	10-16%	0.45
Two-rowed Barley	10-16%	0.35
Six-rowed Barley	10-16%	0.45
Oats	~~10-16%~~8-14%	0.45
Long Grain Rough Rice	10-16 %	0.45
Medium Grain Rough Rice	10-16%	0.45

5. Editorial Change to NIST HB 44, Section 5.56 (a) Table S.1.2. and Section 5.57 Table S.1.2 Column Headings to Add a Column for Grain Class"

Background: At it's August 2006 Meeting, the Sector recommended changes to both the Grain Moisture Meter (GMM) and Near Infrared Grain Analyzer (NIR) sections of NIST HB 44 to include criteria applicable to "multi-class" calibrations. These recommendations were subsequently adopted by the NCWM for inclusion in the 2008 version of NIST HB 44.

Overlooked in the original recommendations were changes to column headings to more specifically indicate that the items listed in those columns include grain "types" or "classes." Following the NCWM Annual Meeting NIST conducted a review of the Specifications and Tolerances Committee's (S&T) Grain issues. At this review Diane Lee, NIST-WMD, mentioned the additional changes to table S.1.2. to add "Class" to the headings. These changes were judged to be editorial changes not requiring Sector approval. Steve Cook of NIST, new NCWM S&T Technical Advisor, and Ms. Lee further modified the tables to improve their appearance and to clarify the relationship between "Type" and "Class" by adding columns for "Grain Type" and "Grain Class". Additional changes were made to the titles in tolerance tables to include "Class." The modified tables are shown below as they will appear in the 2008 version of NIST HB 44:

Accepted:

a. In Table S.1.2 of Section 5.56(a) add a column for Grain Class" as shown below.

Section 5.56(a) GRAIN MOISTURE METERS

S.1.2. Grain or Seed Kind and Class Selection and Recording

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Table S.1.2. Grain Types <u>and Multi-Class Groups</u> Considered for Type Evaluation and Calibration and <u>Their</u> Minimum Acceptable Abbreviations

Grain Type	***Grain Class***	***Minimum Acceptable Abbreviation***
Barley	*Two-Rowed Barley*	*TRB*
	Six-Rowed Barley	*SRB*
	*All-Class Barley**	*BARLEY*
Corn	---	*CORN*
Grain Sorghum	---	*SORG or MILO*
Oats	---	*OATS*
Rice	*Long Grain Rough Rice*	*LGRR*
	Medium Grain Rough Rice	*MGRR*
	*All-Class Rough Rice**	*RGHRICE*
Small Oil Seeds (under consideration)	---	---
Soybeans	---	*SOYB*
Sunflower seed (Oil)	---	*SUNF*
Wheat	*Durum Wheat*	*DURW*
	Soft White Wheat	*SWW*
	Hard Red Spring Wheat	*HRSW*
	Hard Red Winter Wheat	*HRWW*
	Soft Red Winter Wheat	*SRWW*
	Hard White Wheat	*HDWW*
	*All-Class Wheat**	*WHEAT*
	*Wheat Excluding Durum**	*WHTEXDUR*

[Note: Grain Types marked with an asterisk (*) are "Multi-Class Calibrations"]
[Nonretroactive as of January 1, 1998]
(Table Added 1993) (Amended 1995, 1998, and 2007)

b. In Table S.1.2 of Section 5.57 add a column for Grain Class" as shown below.

Section 5.57 NEAR-INFRARED GRAIN ANALYZERS

S.1.2. Selecting and Recording Grain Class and Constituent

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Table S.1.2. Grain Types and Multi-Class Groups Considered for Type Evaluation and Calibration and Their Minimum Acceptable Abbreviations

Grain Type	***Grain Class***	***Minimum Acceptable Abbreviation***
Barley	*Two-Rowed Barley*	*TRB*
	Six-Rowed Barley	*SRB*
	*All-Class Barley**	*BARLEY*
Corn	---	*CORN*
Soybeans	---	*SOYB*
Wheat	*Durum Wheat*	*DURW*
	Soft White Wheat	*SWW*
	Hard Red Spring Wheat	*HRSW*
	Hard Red Winter Wheat	*HRWW*
	Soft Red Winter Wheat	*SRWW*
	Hard White Wheat	*HDWW*
	*All-Class Wheat**	*WHEAT*
	*Wheat Excluding Durum**	*WHTEXDUR*

[Note: Grain Types marked with an asterisk (*) are "Multi-Class Calibrations"]
[Nonretroactive as of January 1, 1998]
(Table Added 1993) (Amended 1995, 1998, and 2007)

6. State Responses to Questions in Don Onwiler's Letter to Enhance State Participation in the Grain Analyzer Sector

Background: In mid-February 2007 Don Onwiler, NTEP Committee Chairman, sent a letter to key weights and measures (W&M) officials seeking their responses to the following questions:

- Does your jurisdiction inspect devices for accuracy in test weight determination? How is that working out? Are the test procedures and tolerances appropriate?
- Has your jurisdiction performed inspections of grain analyzers for protein content of grain? How has that worked out? If you have not done these inspections, is there a reason why? Are there still hurdles to clear in NIST Handbook 44?
- How are you getting along with the tolerances and test procedures for grain moisture?

This was done in an attempt to identify issues of immediate interest to state W&M personnel; reasoning that an agenda featuring issues that are of high concern to them would encourage

participation by state W&M personnel. Also, a direct written request from NCWM for assistance on topics of high concern to them may be helpful when they approach administrators for travel funds.

Responses to Don's questions were received from six states: Colorado, Illinois, Maryland, Nebraska, North Carolina, and South Carolina. They are summarized below:

- Four of the six states have been inspecting grain moisture meters (GMMs) for Test Weight per Bushel (TW) for several years. An additional state will begin this year. The sixth state has been unable to collect samples that will test within the tolerances. (There may be a misunderstanding regarding samples used for testing.) Among the states presently inspecting GMMs with TW capability, one reported using a single SRWW sample for this test. Another reported that rejection rates for TW dropped from 47.7% in 2004 to 12.27% in 2006, with tests thus far in 2007 at 2.83%. Cheryl Tew, North Carolina Department of Agriculture, suggested that it would be helpful if there were procedures for the preparation/selection of field test samples. All respondents presently inspecting GMMs for TW were of the opinion that test procedures and tolerances were appropriate.

- None of the six states reported that they were performing inspections of NIR grain analyzers measuring protein in grain. Four of the six indicated that to the best of their knowledge their jurisdictions did not have any commercial meters performing protein tests. The fifth gave no reason, but said that they have "no plans at this time to conduct inspections on the protein content in grain." The remaining state, Colorado, gave several reasons why they were not inspecting NIR grain analyzers at present:
    - **Statutory authority:** The Colorado Measurement Standards Act provides for the licensing of grain moisture meters but not for NIR grain analyzers.
    - **Resources:** To implement a grain analyzer for protein (NIR) program, we would require more test samples, metrologist and field staff training, and additional inspection time. To date we have not researched the number of eligible devices in our state.
    - **Industry input:** We have not yet contacted our industry partners for input.
    - **Handbook 44, Section 5.57, Paragraph N.1.2.** Colorado interprets this paragraph to mean that constituent values be assigned to NIR test samples by GIPSA. We suspect that purchasing enough samples from GIPSA to test all the commercially used devices in Colorado would be cost prohibitive.

- All six states had no problems with current test procedures and tolerances for grain moisture; however, several areas of concern were mentioned:
    - **Testing with high moisture corn** – difficult to determine if a "failed" inspection is due to the meter or the sample.
    - **Sample preparation** – some make of meters agree well with air oven on a sample while other makes do not. Is the problem with the air oven or is this a normal difference between meter types?
    - **Testing meter to unlike meter** – consistent problems approving one specific type and a large percentage of rejects of another type.

  One state suggested that it might be helpful to do a round robin air-oven comparison among laboratories.

Discussion: The Sector was surprised to learn that field inspections of NIR grain analyzers were not being performed. When the NIR Sector was founded, over 15 years ago, there was an indication that there was an urgent need to develop Handbook 44 Code covering near infrared protein analyzers. The scope of the Code was later expanded to include near infrared devices measuring additional grains/oil

seeds and additional constituents. The Near Infrared Grain Analyzer Code was elevated to permanent status effective January 1, 2003.

Diane Wise, Colorado Department of Agriculture, estimated that there are 100 – 150 NIR instruments in Colorado, mostly used in grain elevators for determining wheat protein. She reported that letters have been sent out to survey industry needs and to seek participants in a pilot program for testing NIR units in the field.

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)

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.

The estimated cost of the NIR protein, Combustion Nitrogen Analyzer (CAN) as-is protein, and air oven moisture tests (based on the fees/charges listed in USDA/GIPSA/FGIS Directive 9180.74, dated 2-12-07) are listed below:

GIPSA NIR Wheat Protein (at 12% M.B.)	$10.00
GIPSA Lab Fees/test:	
CNA “as is protein”	$16.00
Air-Oven Moisture*	$13.00
Total per sample	$39.00

(*required for reporting protein on a specified moisture basis.)

A minimum of five samples are required for field inspection of devices measuring protein in wheat. More than five samples might have to be submitted for testing to assure that at least five samples will meet the criteria specified in N.1.2.

Because of time constraints further discussion on this issue was postponed to a future Sector meeting.

7. Report on OIML TC17/SC1 IR59 “Moisture Meters for Cereal Grains and Oilseeds”

Background and Discussion: 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 committee drafts (CD) have been distributed to the United States National Working Group (USNWG), which for the most part is a subset of the NTEP Grain Analyzer Sector.

TC 17/SC1 last met in September 2004 in Paris, France to review comments to the April 2004 2nd CD of OIML R 59. Since that time, revisions and comments have been handled by mail. A 4th CD dated July 2006 was received from the Secretariat and circulated to the USNWG in August 2006. U.S. comments were returned to the Secretariat in November, 2006. To assist in identifying and locating changes that had been made to the 3rd CD for inclusion in the 4th CD, a copy of the collated comments to the 3rd CD from all participating countries was forwarded to the USNWG in May of 2007.

The U.S. will host the next meeting of TC 17/SC1 at NIST September 24 and 25, at which time comments on the 4th CD will be reviewed. Diane Lee, NIST/WMD, briefed the Sector on the status of comments to the 4th CD of IR59 and brought the Sector up-to-date on plans for the TC17/SC1 meeting to be held at NIST.

Many of the 172 comments on the 4th CD of IR59 dealt with formatting or editorial issues. Major issues brought up in the comments are summarized below:

Japan	Change scope from "fully automated digitally indicating" to "direct indicating" grain moisture meters.
	Remove "The minimum allowable sample size used in analysis shall be 100 g or 400 kernels or seeds, whichever is smaller" (or remove resistance type meters from the scope.)
	Remove requirement that Meters must be equipped with a communications interface.
BIML	In order to have a complete harmonization of the measurements, it would be appropriate to define an International Reference Method based on ISO Standards. In CD4, the reference method for moisture content is defined by the national responsible body. Reference Methods should be those defined in International Standards (e.g. ISO 711, ISO 712, ISO 665 …).
	Disturbance tests should include at least: *Radiated radiofrequency electromagnetic fields (OIML D 11 – 12.1.1), *Conducted radiofrequency fields (OIML D 11 – 12.1.2), *Electrostatic discharges (OIML D 11 – 12..2), *Bursts on supply lines (OIML D 11 – 13.5), *Surges on supply lines (OIML D 11 – 13.8), *Bursts on signal, data and control lines (OIML D 11 – 12.4), *Surges on signal, data and control lines (OIML D 11 – 12..5), *AC mains voltage dips short interruptions and voltage variation (OIML D 11 – 13..4), *Mechanical shocks (OIML D 11 – 11..2), *Damp heat cyclic (OIML D 11 – 10..2.2), *Low voltage of internal battery (OIML D 11 – 14.1)

BIML (continued)	Testing procedures should specify the number of instruments to be tested. Only one could be used for all the tests except reproducibility test which could specify that at least two samples of moisture meters shall be provided by the manufacturer for type approval testing. [Note: Many countries have objected to requiring that two instruments be submitted for all tests.]
	Requirements related to software should be included on the basis of OIML TC 5/SC 2 work. Please refer to the draft Recommendation R 76-1 (clause 5.5 for requirements and annex G for evaluation and testing procedures).
	Proposal: Manufacturers shall provide the technical documentation, a user manual and the description of the adjustment procedure. Other information may be provided such as information on performance tests, on calibrations that support a determination whether the design of the moisture meter meets the requirements of this Recommendation. The technical documentation shall include: • a list of the electronic sub-assemblies with their essential characteristics • a description of the electronic devices with drawings, diagrams • a description of the software and its characteristics(including identification numbers) and operation including a list of the data variables and the circumstances when they may be changed • mechanical drawings • a plan for marking and sealing .

Ms. Lee asked Sector members (most of whom are also members of the USNWG) to review the country comments and provide any reply or concerns they may have with these comments by September 15, 2007. She will arrange a conference call with those who plan to attend the TC17/SC1 meeting to discuss some of the more important concerns with the standard.

[Editor's Update: During the September 24-25, 2007, TC17/SC1 meeting the subcommittee members agreed to a number of changes to the OIML grain moisture Recommendation and addressed a number of the issues that were reviewed during the sector meeting. The subcommittee agreed that:

- the scope would state that "This Recommendation applies to digitally indicating grain moisture meters that directly display moisture content,"
- ISO Standards were recommended but the reference method will still be determined by the national responsible body,
- the sample size of 100 g or 400 Kernels remains in the standard but the national authorities may determine otherwise,
- at least two instruments must be submitted for type approval.

Efforts were made at the meeting to harmonize the OIML grain moisture Recommendation and the protein Recommendation. The updated grain moisture Recommendation will be forwarded to the USNWG when updates to the Recommendation have been completed].

8. Report on OIML TC17/SC8 Draft International Recommendation "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 TC17/SC8. The first meeting of OIML TC17/SC8, charged with developing an International Recommendation (IR) for "Protein Measuring Instruments for Cereal Grain," was held in Sydney, Australia May 31 – June 1, 2004 to review comments received on an outline draft that had been developed earlier by Australia, the Secretariat of TC17/SC8. 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-direct measuring devices.

The U.S. received a 2nd working draft (WD) of this document in August 2004, and a 3rd draft was received in May 2005. The USNWG members provided comments to these drafts relating mostly to parts of the document that appeared to be in conflict with U.S. metrological practice and procedures. In June 2005 a work group meeting was held in Berlin to address comments on the 3rd draft. Subsequently, a 1st Committee Draft (CD) of "Protein Measuring Instruments for Cereal Grain and Oil Seeds" dated May 2006 was forwarded to the USNWG with a request for comments by July 1, 2006. A second meeting of the work group was held in Ottawa, Canada in September 2006 to review comments received on the 1st CD. The main points of contention were: 1) Maximum permissible errors (MPEs), and 2) the standard reference method (Kjeldahl method vs. Dumas method). A small working group (WG) was established to consider appropriate MPEs for protein measuring instruments. A table of proposed MPEs (see table following) has been distributed to USNWG members for review and comment by June 25, 2007.

The U.S. will host the next meeting of the TC 17/SC8 work group at NIST September 20 and 21, 2007 to attempt to resolve issues related to MPEs and the standard reference method.

Grain type	MPE (type approval) %	MPE (repeatability) %	MPE (in-field, verification, re-verification) %	MPE (reproducibility) %
Wheat	± 0.3	± 0.2	± 0.4	± 0.3
Barley	± 0.4	± 0.3	± 0.5	± 0.4
Rice	± 0.5	± 0.25	± 0.5	± 0.5
Corn	± 0.5	± 0.25	± 0.8	± 0.5
Soybean	± 0.55	± 0.5	± 0.8	± 0.55

Discussion: Diane Lee, NIST/WMD, reported that U.S. comments had been forwarded to Australia. The U.S. response included a table of the tolerances that are applied in the U.S. type evaluation

program for protein measuring instruments and also field evaluation tolerances and an explanation of how the tolerances are applied. As of the August 2007 Grain Analyzer Sector meeting, no response had been received from Australia.

[Editor's Update: Australia's reply to comments on the Table of Proposed MPEs was received in the U.S. approximately one week after the Grain Analyzer Sector meeting. The reply was distributed to members of the USNWG requesting comments or feedback by September 15, 2007. In summary, Australia's reply indicated that they were firmly opposed to separate MPEs for repeatability and reproducibility and to the further separation of MPEs for particular instrument characteristics. However, they would support the inclusion of tight MPEs for repeatability, but they are yet to be convinced that there is any need for MPEs for reproducibility.]

[Additional Editor's update: During the September 20-21, 2007, TC17/SC8 meeting, Australia and other members of the subcommittee agreed to add additional tests and separate MPEs for these tests to the OIML Protein Recommendation. An updated OIML Protein Recommendation with changes from the September 20-21, 2007 TC17/SC8 meeting will be circulated to the USNWG when the U.S. received the updates from the Secretariat.]

9. Report on OIML TC5/SC2 Draft "General Requirements for Software Controlled Measuring Devices" and NTETC Software Sector Activities.

Background: This item was included on the Sector's agenda to provide a summary of the activities of OIML TC5/SC2 and the NTETC Software Sector. In 2004 all OIML TCs and SCs that were revising an OIML Recommendation were contacted to ensure that software aspects would be considered in revised Recommendations. All OIML Documents and Recommendations published since 1990 have been 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 Co-Secretariats (Germany and France). When complete, this document will serve as guidance for OIML technical committees addressing software requirements in Recommendations for software-controlled instruments. NIST submitted U.S. comments on an early draft in February 2005. The 1st working draft (WD) of this document, titled: "General Requirements for Software Controlled Measuring Instruments" was received in February 2006. U.S. comments to this WD were sent to the Secretariat in June 2006. A 1st Committee Draft (CD), addressing comments received on 1WD, was recently distributed by the Secretariat. Copies (in pdf format) are available at: http://www.oiml.org/download/cds.html.

The NTETC Software Sector held its first meeting in April 2006. At that time, several subcommittee working groups were formed to focus on various aspects relating to the use of software in today's weighing and measuring instruments. A second meeting was held in October 2006.

Discussion: Diane Lee, NIST/WMD, reported that Ambler Thompson of NIST-WMD has requested that any U.S. comments on CD1 should be sent to him no later than September 7, 2007. The next meeting of TC5/SC2 is scheduled to be held at the PTB in Berlin, Germany during the week of December 3-7, 2007. Comments to CD1 will be addressed at that time.

The NTETC Software Sector held its third meeting May 7-8, 2007 in Sacramento, California. Their next meeting is tentatively scheduled for the spring of 2008 either immediately preceding or following the meeting of NTEP laboratory representatives held at that time. Steve Patoray, NTEP Director, reported that the WELMEC document for Type P (built-for-purpose) and Type U (using a

universal general-purpose computer) instruments is being used as a model for much of the Software Sector's proposed Code.

[Editor's Note: A history and overview of WELMEC activities towards the development of software requirements and software examination for measuring instruments under legal control can be downloaded from: http://www.oiml.org/bulletin/2000/07/welmec.pdf. The complete WELMEC software document is available from: http://www.welmec.org/publications/7-2en.pdf.]

10. Enhanced Trait Soybeans – Calibration Issues

Source: United Soybean Board (USB)

Background: Near infrared analyzers are becoming increasingly necessary for measuring soybean composition factors. In some cases, the factors are those covered by NTEP (protein and oil) and in others the factors are outside NTEP (individual fatty acids, sugar profiles, and others). Successful development of new traits requires uniform measurements across the entire developmental chain, from seed breeder to end user, a broader scope than covered by NIST Handbook 44. Additional instruments beyond those actually submitted for NTEP are used; collectively all instruments across the development chain need to agree, both on average, and, to the extent possible, from sample to sample.

Two United Soybean Board projects, Soybean Quality Traits (SQT) and Analytical Measurements and Marketing Standards Initiative (AMMS) have been developing a program that would generate a common soybean sample pool (with reference chemistry) that could be used to:

1. Modify existing instrument calibrations of all manufacturers (whether NTEP participants or not) such that differences among them are minimized.
2. Allow new manufacturers/technologies to enter the market efficiently
3. Form the basis for a voluntary-participation proficiency program open to any user at any point in the development chain, many of which would not be subject to Handbook 44.
4. Allow rapid evaluation and introduction of tests for new traits, such as amino acids, phytate, fatty acid profiles. This would include the measurement of general market factors (protein and oil) on specialty grains that likely were not in the calibration pool of the NTEP calibrations.

The overall goal is to facilitate the introduction of new technologies and new traits in an organized way that supports the more direct supply chain markets developing from bioprocessing and biotechnology. Activities of the two USB projects could provide both support and sample materials for the NTEP program.

Discussion: Participants in the SQT and AMMS projects will share results and future concepts for cooperation with the Grain Analyzer Sector. Some of the topics include:

1. Should we bring new traits more quickly into the NTEP system, and if so, how can the USB programs assist?
2. Can we harmonize sample pools?
3. Is there a way to collaborate to gain participation in NTEP of instruments not necessarily designed/marketed for trade use, but that still are integral parts of the value chain (i.e., those designed for breeder use).

4. How to harmonize contractual trades as well as those subject to open market regulation - especially when NTEP factors may be measured along with others, but on specialty rather than general market grains.
5. How to update NTEP calibrations to measure the general market factors on new genetics not likely to be found in open market channels.

Amy Lopez, AOCS, manager of the USB SQT Analytical Standards Program, summarized efforts underway on the development and evaluation of analytical tools for the analysis of soybean quality traits. These efforts involve both wet chemistry and NIR analyzers. Work is being done with mulitple NIR companies to improve calibrations not only for protein and oil, but also for fatty acids and amino acids. Toward this end, a sample library, representative of many of the new genotypes, is being maintained. Assistance is offered to NIR manufacturers by supplying samples for calibration development. Calibration files developed in the SQT Analytical Standards Program (with yearly calibration updates) are offered to NIR device users. Also included is the opportunity to take advantage of a QC program in which the same prepared sample is sent to all participating laboratories to obtain specific analytical results. After performing the required analyses a participaing laboratory returns the results to AOCS which provides a statistical evaluation of the analytical results that compare, on a confidential basis, that laboratory's data with those of the other participating laboratories. A submitting laboratory's identity is known only to the submitter.

Dr. Nick Bajjalieh, Integrative Nutritition, Inc., outlined the approach the USB AMMS program was taking to develop marketing initiatives especially in the animal feed area.

Following the presentations, it was pointed out that most of the suggested topics were outside of the Sector's scope. However, several Sector members agreed that all NIR instruments in commercial use should be capable of providing in-tolerance results for protein, oil, and moisture when tested using the same soybean sample, whether that sample is a commodity-type soybean variety or a so-called "enhanced trait" variety. In other words, protein, oil, and moisture measurements using a "specialty soybean calibration" should agree with protein, oil, and moisture measurements using an NTEP soybean calibration. As more "enhanced trait" varieties are introduced, it is inevitable that some will find their way into commodity soybean channels, so harmonization of soybean protein, oil, and moisture calibrations between NTEP calibrations and "Enhanced Trait" calibrations should be a goal.

Dr. Pierce noted that GIPSA is expanding their NIR calibration database to include some specialty trait grains.

11. Prevention of Potential GMM Fraud - Expected Integrity among Moisture Meter Manufacturers

Source: DICKEY-john Corporation

Background: This item is intended to call attention to the potentially fraudulent practice of "calibrating" field instruments to read differently (higher) than like-type NTEP meters in the grain moisture meter (GMM) Ongoing Calibration Program (OCP) at GIPSA in Kansas City, thereby encouraging elevator owner-operators to purchase meters reading higher than the Federal Standard moisture meter. This issue has recently surfaced again due to seasonal grain movement in commercial corn markets.

For years, certain manufacturers or service agencies have been suspected of performing fraudulent electronic calibration adjustments to grain moisture meters before returning them to the field after repair or periodic routine maintenance. In fact, many like-type commercial moisture meters in field

use have been noted to read (consistently) at the high end of the maintenance tolerance for moisture, thus allowing them to read several tenths to full percentage points higher in moisture, during commercial grain trade, than the GAC2100 Federal Standard meter. Grain purchased using a meter reading higher, inaccurate moisture values costs producers money in terms of inflated drying charges and excess shrinkage, thus benefiting the buyer. This same grain can then be sold by the buyer using a different meter (one that reads lower moisture) without incurring excess shrinkage or inflated drying cost, affording the buyer (now seller) an unfair profit at the cost of the producer.

This alleged fraudulent practice has been noted due to the fact that comparative OCP data for Corn identifying the Official Meter and listing the average bias for each NTEP meter type published by the NTEP Participating Laboratory for Grain Analyzers in 2005 and 2006 clearly show the Official Meter (the DICKEY-john GAC2100) to agree within 0.2 percent moisture with any other NTEP meter up to 20% moisture. Above 20% moisture, the GAC2100 moisture indication increases to over 0.4 percent moisture above other NTEP meters and peaks to 1.3 percent moisture above most other meters at 27% moisture. These data would indicate that most *field* meters should consistently read the same as the federal standard meter below 20% moisture and below the federal standard meter at moistures higher than 20%. However, state regulatory field test results for Corn (crop years 2005 and 2006) appear to indicate that the opposite may be true.

There are several NIST HB 44 requirements that speak to the maintenance and use of devices that are intended to prevent the user from taking advantage of the tolerance of any device. The general code in HB 44 includes the following pertinent paragraphs:

GUR.4.1 Maintenance of Equipment
This paragraph states that *"...Equipment in service at a place of business found to be in error predominately in a direction favorable to the device user shall not be considered maintained in a proper operating condition"*. Although this does not speak directly to moisture meters, its intent is to ensure that when devices are calibrated, the calibration is set as close to zero as possible and is not set to one side of the tolerance in favor of the device owner.

GUR.4.3 Use of Adjustments
This paragraph states that "*…Whenever equipment is adjusted, the adjustment shall be so made as to bring performance as close as practicable to zero value*."

Fundamental Considerations, NIST HB 44, paragraph 2.3 Tolerance and Adjustments
"*…Equipment owners should not take advantage of the tolerances by deliberately adjusting their equipment to have a value or to give performance at or close to the tolerance limit..."*

There are also provisions for avoidance of perpetration of fraud found in NIST Handbook 130 Uniform Laws and Regulations:

Section 15, Misrepresentation of Quantity
"*No person shall: sell, offer, or expose for sale a quantity less than the quantity represented, nor take more than the represented quantity when, as buyer, he/she furnished the weight or measure by means of which the quantity is determined, nor represent the quantity in any manner calculated or tending to mislead or in any way deceive another person."*

Section 22, Prohibited Acts
"No person shall use or have in possession for use any incorrect weight or measure..."

The above information is not intended in any way to accuse or insinuate that any particular meter manufacturer is knowingly participating in fraudulent practices, but is intended to provide information regarding the regulations designed to prevent such potential occurrences. Reviewing these regulations is intended to remind manufacturers and their service agencies that intentionally adjusting meters *to be in error predominately in a direction favorable to the device user* is considered a fraudulent practice, and also to remind weights and measures officials that meters adjusted in this manner *shall not be considered maintained in a proper operating condition.*

Discussion: Questions were raised about the validity of the 2002 study in Illinois, especially with regard to the use of high-moisture corn samples (above 22% moisture), many of which were so wet that they had to be hand-shelled. Responding to the question, "How do you prove that production does or does not meet type?" Dr. Richard Pierce, GIPSA, noted that because different meter types react differently to the same sample, the only way to show conformance to type is by a meter to like-meter comparison where the "standard" meter is traceable to the meters in the NTEP Phase II program at GIPSA. Steve Patoray, NTEP Director, suggested that this may be an enforcement issue, not a conformity issue. As such, this type of issue should be discussed at a regional meeting. Co-Technical Advisor, Jack Barber, offered the opinion that it is a standardization or normalization issue. If a difference does exist between the NTEP "standard" meters and a device in the field it could be due to improper adjustment either by the manufacturer or by a service agency. It was suggested that states may need to ensure that there is a Registered Service Agent program in the state and that service personnel receive the proper training to ensure that adjustments made to the meter are appropriate.

The Sector took no action on this issue.

12. Time and Place for Next Meeting

The next meeting is tentatively planned for Wednesday, August 20 and Thursday, August 21, 2008 in the Kansas City, MO area. Meetings will be held in either the meeting hotel or the National Weather Service Training Center. 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 May 2008.

If you would like to submit an agenda item for the 2008 meeting, please contact Steve Patoray, NTEP Director, at spatoray@mgmtsol.com; G. Diane Lee, NIST Technical Advisor, at diane.lee@nist.gov; or Jack Barber, Technical Advisor, at jwbarber@insightbb.com by April 15, 2008.

Change Summary

Recommended 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	Add Table specifying "Basic 6-Percent Moisture Interval", "Standard Moisture	GMM-7 thru	08/07 Grain Moisture

Review	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-10	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

National Type Evaluation Technical Committee (NTETC)
Grain Analyzer Sector
August 20, 2008 - Kansas City, Missouri
Meeting Summary

Agenda Items

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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, NE office and Jim will operate from a home office in Ohio. The transition of duties from Management Solutions in Rockville, MD to the new NCWM Headquarters in Lincoln, NE will occur gradually over the coming weeks and will be completed by October 1, 2008. Contact information for the new offices is shown below:

NCWM
1135 M St., Ste. 110
Lincoln, NE 68508
P: 402.434.4880
Fax: 402.434.4878
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Jim Truex
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jim.truex@ncwm.net

Don Onwiler
Executive Director
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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 3 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 3 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 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 mfg's)	(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 that 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 HB 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 an 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 ~~a pending or higher~~ 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:

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

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:

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

where,

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

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

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

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

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

Table 1. Yearly TW Sample Set Composition

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 ~~corn~~ 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 3 years for ~~the entire moisture range (data for corn samples above 20 percent moisture will be excluded.)~~ 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.

~~Submit as flat ASCII files (see note below) on 3.5" diskettes, one diskette for each instrument~~ Email 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. ~~Package the disks in protective mailers and mail to the NTEP Laboratory.~~

~~*Note: The print files generated by today's popular spreadsheets are flat ASCII text files; that is, the contents are in one continuous string with each field delimited by one space (or a comma) with each record delimited by a carriage return line and a line feed*~~.

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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 that 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."

~~The status of all calibrations will be listed on the NTEP Certificate of Conformance. The categories are (1) approved, (2) pending, and (3) not available. The categories can be described as follows:~~

~~**Approved:** Corn, HRW wheat, and soybean calibrations will be approved based upon performance over the 6 percent type evaluation moisture range and manufacturer supplied data. Continued approval requires acceptable performance as part of the ongoing national calibration effort.~~

~~Calibration data, collected as part of the national calibration program, must indicate that calibration performance meets the tolerances for each 2 percent moisture interval before additional grains will be approved. Continued approval again requires acceptable performance as part of the national calibration effort, (i.e., none of the average differences between predicted and reference values for the respective 2 percent moisture intervals exceed one half the Handbook 44 acceptance tolerance within the basic 6 percent moisture range and one half the Handbook 44 acceptance tolerance plus a 95 percent confidence interval outside the basic 6 percent moisture range).~~

~~**Pending:** A new calibration that has not been validated by ongoing calibration data collected as part of the national calibration program will automatically be placed in this category.~~

~~This category also includes calibrations that have not yet met the criteria for approval, but that also have not performed badly enough to be listed as not approved. Such calibrations may be used on NTEP approved meters.~~

~~**Not Available:** A calibration is not available for this grain included in the national calibration program. A calibration for this grain type shall not be used on NTEP approved meters.~~

~~For grains other than corn, soybeans, and hard red winter wheat, a calibration will not be listed on the Certificate of Conformance until it has had its calibration bias checked using a set of 10 to 12 samples referenced to the FGIS air oven laboratory and the FGIS official meter. "Multi-class" calibrations will be bias checked using 10 to 12 samples of each individual grain class included in the calibration. "Multi-class" calibrations must meet the overall bias requirements for the test sets of each individual class.~~

~~For this bias, check the maximum allowable overall bias between Meter under test and air oven is: ± 0.4.~~

~~During bias testing of such pending calibrations, if biases are detected which exceed the limits shown above, the Type Evaluation Laboratory shall immediately notify the manufacturer. The manufacturer shall then make changes or adjustments to the calibration which, in the manufacturer's best judgment, minimize the differences between the manufacturer's meter and the official air oven.~~

~~In support of such changes, the Manufacturer shall forward to the Type Evaluation Laboratory:~~

~~1. Detailed descriptions of the changes,~~

~~2. an explanation of how the changes affect the previous test results,~~

~~3. the calibration coefficients for the revised calibration, and~~

~~4. the unique identifier of the revised calibration.~~

~~The Type Evaluation Laboratory shall not forward a recommendation for certification to NCWM until the Manufacturer supplies this information or notifies the Type Evaluation Laboratory that it wants to amend the application for type approval to show the calibration in question as "NOT AVAILABLE." Testing of the revised calibration by the Type Evaluation Laboratory will not be required.~~

11. Report on OIML TC17/SC 1 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/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 TC17/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 R59, 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 R59 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 R59 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 TC17/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 TC17/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 2CD 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 93nd 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 **HB44, §5.56.(a)** and paragraphs **S.2.5.2. Calibration Version** and **S.2.5.3. Calibration Corruption** in **HB44, §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 on line at: http://ts.nist.gov/WeightsAndMeasures/Publications/upload/11-ST-08-Pub16-Final.pdf and 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 on line 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-2CD" 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, MO. 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

National Type Evaluation Technical Committee (NTETC)
Grain Analyzer Sector
August 19-20, 2009 - Kansas City, Missouri
Meeting Summary

Agenda Items

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1. Report on the 2009 NCWM Interim and Annual Meetings

The Interim Meeting of the 94th National Conference on Weights and Measures (NCWM) was held January 11-14, 2009, in Daytona Beach, Florida. At that meeting the NTEP Committee accepted the Sector's recommended amendments and changes to the 2008 Edition of NCWM Publication 14. These changes appear in the 2009 Edition of Publication 14. For additional background refer to *Committee Reports for the* 94th *Annual Meeting*, NCWM Publication 16.

Changes to the Grain Moisture Meter & Near Infrared Grain Analyzers 2009 Edition of NCWM Publication 14			
Section Number	Amendment/Change	Page	Source
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 GMM Sector Agenda Item 10
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

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 2009 Annual Meeting held July 12-16, 2009, in San Antonio, Texas. Jim Truex, NTEP Administrator, reported that Annual Meeting attendance was down this year, but 35 states were represented exceeding the quorum requirements of 27. Other General Code items of interest to the Sector were non-voting items related to software and provisions for sealing electronic adjustable components. [See Sector Agenda Items 4, 4a, 4b, 4c, 4.d, 4.e and 9.]

2. 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. Evaluations are currently underway for three additional devices: one new grain moisture meter with test weight capability; one new grain moisture meter; and one test weight per bushel add-on to a currently approved grain moisture meter. 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 five device types are enrolled in the OCP (Phase II) for the 2009 harvest:

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

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

[Note: Foss Infratec 1227 & 1229 dropped out of Phase II – CC expires June 30, 2010.]

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

At the Sector's August 2005 meeting it was 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. These data are based on the last three crop years (2006–2008) using calibrations updated for use during the 2009 harvest season.

Four meter types were included in the comparison graphs: DICKEY-john's GAC2100, Foss's Infratec 1241, Foss's Infratec 1229, and Steinlite's SL95. Only the GAC2100 has been identified on the comparisons. It is identified as "Official Meter". The remaining three instruments were randomly assigned numbers 1, 2 and 3.

Ms. Brenner pointed out that data on Perten's AM5100 was not included in the comparisons because it has not been in the program for three full years. It will be included next year. 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. She noted that labels are missing on the moisture axis of the comparison graph for Hard White Wheat. The moisture intervals and number of samples for Hard White Wheat should be as follows:

8-10%	43 samples
10-12%	20 samples
12-14%	9 samples

[Note: The 2006-2008 GMM Phase II comparison graphs were distributed with the August 2009 Grain Analyzer Sector Agenda. They can also be downloaded from the NCWM web site using the following link: http://www.ncwm.net/ntep/pdf/09_GMMBiases.pdf.]

Dr. Richard Pierce explained that GIPSA was considering changes in sample collection procedures, this year and in the future, to make moisture data somewhat more representative with respect to both geographical and moisture-range distribution. To illustrate the problem that present procedures have created he offered an example involving soybean samples. Sample collection assignments are communicated to GIPSA field offices in the spring of each year through a sample collection notice. In the past GIPSA has requested Soybean samples in moisture ranges of 10-13% and 13-16%. Within these ranges they typically receive large quantities of 12-13% and 13-14% samples, which results in a huge number of samples in the 12-14% range. To avoid this unintended consequence, GIPSA intends to request samples in moisture intervals matching those used in reporting Phase II data. They will also try to limit the number of samples that will be analyzed in each 2% moisture interval.

Dr. Pierce noted that having too many samples is not a problem for many of the moisture intervals, but GIPSA is trying to scale back so that they don't have more than 25-40 samples in a given 2% interval per year. They will also be attempting to achieve better geographical balance that, as much as reasonably possible, is proportional to crops grown in an area. His message was, "We're not going to analyze every sample we receive."

4. Software Requirements That May Impact Grain Analyzers

Background: In October 2008 the International Committee of Legal Metrology (CIML) approved the new OIML Document **D 31** ***General requirements for software-controlled measuring instruments*** that is intended to serve as guidance for software requirements in International Recommendations under development by OIML technical committees. **Document D 31** can be downloaded free of charge from:

http://www.oiml.org/publications/D/D031-e08.pdf

In 2005 the NCWM Board of Directors established an NTETC Software Sector. One of the tasks assigned to the Sector was to develop a clear understanding of the use of software in today's weighing and measuring instruments. A good overview of the work of the Software Sector is contained in the Meeting Summary of the Sector's Annual Meeting held March 11-12, 2009, in Reynoldsburg, Ohio. The Summary can be downloaded from the NCWM web page:

http://www.ncwm.net/events/pdf/09_Software_Sector_Summary.pdf .

Two NTETC Software Sector items have been accepted as Information items by the S&T Committee for inclusion in the Committee Reports for the NCWM 94th Annual Meeting in 2009. Information Items report on subjects and/or actions under consideration by the committee but not proposed for

voting. The Committee Reports can be downloaded from the NIST Weights and Measures Division (WMD) web page:

http://ts.nist.gov/WeightsAndMeasures/Publications/upload/11-ST-09-Pub16-FINAL.doc

The two Information items and several other Software Sector items are summarized and discussed separately in Agenda Items 4.a, 4.b, 4.c, 4.d, and 4.e. (This information was included to facilitate discussion on the possible impact of these recommendations on Grain Moisture Meters (GMMs) and Near Infrared (NIR) Grain Analyzers.)

Discussion: Cassie Eigenmann, DICKEY-john, encouraged other meter manufacturers to get involved in the Software Sector and to attend their meetings, noting that what gets decided in those meetings can have a big effect on both existing meters and on the design of future meters.

Jim Truex, NTEP Administrator, explained that much of the work the Software Sector is doing will likely become General Code items that would affect every code in NIST Handbook 44 (HB 44). Fortunately, GMMs and NIR Grain Analyzers have their own specific codes which take precedent over the General Code when there are conflicts/differences. He urged the Sector to pay attention to what is happening so it can anticipate where changes or additions to the specific codes might be required.

4.a Item 310-2: Appendix D – Definition of Electronic Devices, Software-Based and Built-For-Purpose Device

Background: At the Software Sector's October 2007 meeting, it was initially suggested that the term "not-built-for-purpose" be removed from the wording in NIST HB 44 paragraph G-S.1.1., because there is no definition for a not-built-for-purpose device in HB 44. After a lengthy discussion related to the terms "built-for-purpose" and "not-built-for-purpose," the Software Sector agreed these terms were not clear and should be replaced with definitions based on the revision of **OIML R 76** ***Non-automatic Weighing Instruments***, Subsections 5.5.1. (Type P) and 5.5.2. (Type U).

At the 2009 NCWM Interim Meeting, the S&T Committee received comments from the Scale Manufacturers Association (SMA) stating that it now opposes this item since there is no technological justification for making a distinction in software-based device types. Other comments were received taking issue with the SMA position arguing that significant physical differences make the distinction necessary. The Software Sector recommended that this item remain Informational to allow further review. Following is the definition as it appeared the S&T Committee Report for the 94th Annual Meeting:

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.

At the Software Sector's March 2009 meeting, some discussion on the wording of the definitions resulted in the proposal of a slightly modified version (see below), but no consensus was reached on the language change shown below.

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

(a) Type 'P' (aka built-for-purpose) software-based electronic devices. 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;

(b) Type 'U' (aka not-built-for-purpose) software-based electronic devices. All metrological software-based devices not meeting the conditions of a Type 'P' device. Example: a personal computer or other device and/or element with PC components with programmable or loadable metrological software.

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

Discussion: The differentiation between software embedded in a built-for-purpose measuring instrument (Type P) and software for measuring instruments using a universal computer (Type U) is well established in the European Community. See **WELMEC *Software Guide (Measuring Instruments Directive 2004/22/EC)***. The designations Type P and Type U are also expected to be used in the General Code section of NIST Handbook 44 (HB 44).

Grain Analyzer Sector members were asked for comments on the definition proposed by the Software Sector at their March 2009 meeting. This prompted a lengthy discussion as Sector members tried to grasp the differences between "P" and "U" and to understand why it might be important to them. Some questioned, "Does the user care?" It was pointed out that there are security differences and field inspection differences.

When the Sector was asked to express a preference for the definition proposed by the Software Sector at their March 2009 meeting over the definition proposed as Item 310-2 in the S&T Committee Report for the 94th Annual Meeting, additional questions were raised. One member asked if there was anything in either of the two definitions that would cause problems for GMMs or NIR grain analyzers. The Co-Technical Advisor didn't believe that there was anything in either of the two definitions themselves that would be troublesome for GMMs or NIR Grain Analyzers. He explained that the reason that this question of definitions had been placed on the Sector's agenda as the first software-related item was that the following software items require a thorough knowledge and understanding of what is meant by "Type P" and "Type U". He strongly favored the definition proposed by the Software Sector in March of 2009 because of its clarity and sentence structure.

Andy Gell, Foss North America, was concerned about the definition for Type "U" devices (see part "b" of the definition above) possibly precluding any instrument that consists of a black box that requires a personal computer (PC) to be sitting next to it. In this case the black box will not function

without a PC being connected to it. Proprietary software loaded into a generic PC controls all the functions of the black box and calculates the results which can be displayed on the PC, stored on the PC, and printed on a generic printer attached to the PC. Because the PC was a generic PC capable of functioning as a regular PC, it appeared to the Sector that this would be a Type U device requiring the proprietary software to meet the general code requirements for Type U software, while the system consisting of PC+software and black box would have to meet the requirements of the appropriate grain analyzer code. The Sector wondered if a single CC could be issued for this system. No decision was reached on this question.

Conclusion: The Sector reached a consensus that, at this point, the Software Sector's March 2009 definition was preferred over the definition that appeared as Item 310-2 in the S&T Committee Report for the 94th Annual Meeting.

Jim Truex, NTEP Administrator recommended that the Sector's decision be forwarded to the Software Sector and to the S&T Committee.

4.b Item 310-3: G-S.1. Identification. – (Software)

Background: Starting at the October 2007 meeting, the Software Sector has discussed the value and merits of required markings for software. After several iterations, the Software Sector developed a table to reflect their positions. This table was submitted to NCWM S&T Committee and was assigned Developing status in 2008. However, the Software Sector did not include a recommendation on how to incorporate the proposal into existing G-S.1. and G-S.1.1. language. In particular, WMD was concerned about properly addressing the various existing requirements and multiple non-retroactive dates.

Prior to the NCWM 2009 Interim Meeting, NIST WMD commented on S&T Item 310-3, and presented an alternate proposal with significant modifications, which were included in the Interim Meeting Agenda background for the item (See 2009 Pub 15 for more details). The WMD proposal was subsequently accepted by the S&T Committee as Information Item 310-3 in the Committee Reports for the 94th Annual Meeting of the NCWM. The WMD proposal is reproduced below:

> **G-S.1. Identification. – For the purposes of identification, all equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect and manufactured on or after January 1, 201X, shall be clearly marked as specified in Table G-S.1. Identification and explained in the accompanying notes in Table G-S.1. Notes:**
>
> All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect **and manufactured prior to January 1, 201X**, shall be clearly and permanently marked for the purposes of identification with the following information:
>
> (a) the name, initials, or trademark of the manufacturer or distributor;
>
> (b) a model identifier that positively identifies the pattern or design of the device;
>
> *(1) The model identifier shall be prefaced by the word "Model," "Type," or "Pattern." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The abbreviation for the word "Model" shall be "Mod" or "Mod." Prefix lettering may be initial capitals, all capitals, or all lowercase. [Nonretroactive as of January 1, 2003]*
>
> (Added 2000) (Amended 2001)

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

(Amended 2003 **and 201X**)

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

(2) Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No., and S. No.).
[Nonretroactive as of January 1, 2001]

(d) the current software version or revision identifier for ***Type U (not-built-for-purpose) software-based*** *devices;*
[Nonretroactive as of January 1, 2004]

(Added 2003) **(Amended 201X)**

(1) The version or revision identifier shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision.
[Nonretroactive as of January 1, 2007]

(Added 2006)

(2) Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number." Abbreviations for the word "Revision" shall, as a minimum, begin with the letter "R" and may be followed by the word "Number." The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).
[Nonretroactive as of January 1, 2007]

(Added 2006)

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

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

(Amended 1985, 1991, 1999, 2000, 2001, 2003~~, and~~**,** 2006**, and 201X**)

G-S.1.1. Location of Marking Information for Type U (Not-Built-For-Purpose), Software-Based Devices. – *For* ***Type U*** ~~***not built-for-purpose, software-based***~~ *devices* ***manufactured prior to January 1, 201X,*** *either:*

(a) The required information in G-S.1. Identification. (a), (b), (d), and (e) shall be permanently marked or continuously displayed on the device; or

(b) The Certificate of Conformance (CC) Number shall be:

(1) permanently marked on the device;

(2) continuously displayed; or

(3) accessible through an easily recognized menu and, if necessary, a submenu. Examples of menu and submenu identification include, but are not limited to, "Help," "System Identification," "G-S.1. Identification," or "Weights and Measures Identification."

Note: *For (b), clear instructions for accessing the information required in G-S.1.(a), (b), and (d) shall be listed on the CC, including information necessary to identify that the software in the device is the same type that was evaluated.*

[Nonretroactive as of January 1, 2004]

(Added 2003) (Amended 2006 **and 201X**)

Table G-S.1. Identification for Devices Manufactured on or after January 1, 201X (For applicable notes, see Table G-S.1. Notes on Identification)			
Required Marking	**Full Mechanical Devices and Separable Mechanical Elements**	**Type P Electronic Devices and Separable Elements**	**Type U Electronic Devices and Separable Elements**
Name, initials, or trademark of the manufacturer or CC holder	**Hard-Marked**	**Hard-Marked or Continuously Displayed**	**Hard-Marked, Continuously Displayed, or Via Menu (display) or Print Option (8)**
Model identification information that positively identifies the pattern or design of the device (1)	**Hard-Marked**	**Hard-Marked or Continuously Displayed**	**Hard-Marked, Continuously Displayed, or Via Menu (display) or Print Option (8)**
Non-repetitive serial number (2)	**Hard-Marked**	**Hard-Marked or Continuously Displayed**	**Not Acceptable**
Software version or revision (3)	**Not Applicable**	**Hard Marked (5), Continuously Displayed, or by Command (operator action) (6)**	**Continuously Displayed or Via Menu (display) or Print Option (8)**
Certificate of Conformance number or corresponding CC Addendum (4)	**Hard-Marked**	**Hard-Marked or Continuously Displayed**	**Hard-Marked (7) or Continuously Displayed**
The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device.			

(Added 201X)

Table G-S.1. Notes on Identification
For Devices Manufactured on or after January 1, 201X

1) **The model identifier shall be prefaced by the word "Model," "Type," or "Pattern." These terms may be followed by the word "Number" or an abbreviation of that word.**
   - **The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).**
   - **The abbreviation for the word "Model" shall be "Mod" or "Mod." Prefix lettering may be initial capitals, all capitals, or all lowercase.**

2) **Except for equipment with no moving or electronic parts, the serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.**
   - **Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No., and S. No.).**

3) **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 dedicated to the metrologically significant portion.**
   - **The version or revision identifier shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision.**
   - **Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number."**
   - **Abbreviations for the word "Revision" shall, as a minimum, begin with the letter "R" and may be followed by the word "Number."**
   - **The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).**

4) **An NTEP Certificate of Conformance (CC) number or a corresponding CC Addendum Number for devices that have a CC. The CC Number or a corresponding CC Addendum Number shall be prefaced by the terms "NTEP CC," "CC," or "Approval."**
   - **These terms may be followed by the word "Number" or an abbreviation of that word.**
   - **The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).**

5) **If the manufacturer declares that the primary sensing element "software" is integral, has no end user interface and no print capability, 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).**

6) **Information on how to obtain the Version/Revision shall be included on the NTEP CC.**

7) **Hard-marking of the CC Number is permitted if no means of displaying this information is available.**

8) **Information on how to obtain the name, initials, or trademark of the manufacturer or CC holder, model designation, and software version/revision information shall be included on the NTEP CC.**

(Added 201X)

At the Software Sector's March 2009 meeting several members were of the opinion that the perceived scope of their original proposal had been extended by the modifications proposed by WMD and had actually made the Sector's intent less clear. The Sector chairman proposed revisiting the current text of G-S.1. to determine exactly what changes would be required to reflect the Sector's position. It was also noted that there was some validity to the Scale Manufacturers Association argument that there is no justification for differentiation of marking requirements based on device type (P or U). After additional lengthy discussions, the following modified versions of G-S.1/G-S.1.1 were drafted. Although the Sector believed that a table was now unnecessary, they also suggested what the table should look like if one was desired. They also pointed out that the second table of "Notes" as proposed by WMD was now redundant because the notes were incorporated in their suggested table.

The Software Sector's March 2009 proposal is shown below:

G-S.1. Identification. – All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect **and manufactured after January 1, 201X**, shall be clearly and permanently marked for the purposes of identification with the following information:

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

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

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

*(c) a nonrepetitive serial number, except for equipment with no moving or electronic component parts and ~~not-built-for-purpose, software-based devices~~ **software that is not part of a Type P (built-for-purpose) device**;*
[Nonretroactive as of January 1, 1968]
(Amended 2003 **and 201X**)

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

(4) Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No., and S. No.).
[Nonretroactive as of January 1, 2001]

*(d) the current software version or revision identifier for ~~not-built-for-purpose,~~ software-based **electronic** devices;*
[Nonretroactive as of January 1, 2004]
(Added 2003)**(Amended 201X)**

(3) The version or revision identifier shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision.
[Nonretroactive as of January 1, 2007]
(Added 2006)

(4) Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number." Abbreviations for the word "Revision" shall, as a minimum, begin with the letter "R" and may be followed by

the word "Number." The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).
[Nonretroactive as of January 1, 2007]

(Added 2006)

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

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

(Amended 1985, 1991, 1999, 2000, 2001, 2003 and 2006)

G-S.1.1. ~~Location~~ Method of Marking Information for ~~Not-Built-For-Purpose,~~ all Software-Based Devices. *– For ~~not-built-for-purpose, software-based~~ devices **manufactured after January 1, 201X, e**ither:*

(a) The required information in G-S.1 Identification. ~~(a), (b), (d), and (e)~~ shall be permanently marked or continuously displayed on the device; or

(c) The Certificate of Conformance (CC) Number shall be:

(1) permanently marked on the device;

(2) continuously displayed; or

(3) accessible through an easily recognized menu and, if necessary, a submenu. Examples of menu and submenu identification include, but are not limited to, "Help," "System Identification," "G-S.1. Identification," or "Weights and Measures Identification."

Note: *For (b), clear instructions for accessing the information required in G-S.1. (a), (b), and (d) shall be listed on the CC, including information necessary to identify that the software in the device is the same type that was evaluated.*

[Nonretroactive as of January 1, 2004]

Added 2003) (Amended 2006 **and 201X**)

Table G-S.1. Identification for Devices Manufactured on or after January 1, 201X		
Required Marking	**Full Mechanical Devices and Separable Mechanical Elements**	**Electronic Devices, Software Based**
Manufacturer or CC holder ID	**Hard-Marked**	**Hard-Marked, Continuously Displayed, Via Menu (display) or by command (operator action)**
Model identification	**Hard-Marked**	**Hard-Marked, Continuously Displayed, Via Menu (display) or by command (operator action)**
Serial number	**Hard-Marked**	**Hard-Marked, Continuously Displayed[1]**
Metrologically Significant Software version	**Not Applicable**	**Continuously Displayed, Via Menu (display) or by command (operator action)[2]**
Certificate of Conformance number	**Hard-Marked**	**Hard-Marked, Continuously Displayed, Via Menu (display) or by command (operator action)[3]**

[1]Type 'U' devices need not have a non-repetitive serial number.

[2]If the manufacturer declares that the primary sensing element "software" is integral, has no end user interface and no print capability, 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).

[3]If the Certificate of Conformance number is to be displayed via menu and/or submenu, the means of access must be easily recognizable. In addition, instructions on how to obtain the remaining required information not hard-marked or continuously displayed shall be included on the NTEP CC.

Discussion/Conclusion: 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 would be the only change required to comply with the proposed marking for Type P devices.

The Grain Analyzer Sector's Co-Technical Advisor suggested that the Software Sector's March 2009 proposal does not address the WMD's concerns regarding addressing the various existing requirements and multiple non-retroactive dates. In the Software Sector's proposal, both **G-S.1. Identification** and ***G-S.1.1. Method of Marking Information for all Software-Based Devices*** include a statement indicating that the following subparagraphs apply to equipment **"manufactured after January 1, 201X"** implying that G-S.1 and G-S.1.1 do NOT apply to equipment manufactured prior to that date, yet the subparagraphs indicate added, amended, and non-retroactive dates ranging from 1968 to 2007. The Software Sector's proposal is unclear as to which (if any) paragraphs/subparagraphs apply to equipment manufactured prior to 201X. The NIST WMD proposal clearly indicates which requirements are applicable to devices manufactured before Jan 1, 201X, and which are applicable to devices mfg. after Jan 1, 201X.

The Sector was in general agreement that the NIST WMD proposal was less confusing from an enforcement point of view.

4.c Identification of Certified Software

Background: The Software Sector's work on this item originated as an attempt to answer the question, "How does the field inspector know that the software running in the device is the same software that was evaluated and approved by the lab." The Software Sector is developing language to be added to HB 44 that will include requirements similar to those developed by OIML. The Initial DRAFT of the Software Sector's proposed language (for G-S.1.1.?) is shown below:

> **Identification of Certified Software:**
>
> **Software-based electronic devices shall be designed such that the metrologically significant software is clearly identified. The identification of the software shall be inextricably linked to the software itself.**
>
> - **Unique identifier must be displayable/printable on command or during operation, etc. (marking req't in addition)**
> - **At a minimum, a version/revision indication (1.02.09, rev 3.0 a, etc). Could also consist of / contain checksum, etc (crc32, for example)**

Discussion: All GMMs and NIR Grain Analyzers currently holding active CCs are of Type P. The metrologically significant (legally relevant) software elements of these devices can be classified as either "Fixed" or "Other" as shown below:

Fixed:

- Main Program
- Associated subroutines
- Type Specific Parameter tables (set by the manufacturer)

Other:

- Device Specific Parameter tables (set by the manufacturer or a competent service representative.)
- Site Specific Parameter tables (set by user and verified by field inspection)
- Individual Grain Calibrations (periodically changed – frequently by user, verified by field inspection.)

In order for software to have a unique identifier that is "inextricably linked to the software itself" the software must be "Fixed" so that any change made after certification is reflected by a change in the unique identifier. Alternate methods may have to be found to identify the versions of the software elements classified as "Other".

For Grain calibrations, the requirements for version identification are specified in existing HB 44 code. Grain calibrations are individually identified and are required to be "self-checking" against data corruption or alteration (see **HB 44, §5.56.(a)** paragraphs **S.2.4.1. Calibration Version** and **S.2.4.2. Calibration Corruption** and **HB 44, §5.57.** paragraphs **S.2.5.2. Calibration Version** and **S.2.5.3. Calibration Corruption**.**)**

Site Specific Parameters and Device Specific Parameter tables (e.g., any tables or parameters residing in software to normalize the response of like instruments) currently are not required to be identified by version, but existing code requires these to be secured by a physical seal or an audit trail.

Dr. Richard Pierce, GIPSA (the NTEP Participating Laboratory for Grain Analyzers), wondered if there might be a problem with the way GMM CCs have been handled in the past. The example he cited was related to GMMs that also have Test Weight per Bushel (TW) capability. Such devices have an extra sensor to determine if there is adequate sample in the hopper for a TW measurement. Presently, a GMM without TW capability and the same model with TW capability are both covered under the same CC. In some cases, they have the same instrument identifier. If they should happen to use two different software versions, with different identifiers, it could be very difficult if all the different options have to be tracked. Many different CCs might be required for the same basic instrument.

The Sector Co-Technical Advisor didn't think that separate CCs would be required. If the software had different identifiers they could all be listed on the same CC with a description of which one was applicable to the basic instrument and which one was applicable to the version with TW capability.

Jim Truex, NTEP Administrator, reported that this was already being done on CCs for point of sale systems. NCR offers multiple software versions on the same device.

Dr. Charles Hurburgh, Iowa State University, remarked that Device Specific and Site Specific Parameters for NIR Analyzers are going to get a lot more complicated than slope and bias. Eight to ten different algorithms, some very complex and some with virtual coefficients, are now available to adjust one instrument to match another. He was of the opinion that getting locked in as to what is "Fixed" could create problems. When asked if all the algorithms would behave the same over the operating temperature range his reply was, "Absolutely not!" It was pointed out that each algorithm would have to be evaluated separately to convince the NTEP lab that these device specific algorithms don't affect the operating characteristics of the device (temperature range, etc.)

It was later proposed that if these algorithms were calibration specific and the manufacturer could demonstrate that they would be invoked/applied only to non-NTEP grains or non-NTEP constituents they would not have to be evaluated.

When the discussion returned to the subject of alternate ways to handle Device Specific Parameters, Dr. Pierce suggested that if you standardize an instrument at the factory and have Device Specific adjustments (as opposed to Type Specific adjustments) a checksum could be used to protect those specific adjustments against corruption in the same manner that grain calibrations are protected. Although individual instruments would all have different standardizing packages, as long as those don't change (unless service is performed) the need to assign a version to those adjustments seems unnecessary.

Ole Rasmussen proposed defining "actual code" as the actual compiled machine code that is changed by re-compiling source code. Then what is "actual code" can be separated from those parameters that you can track by audit trail, parameters which could be user definable or service changeable. We're not re-compiling code when we're simply making an adjustment to that device.

Expanding on Rich's and Ole's suggestions the Sector Technical Advisor outlined how these parameters might be protected. Put service/standardization parameters in a module/table/file that contains all the adjustment parameters plus a stored checksum for that instrument's unique set of parameter values. At instrument start-up, the main program calculates a checksum based on that unique set of parameter values and compares it with the stored checksum. If they don't match, the instrument can't proceed further and it displays an error code/message. To save audit trail memory space, he proposed that the individual corrupted parameter values not be logged in the audit trail. It

would be sufficient to log only the error or error code for the type of error (e.g., corrupted standardization parameters).

The discussion moved to what the software identification might look like and how changes might be tracked.

Several members suggested that the software version might look like:

3.yy.xx where "3" is the version that was originally evaluated, yy are metrologically significant changes that are compatible with older instruments running other 3.yy.xx versions, and xx can be any sequentially issued change that does not need new approval (a non-metrologically significant change.) Typically, "yy" versions do not require re-testing, but will require notifying the NTEP lab. A revised CC may or may not be required.

4.yy.xx where "4" is incompatible with older versions of the instruments in the field and cannot be used in instruments of that type manufactured prior to a given serial number or manufacturing date. A revised or new CC will be required. If a revised CC is issued, the revised CC must list the various older revisions and the range of serial numbers on which they can be used.

Jim Truex remarked that what is important is that software is going to have to be identified and that identification is going to have to be available to the inspector.

The discussion shifted to what "inextricably linked" means … how much security is required to guarantee that the displayed software identification number has the actual approved software behind it? Is it sufficient to embed the version number in the "fixed" portion of the code (before it is compiled) and to include in the code a routine for displaying that number upon command, or must the version number be scrambled or otherwise "hashed" before being embedded in the "fixed" portion of the code? These questions were not answered.

Dr. Pierce commented that he doesn't see GIPSA with a software engineer in the NTEP lab examining the software, or the NTEP lab sending the device elsewhere for the software to be examined.

Jim Truex replied, "We're not going to have software engineers, but we will be requesting information from manufacturers about their software." --- (see next agenda item).

4.d Software Protection/Security

Background: The Software Sector derived a trial Publication 14 checklist based on the OIML checklist to verify that the software adequately protected against fraudulent modification as well as accidental or unintentional changes. The checklist has been distributed to current NTEP labs for use on a trial basis for new type approval applications.

Devices with embedded software TYPE P (aka built-for-purpose)		
	Declaration of the manufacturer that the software is used in a fixed hardware and software environment, and	Yes☐ No ☐ N/A ☐
	cannot be modified or uploaded by any means after securing/verification	Yes☐ No ☐ N/A ☐

	Note: *It is acceptable to break the "seal" and load new software, audit trail is also a sufficient seal.*		
	The software documentation contains:		
		description of the (all) metrologically significant functions OIML states that there shall be no undocumented functions	Yes☐ No ☐ N/A ☐
		description of the securing means (evidence of an intervention)	Yes☐ No ☐ N/A ☐
		software identification	Yes☐ No ☐ N/A ☐
		description how to check the actual software identification	Yes☐ No ☐ N/A ☐
	The software identification is:		
		clearly assigned to the metrologically significant software and functions	Yes☐ No ☐ N/A ☐
		provided by the device as documented	Yes☐ No ☐ N/A ☐
Personal computers, instruments with PC components, and other instruments, devices, modules, and elements with programmable or loadable metrologically significant software TYPE U (aka not built-for-purpose)			
	The *metrologically significant* software is:		
		documented with all relevant (see below for list of documents) information	Yes☐ No ☐ N/A ☐
		protected against accidental or intentional changes	Yes☐ No ☐ N/A ☐
	Evidence of intervention (such as, changes, uploads, circumvention) is available until the next verification / inspection (e.g. physical seal, Checksum, CRC, audit trail, etc. means of security)		Yes☐ No ☐ N/A ☐
Software with closed shell (no access to the operating system and/or programs possible for the user)			
	Check whether there is a complete set of commands (e.g. function keys or commands via external interfaces) supplied and accompanied by short descriptions		Yes☐ No ☐ N/A ☐
	Check whether the manufacturer has submitted a written declaration of the completeness of the set of commands		Yes☐ No ☐ N/A ☐
Operating system and / or program(s) accessible for the user:			
	Check whether a checksum or equivalent signature is generated over the machine code of the metrologically significant software (program module(s) subject to legal control W&M jurisdiction and type-specific parameters)		Yes☐ No ☐ N/A ☐
	Check whether the metrologically significant software will detect and act upon any unauthorized alteration of the metrologically significant software using simple software tools e.g. text editor.		Yes☐ No ☐ N/A ☐
Software interface(s)			
	Verify the manufacturer has documented:		
		the program modules of the metrologically significant software are defined and separated	Yes☐ No ☐ N/A ☐
		the protective software interface itself is part of the metrologically significant software	Yes☐ No ☐ N/A ☐
		the *functions* of the metrologically significant software that can be accessed via the protective software interface	Yes☐ No ☐ N/A ☐
		the *parameters* that may be exchanged via the protective software interface are defined	Yes☐ No ☐ N/A ☐
		the description of the functions and parameters are conclusive and complete	Yes☐ No ☐ N/A ☐
		there are software interface instructions for the third party (external) application programmer.	Yes☐ No ☐ N/A ☐

Discussion: It was pointed out that the draft checklist should have been distributed to manufacturers rather than NTEP labs. The check list relates to information that the manufacturer might be asked to submit to the NTEP lab with a new application for evaluation. Grain Analyzer members were asked to see what might be involved in supplying the requested information. There was no further discussion of this item.

4.e Software Maintenance and Reconfiguration

Background: The Software Sector has followed the lead of OIML in defining two procedures used to check software updates for authenticity and integrity and has agreed upon the following language:

> **Verified Update:** A verified update is the process of installing new software where the security is broken and the device must be re-verified. Checking for authenticity and integrity is the responsibility of the owner/user.
>
> **Traced Update:** A traced update is the process of installing new software where the software is automatically checked for authenticity and integrity, and the update is recorded in a software update log or audit trail.

The Software Sector has worked on language for defining the requirements for a Traced Update. Their draft specifies, "For a Traced Update, an event logger is required . . ." The draft goes on to say that the use of a Category 3 audit trail is acceptable for the software update logger. The requirements the Software Sector has proposed for Category 3 audit trails are quite similar to the requirements for Category 3 audit trails in the GMM and NIR sections of HB 44 and Pub 14.

The Software Sector also proposed the addition of new text to the General Code section of HB 44:

> **G-S.9. Metrologically Significant Software Updates**
> The updating of metrologically significant software shall be considered a sealable event. Metrologically significant software that does not conform to the approved type is not allowed for use.

The NTEP Administrator was of the opinion that the proposed G-S.9. was unnecessary, because G-S.8. already requires that any changes that affect metrological function are sealable. The Software Sector felt that the explicit language proposed for G-S.9. is clearer than any implied requirement in G-S.8. The Software Sector decided to ask for clarification/interpretation from the S&T Committee.

Discussion: OIML D 31:2008 (E) includes flow charts illustrating the implementation of Traced and Verified Updates (reproduced at the end of this agenda item). The Sector questioned the need for a definition of "Traced Update". The traced update was probably intended to cover cases in Europe where the National Body controls a network of devices and wants to update all the devices simultaneously from a central location. Denmark and France do this with NIR Grain Analyzers. It is unlikely that a traced update would be used in the U.S. for Gain Analyzers that fall under state W&M jurisdiction. Verification would still be required by state inspectors.

Ole Rasmussen, Foss North America, commented on the OIML diagram for Traced Update, comparing it to the situation where a device in the field has calibrations and a lot of the device's specific information on a memory stick. You can go to the company's web site and download all the necessary new calibrations and information on the memory stick and plug it back into the device. The downloaded information is serial number specific for that device. The user license is checked, and all

the information is checked for integrity and authenticity. Because there is no "person at place" to verify it he believed that this is essentially a traced update.

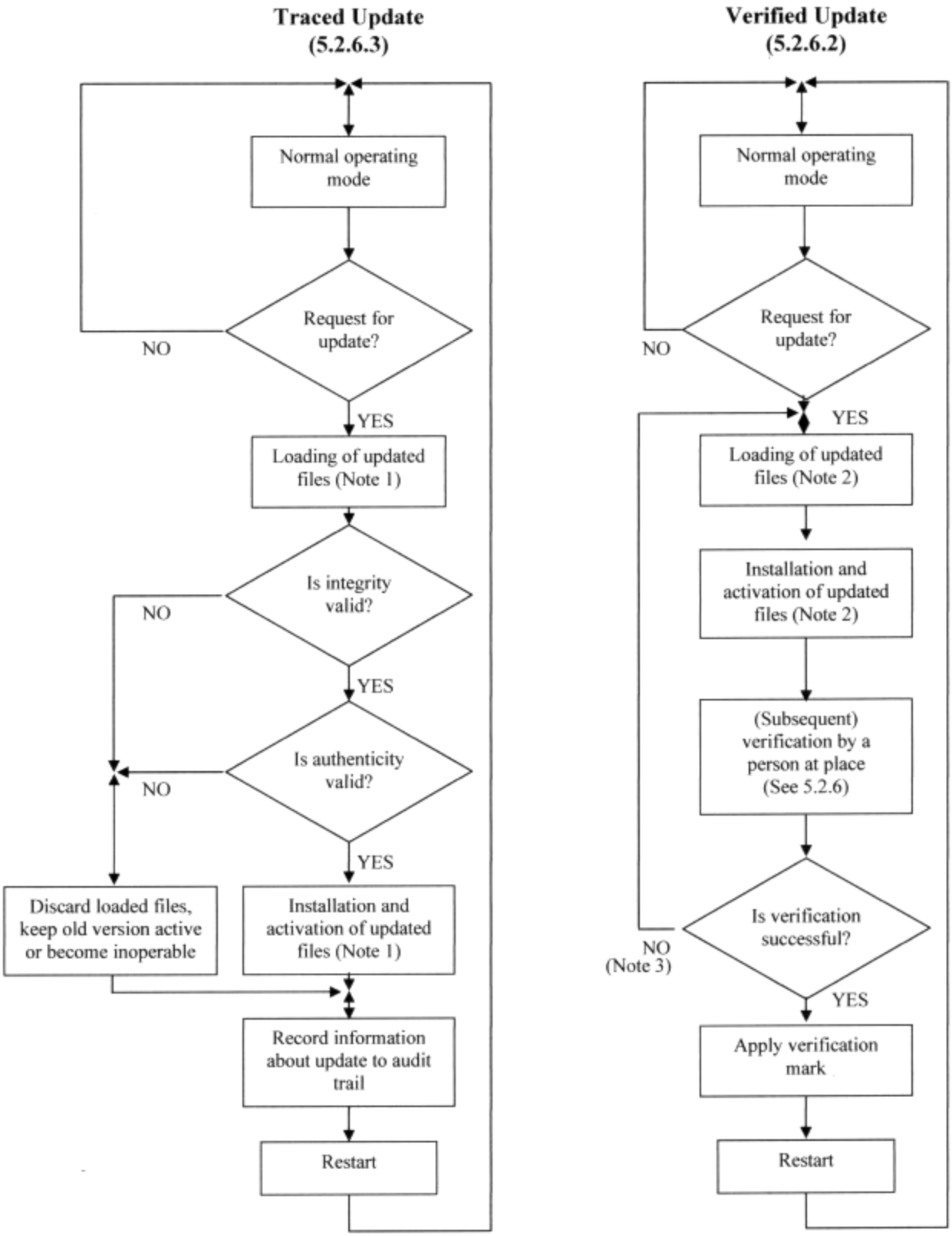
When asked whether information about the update was recorded to the audit trail, Ole explained that it depended on how that was defined. The information is all on the server. That could be called an audit trail; it just doesn't reside on the device.

The Sector Co-Technical Advisor maintained that this example involves a Type P device, and this update falls under the category of a Verified update the same as if software was being downloaded (whether over a high-speed data link, or from a thumb drive, or from a local or remote PC, etc.) and would have to meet the security requirements for a Type P device. It would be up to the local authority to verify that the downloaded version of software agrees with what's on the CC.

Dr. Pierce added that in this case, the user has no control over the process. He's just moving the memory stick from the computer to the instrument … saying, in essence, that the manufacturer is installing the updates.

Verification is defined as a procedure (other than type approval) that includes the examination and marking and/or issuing of a verification certificate that ascertains and confirms that the measuring instrument complies with the statutory requirements). This simply means that the local authority (the state) confirms that the device meets the applicable requirements of HB44 and conforms to the CC.

In the OIML flow chart for Verified Update, the three boxes titled: "(Subsequent) verification by a person at place"; "Is verification successful?"; and "Apply verification mark" are decisions/operations that would be made by state W&M personnel.



Software Update Procedure – from OIML D 31:2008 (E)

Notes:

(1) In the case of a Traced Update updating is separated into two steps: "loading" and "installing/activating". This implies that the software is temporarily stored after loading without being activated because it must be possible to discard the loaded software and revert to the old version, if the checks fail.

(2) In the case of a Verified Update , the software may also be loaded and temporarily stored before installation but depending on the technical solution loading and installation may also be accomplished in one step.

(3) Here, only failure of the verification due to the software update is considered. Failure due to other reasons does not require re-loading and re-installing of the software, symbolized by the NO-branch.

5. Report on New GIPSA/NIST Interagency Agreement for 2010 - 2014

The present five-year Interagency Agreement that provides funding for the Grain Moisture Meter On-going Calibration Program (OCP) expires at the end of the Federal Government's Fiscal Year 2009 (September 30, 2009). Under the proposed terms of the new agreement NIST and GIPSA each contribute one-third the cost of the program subject to an annual maximum of $30,000 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). Diane Lee, NIST/WMD, reported that NIST's legal office has been reviewing the interagency agreement. She anticipated receiving their approval by the end of August after which the agreement would be forwarded to GIPSA for the appropriate signatures.

Rich Pierce, GIPSA, indicated that the fee schedule remains as shown in the table below. It appears that five meters will be in the plan at a cost to each manufacturer of $6000 per meter type per year. If another meter type increases the number of meters to six, the cost to each manufacturer will increase to $8750 per meter type per year.

Proposed NTEP On-going Calibration Program Fee Schedule For Year 2010 to 2014							
(1) Total Meters (including official meter)	(2) Meters In NTEP Pool	(3) Cost Per Pool Meter	(4) Total Program Cost	Funding Contribution From Participants			
				(5) NIST	(6) GIPSA	(7) Mfg's (total funding from mfg's)	(8) Cost Per Meter Type
2	1	22,500	22,500	7,500	7,500	7,500	3,750
3	2	22,500	45,000	15,000	15,000	15,000	5,000
4	3	22,500	67,500	22,500	22,500	22,500	5,625
5	4	22,500	90,000	30,000	30,000	30,000	6,000
6	5	22,500	112,500	30,000	30,000	52,500	8,750
7	6	22,500	135,000	30,000	30,000	75,000	10,715
8	7	22,500	157,500	30,000	30,000	97,500	12,185
9	8	22,500	180,000	30,000	30,000	120,000	13,335

Explanation of columns in the Fee Schedule table:

Column	Explanation (or formula for calculating)
(1) Total Meters	The number of meter types (including the Official GIPSA meter) that will share in the NTEP calibration costs.
(2) Total Meters in NTEP Pool	The number of meter types other than the Official meter that will share in the NTEP calibration costs.
(3) Cost per Pool Meter	The cost associated with each pool meter in the program.
(4) Total Program Cost	A per meter type cost of $22,500 times the number of NTEP "pool" meters.
(5) NIST Contribution	One-third the total program cost up to a maximum of $30,000.
(6) GIPSA Contribution	One-third the total program cost up to a maximum of $30,000.
(7) Manufacturers Contributions (total funding from manufacturers)	Total Program Cost minus NIST Contribution minus GIPSA Contribution.
(8) Cost per Meter Type	Manufacturers' Contributions divided by Total Meters (including the Official meter).

6. Report on OIML TC17/SC1 R59 "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. In October 2008, the Secretariat of TC 17/SC 1 was jointly allocated to China and the United States. The Co-Secretariats (China and the United States) are working closely with an IWG to revise OIML R 59 "Moisture meters for cereal grains and oilseeds." The 5 CD of **OIML R 59**, revised to comply with OIML's Guide ***Format for OIML Recommendations*** and to incorporate tests for the recommended disturbances of **OIML D 11** ***General Requirements for Electronic Measuring Instruments***, was distributed to the U.S. National Working Group (USNWG) in March 2009 with a request for comments by May 21, 2009. The changes to R59 5 CD are summarized below:

- Extensive reformatting to comply with OIML's Guide ***Format for OIML Recommendations***, OIML B 6-2 ***Directives for Technical Work*** – *Part 2*, and the April 2008 OIML Secretariat training.
- Changes to address the comments received to 4 CD
- Changes to the MPE tables
- Added requirements for software
- Added OIML D11 tests
- Added test report section - B
- Added new section 3, Description of instruments
- Added definitions
- Revised the bibliography section
- Explanatory notes includes a history of the TC17/SC1 meetings and committee draft revisions.
- Added cross reference table of OIML R59 5 CD and OIML ***Directives for Technical Work***
- Added cross reference table of OIML R59 5 CD and OIML D11

Discussion: Diane Lee, NIST/WMD, reported that she had received approximately 170 comments from 10 countries. The next version, R59 CD6, will be sent out for a vote. She asked the Sector to discuss the OIML D 11 tests that are included in R59, and if some of the tests are not appropriate for moisture meters, provide technical reason as to why they should not be included. She explained that this may be the last opportunity to provide comments, because the next step for this draft recommendation will be voting for its acceptance as an approved OIML Recommendation. Special attention should be paid to the "disturbance" tests from OIML D 11.

The following table lists the tests in question and shows where their test procedures are located in 5 CD of R59.

Immunity tests of IEC 61326 and/or Recommended Disturbances in OIML D 11	Test Procedure Section (As appropriate, severity levels are included in test procedures, Annex A)
Sand and Dust	A.4.1
Short time power reduction	A.4.2
Bursts	A.4.3
Radiated radiofrequency, electromagnetic susceptibility	A.4.4
Conducted radiofrequency fields	A.4.5
Electrostatic discharges	A.4.6
Mechanical shock	A.4.7

Cassie Eigenmann, DICKEY-john Corporation, expressed concern over the inclusion of the Sand and Dust test. She was of the opinion that grain moisture meters (GMMs) are not located in areas subject to the Sand and Dust concentrations that they would be exposed to under the conditions described in D 11, citing paragraph **8.2.4 Sand and Dust** from OIML D 11:

> This test is mainly applicable for instruments or parts of instruments typically being used in dusty warehouses and in the building industry (for instance production of concrete) or, in some climatic regions, in the open air. Therefore, it is advised to prescribe test 10.5 in the relevant Recommendation only for those measuring instruments that can be expected to be typically used under sandy/dusty conditions (refer to 4.4).

[Note: **D 11 4.4** shown below for reference]

> **4.4** Some of the tests described in this Document may be relevant only for specific kinds of instruments. Therefore, a test should be included for a particular kind of instrument only if that instrument is likely to be significantly influenced by the test, under the instrument's specified operating conditions.

The Sector's Co-Technical Advisor noted that D 11 gives only a vague description of how the test is to be performed: A brief description of the test in D11 section 10.5 states:

> The test consists of exposure to cyclic temperature variation between 30 °C and 65 °C, maintaining the following conditions:
> - Relative humidity: less than 25 %
> - Air velocity: 3 m/s
> - Particle concentration: 5 g/m3
> - Composition of the particles: as specified in 3.2.1 of IEC 60512-11-8 [17]

He questioned the severity of the test with regard to the concentration of 5 grams per cubic meter.

Dave Krejci, Grain Elevator & Processing Society (GEAPS), remarked that 5 grams per cubic meter is really dusty. He couldn't imagine people operating a meter in those conditions without wearing a

respirator. Table Z-1 Limits for Air Contaminants in OSHA Regulation 29CFR1910-1000 originally set grain dust limits of no more than 10 milligrams per cubic meter for wheat, barley and oats grain dust and 15 milligrams per cubic meter for other grains. Those limits were set aside by a court challenge, because they were based on limits established by the American Conference of Governmental Industrial Hygienists (ACGIH) without sufficient scientific basis. Table Z-1 in the current issue of 29CFR1910-1000 lists a limit of 10 milligrams per cubic meter for "particulates not otherwise regulated" (PNOR). Grain dust falls under that category. He believed that an argument could be made that people operating GMMs aren't wearing respirators so the instruments aren't being exposed to dust concentrations anywhere near 5 grams per cubic meter.

In addition, he pointed out that if a GMM was expected to operate in an atmosphere of 5 grams per cubic meter, it would be required to have a dust-tight or weather-tight enclosure. There is nothing in R59 requiring a dust-tight/weather-tight enclosure, so it seems illogical to require a Sand and Dust test. In the U.S. if a GMM was being operated in the sand and dust environment you are testing for it would be a violation of the electrical codes for hazardous locations unless the enclosure was a NEMA9 or the GMM was intrinsically safe (which they are not).

One Sector member, playing the devil's advocate, asked if a case could be made for retaining the Sand and Dust test on the basis of accelerated testing for an operating environment with a low level of dust (below 10 mg/m^3) that is allowed to accumulate over a long period of time. Sector members were quick to respond that there are user requirements that specify that instruments are to be maintained in good working condition, so there should be no large accumulation. Others also pointed out that User Manuals typically specify the installation conditions such as, "Avoid a hazardous (classified) location as defined in Article 500 of the NFPA Handbook of the National Electrical Code," and "Choose a clean environment …"

The Sector agreed that A.4.1 Sand and dust should be removed from R59.

Rich Pierce, GIPSA, the NTEP Participating Laboratory for Grain Analyzers, took issue with the D 11 tests as they had been incorporated in R59 5CD. It was his opinion that they are too vague, and don't give sufficient details (e.g., what grains are to be used, how many drops, initial conditions, whether the instrument was turned on or turned off, etc.) When D11 tests are incorporated in specific Recommendations, these additional details have to be specified. This detail is needed to assure that when a device is tested in country "B" it's done the same way it was done in country "A."

The Co-technical Advisor called the Sector's attention to several other shortcomings to 5CD:

> **A.4.4 Radiated radio-frequency electromagnetic fields** - R59 should also specify wiring to and from the GMM from any and all ports. The paragraph:
> The equipment under test is subjected to 20 discrete frequency bands of electromagnetic radiation in the frequency range 26 MHz to 1000 MHz, at a field strength of either 10 V/m (for electromagnetic environment E1) or 10 V/m (for electromagnetic environment E2) appears to be in conflict with the previously described tests.
>
> **A.4.5 Conducted radio-frequency fields** – This item is missing from Annex B. R59 should also specify wiring to and from the GMM for any and all ports.
> Need to add:
> The difference between the intrinsic error and the error (of indication) measured while the EUT is subjected to conducted radio-frequency fields, at the same reference

conditions, shall not exceed the maximum permissible error in the specified operating range (or significant faults are detected and acted upon by means of a checking facility).

A.4.7 Mechanical shock – This item is missing from Annex B.
Need to add:
The difference between the intrinsic error and the error (of indication) measured after the EUT is subjected to mechanical shock, at the same reference conditions, shall not exceed the maximum permissible error in the specified operating range (or significant faults are detected and acted upon by means of a checking facility).

Conclusions/Summary: The Sector agreed that A.4.1 Sand and dust should be removed from R59. The sand and dust concentration specified for that test far exceeds the acceptable level of particulate concentration for human health unless an approved respirator (or OSHA approved dust mask) is worn and we know that GMM operators do not wear respirators. [References: Table Z-1 Limits for Air Contaminants for PNOR in OSHA Regulation 29CFR1910-1000.]

The Sector is also concerned that the present wording of the new tests in Annex A is too vague. They are not detailed enough to specify which grains are to be used. Is it necessary to use all grains for this test? Can a single grain be used? Can another grain be substituted? From what moisture range should the test samples be selected? Do you drop the sample one time through the instrument or multiple times? If multiple times, can you average the results? If you have to repeat the tests under several different conditions (as at maybe 20 or more different frequencies) is the same grain sample going to be used for each frequency? By the time D11 requirements come into a Recommendation, the test procedures should be very specific.

The corrections/additions to **A.4.4**, **A.4.5**, and **A.4.7** detailed above, should be incorporated. **Annex B** should be edited to include references to A.4.5 and A.4.7.

The Sector is of the opinion that CD 5 as it exists today is not ready for a final vote.

7. Report on OIML TC17/SC8 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 TC17/SC8. 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 TC 17/SC 8 meeting was hosted by NIST in September 2007 to discuss the 2 CD. 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.

Discussion: Diane Lee, NIST/WMD, reported that she had not received an updated draft Protein Recommendation from Australia, Dr. Grahame Harvey, Secretariat, so she was not sure what the status is concerning the Protein Recommendation. It has been difficult to follow the version and revisions to the protein document because the U.S. has not received regular updates or lists of comments to the revisions.

Rich Pierce, GIPSA, commented that at the conclusion of the joint meeting of SC1 and SC8 in October 2007, the two respective documents were closely aligned. However, the 5CD of R59 doesn't look anything like the version of R59 that came out of the meeting in October 2007. He speculated that SC8 was waiting to see what SC1 comes up with before they come out with another draft.

8. Air-Oven Collaborative Study

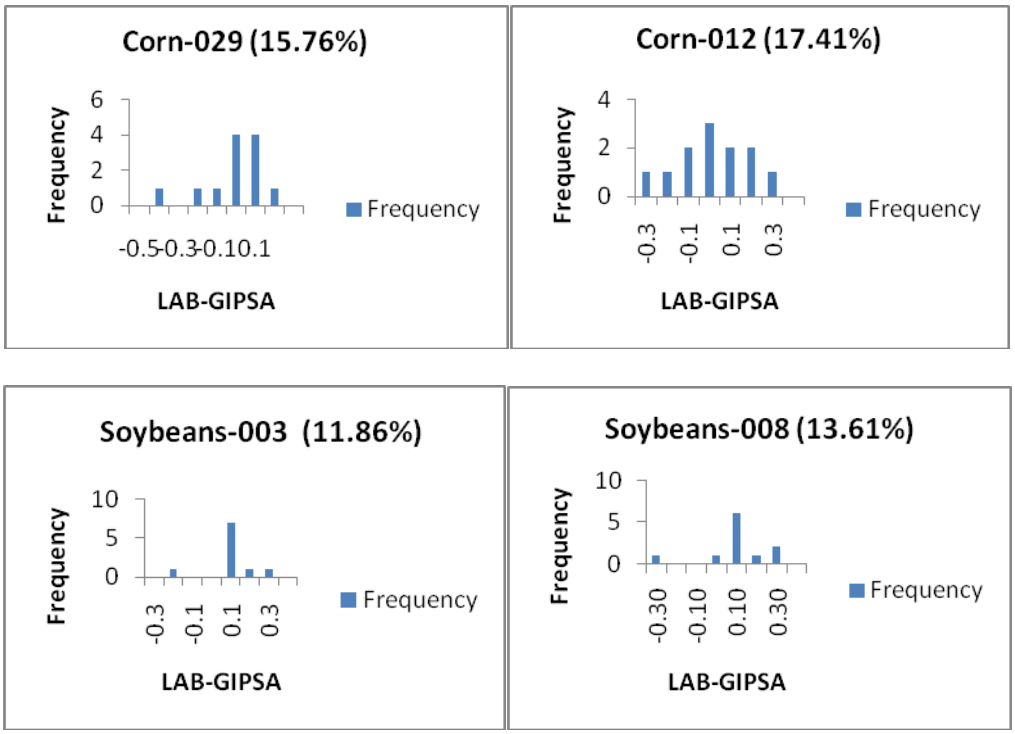
Background: NIST-WMD's laboratory measurement traceability program requires that laboratories participate in interlaboratory and other collaborative experiments. A structured collaborative air oven study was last conducted following the 2000 harvest. Results of that study were reported at the Sector's August 2001 meeting. At its August 2008 meeting, 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** ***General requirements for the competence of testing and calibration laboratories***. Karl Cunningham subsequently agreed that the State of Illinois Moisture Meter Laboratory would serve as the "pivot" laboratory.

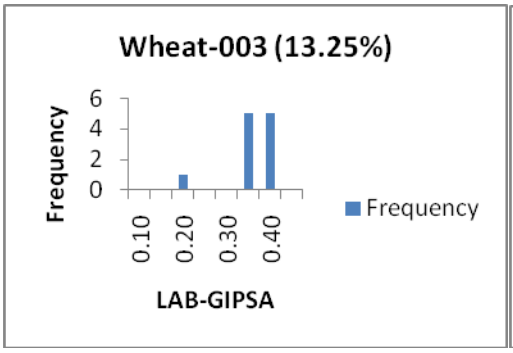
Discussion: Karl Cunningham, Illinois, reported that 14 laboratories participated in this study. Participants included: USDA/GIPSA (as reference laboratory), Arkansas, Colorado, Illinois, Iowa, Maryland, Mississippi, Missouri, North Carolina, South Carolina, Wisconsin (corn only), Wyoming, and DICKEY-john. Perten was sent samples but didn't return results. With the exception of one or two outliers, results were fairly good. The histograms below show the distribution of Lab error (Participant Lab result minus Reference Lab result) for each of the grain samples. A more detailed analysis of results will be distributed at a later date.

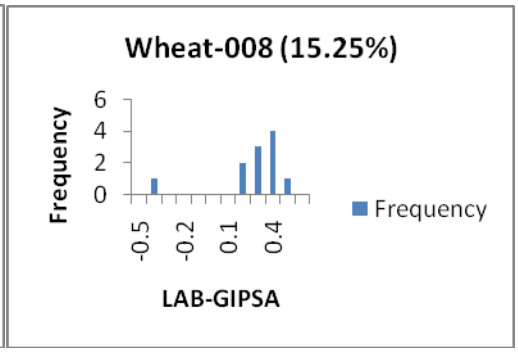
The Sector agreed that when detailed results are distributed participants should not be identified by name (except for USDA/GIPSA.) Individual participants will be told which laboratory they were (e.g., you are lab #4.)

In response to the question if a collaborative air oven study was something that should be scheduled to happen on a regular basis, Karl suggested that every two years might be appropriate.

Dr. Charles Hurburgh, Iowa State University, urged the representatives from the American Oil Chemists Society (AOCS) to prepare a proposal so that the collaborative study could be conducted on an on-going basis rather than on an ad hoc basis. He cautioned that the proposal would have to include corn and wheat as well as soybeans.







9. Item 310-1: G-S.8. Provision for Sealing Electronic Adjustable Components, G-S.8.1. Access to Calibration and Configuration Adjustments, and G-S.8.2. Automatic or Semi-automatic Calibration Mechanism

Background: At its 2007 Annual Meeting, the SWMA received a proposal to add requirements to G-S.8. to assure that a device could not be sealed in the configuration mode and continue to operate normally. Such a condition could facilitate fraud. The proposal as submitted required that a device continuously indicate when access to the set-up mode was not disabled.

At the 2008 Interim Meeting, the S&T Committee reviewed comments received during the open hearing and discussed alternate proposals provided by WMD and SMA. At the 2008 Annual Meeting, the WMD suggested that the S&T Committee amend the recommendation to address some of the concerns noted by the CWMA, NTEP participating laboratories, and WMD since the 2008 Interim Meeting.

During the open hearings at the 2009 Interim Meeting, WMD stated that it had received comments questioning how the application of a physical seal (as recommended by the manufacturer and listed on the CC) ensures that the calibration and configuration modes are disabled. What does that presence of the physical seal (pressure sensitive or lock and wire) do to the device that disables the calibration and configuration modes?

The S&T Committee agreed with the comments that the proposal ***is not ready*** to become a Voting item and suggested that further development to the proposal addresses the following concerns:

1. Avoid language that allows the indication of usable metrological values while in the adjustment mode for devices that do not have an event logger.

2. Recognize that more than one method of sealing is acceptable on a single device, such as using a lock and wire seal for the mechanical adjustments and an audit trail for electronic adjustments.

3. Recognize that other codes in HB 44 do not have language for device categories and corresponding methods of sealing.

4. Require an obvious indication when a device is being adjusted if it is provided with a physical security seal.

5. Clarify that the application of a physical security seal to a specially designed and sealable plate or cover that disables external access to the configuration and adjustment mode is not the only method to seal adjustable components.

Consequently, the S&T Committee recommended that this item remain Informational.

After the 2009 Interim Meeting, the NIST technical advisor developed the following language for further development by the regional weights and measures associations, NTETC sectors, and other interested parties with the intent that a revised proposal can be forwarded to the S&T Committee for consideration at the 2010 NCWM Interim Meeting.

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

(a) applying a physical security seal that must be broken, or

(b) using other approved means of providing security (e.g., data change audit trail available at the time of inspection)

before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism.
[Nonretroactive as of January 1, 1990]

(Amended 201X)

A device may be fitted with an automatic or a semi-automatic calibration mechanism. This mechanism shall be incorporated inside the device. After sealing, neither the mechanism nor the calibration process shall facilitate fraud.
(Added 1985) (Amended 1989 and 1993)

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

G-S.8.2. Multiple Sealing Methods. – Weighing and measuring devices may be approved for use with multiple methods for sealing adjustable components such as physical seals for calibration adjustment (e.g., load cells, meters, etc.) and event counters or event logger for the configuration parameters (e.g., capacity, interval size, octane blend settings, etc.).
[Nonretroactive as of January 1, 1990]

(Added 201X)

G S.8.3. Adjustment Mode Indications. – During the calibration and configuration adjustment mode, the device shall:

(a) Not provide metrological indications that can be interpreted, or transmitted into memory, or printed while it is in the calibration and/or configuration adjustment mode as a correct measurement value, or

(b) Clearly and continuously indicate that it is in the calibration and/or configuration adjustment mode, and record such message if capable of printing in this mode.

Nonretroactive as of January 1, 201X)
(Added 201X)

Discussion: The proposed changes to **G-S.8.** and the proposed language of **G-S.8.2.** don't appear to affect the provisions for sealing GMMs and NIR Grain Analyzers (see **HB 44, Section 5.56.(a)**, paragraph **S.2.5. Provision for Sealing** and **HB 44 Section 5.57**., paragraph **S.2.6. Provision for Sealing.)** The requirements of **G-S.8.3.**, however, may affect some instruments. This proposal stipulates that during any adjustment mode the device must either not provide any metrological result that could be interpreted as a correct measurement, or must clearly and continuously indicate that it is in the adjustment mode.

In response to a request for feedback from manufacturers on the proposed changes/additions to **G-S.8.3** Sean Bauer, Steinlite, described how the SL95 seals a switch that gives access to "adjustment mode". A wire seal must be broken to slide the switch to "adjustment mode" position. The device cannot be re-sealed without returning the switch to normal "operate" position. In "operate" position, the user cannot access "adjustment mode". Jim Truex, NTEP Administrator, offered the opinion that this sort of arrangement sounded as if it would meet the requirements of option "(a)" of the proposal. He mentioned that some devices display "CAL OPEN" or "CON OPEN" continuously whenever the device is in "adjustment mode" to comply with option "(b)" of the proposal.

During a discussion of **G-S.8. Provision for Sealing Electronic Adjustable Components**, and use of a data change audit trail as a method of sealing, there was some concern that the two Grain Analyzer chapters of Pub14 might contain wording that allows certain manufacturer/service company adjustments to be excluded from the audit trail. A cursory examination of Pub 14 did not reveal any obvious exclusions.

The Co-Technical Advisor suggested that the GMM and NIR grain analyzer code of HB44 would appear to cover the proposed changes to **G-S.8., G-S.8.2**, but **Table S.2.5. Categories of Device and Methods of Sealing** in the GMM code may require some minor changes to expand the meaning of "remote configuration" capability to include the ability of the device to accept a new memory chip or to accept new parameters from anything plugged into a USB port (or other port).

[Note the following definitions from **Appendix B - Philosophy for Sealing** in the GMM Chapter of Publication 14.]

> **Remote configuration capability.**
> The ability to adjust a weighing or measuring device or change its sealable parameters from or through some other device that is not itself necessary to the operation of the weighing or measuring device or is not a permanent part of that device.
>
> **Remote device.**
> A device that (1) is not required for the measurement operation of the primary device or computing the transaction information in one or more of the available operating modes for commercial measurements or (2) is not a permanent part of the primary device. In the context of this paper, a remote device has the ability to adjust another device or change its sealable configurable parameters.

The Sector decided to make this a carryover item for the next meeting so it could be studied in more depth.

9.5 Properly Standardized Reference Meters

[Submitted by Karl Cunningham, Illinois Department of Agriculture – received after the formal Agenda was published.]

The State of Illinois is requesting a definition for "Properly Standardized Reference Meter" and what the requirements are to qualify a meter as such. As with all standards there must be traceability. What criteria must these "Reference Meters" meet? Also, for non-NTEP meters the testing procedure allows for air-oven testing to be performed not meter to like meter testing. What suggestions does the sector have on traceability of grain standards?

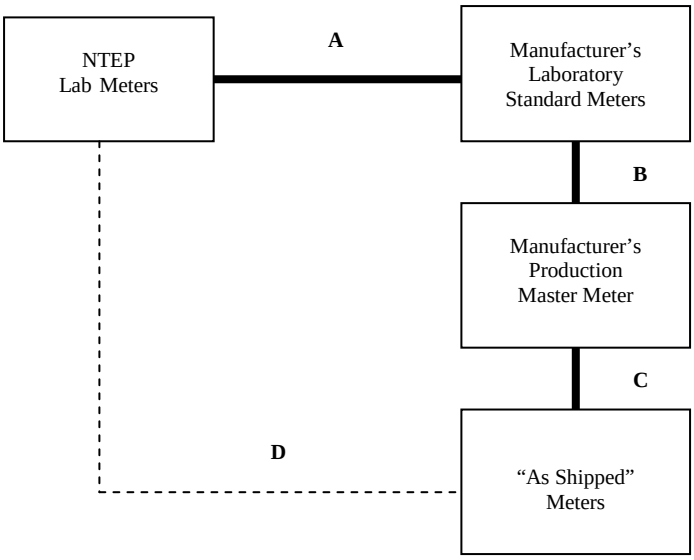
Background and Discussion:

[Note: The Illinois Bureau of Weights and Measures licenses companies and individuals who sell, install, or repair commercially used weighing and measuring devices through the Registered Serviceperson Program. Before becoming licensed, servicepersons are examined on their proficiency and understanding of applicable regulations. Licenses must be renewed annually. A registered serviceperson in good standing may place a commercially used device into service and the device may be used in trade or commerce until a state test is performed. Anyone who sells, installs, services, reconditions, or repairs a commercially used weighing or measuring device must be registered with the Illinois Department of Agriculture. On the bureau's list of Registered Repair Companies, eight are classified as registered to service moisture meters. Two of these companies carry the note "Sell only". Whenever a GMM has been serviced **or has had updated grain calibrations installed**, the meter must be "returned to service" by a registered serviceperson before it can be used. It is still subject to later inspection by Illinois Weights and Measures personnel.]

This item originated because the State of Illinois is concerned that some of its Registered Service Companies do not have the required procedures or equipment to comply with Handbook 44 test requirements when placing meters back into service.

For NTEP meters Handbook 44 permits meter to like-meter testing using "properly standardized reference meters …" Karl Cunningham, Illinois, asked, "What is the definition of a properly standardized reference meter? How are they maintaining these standardized reference meters to know that they are operating properly and accurately?"

He was referred to **Section VI. Standardization of Instruments** in the GMM chapter of Publication 14 that shows the relationship and maximum permissible errors between the NTEP Lab meters, Manufacturer's Laboratory Standard Meters, Manufacturer's Production Master Meter, and "As Shipped" meters. It was explained that a properly standardized reference meter for a Service Company should have the same traceability to the NTEP Lab Meters as the Manufacturer's Production Master Meter has.



Cassie Eigenmann explained how DICKEY-john checks and maintains the traceability required by Publication 14. DICKEY-john has three Laboratory Standard Meters that never leave the moisture laboratory. In the factory they have "production line standards" corresponding to the "Manufacturer's Production Master Meter" shown in the above diagram. Once a month the "production line standards" are brought into the laboratory and checked against the three lab instruments. Six drops of grain are run though each of the four meters. This is done in a sequence that minimizes the effect of any moisture loss in the grain being used. Averages and standard deviations are calculated, and several other comparison tests are performed. The mean moisture difference between the Laboratory Standard Meters and a Production Line Standard (path "B" in the diagram) must not exceed .o8% moisture. Similarly, remote service locations bring their working standards to the DICKEY-john moisture laboratory once a year for the same kind of checks that are given to "production line standards".

It was pointed out that there was no way to standardize a non-NTEP meter to the NTEP Lab Standard Meters. This is why HB44 requires that grain samples with air-oven moisture values be used for testing non-NTEP meters. Mr. Cunningham was concerned that there were service agencies and manufacturer's dealers who were placing non-NTEP meters into service without using air-oven samples. He thought that this was going to be another issue for these service companies, because they were going to be required to have air-oven capability or to show how they can obtain air-oven samples for putting non-NTEP meters back into service.

Tom Runyon, Seedburo Equipment Company, expressed the opinion that it is not reasonable to expect some dealers working out of their home (especially those not doing any repair work) to have air-oven capabilities. They just need a set of air-oven samples. Dr. Hurburgh suggested that Illinois could offer a service supplying State Certified air-oven samples for use by a Registered Service Company to verify that a meter meets the accuracy requirements of HB44 when it places a meter back into service. The State could require the Service Company to use a "monitor meter" and maintain a log of initial moisture and results of periodic "monitor meter" checks just like Illinois inspectors do.

10. Time and Place for Next Meeting

The next meeting is tentatively planned for Wednesday, August 25 and Thursday, August 26, 2010, at the Chase Suites by Woodfin at KCI in Kansas City, MO. 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 2010.

If you would like to submit an agenda item for the 2010 meeting, please contact any of the following persons by June 1, 2010:

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

UNITED STATES DEPARTMENT OF COMMERCE
National Institute Of Standards And Technology
Gaithersburg, Maryland 20899

November 2, 2010

MEMORANDUM FOR: National Type Evaluation Technical Committee (NTETC)
Grain Analyzer Sector
Interested Parties

From: Jack Barber
Technical Advisor

G. Diane Lee
NIST WMD
Technical Advisor

Subject: Meeting Summary for August 2010 Grain Analyzer Sector Meeting

Attached is the summary of the August 2010 Sector meeting held in Kansas City, Missouri.

The next meeting is tentatively planned for Wednesday, August 24 and Thursday, August 25, 2011, at the Chase Suites Hotel in Kansas City, MO. 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 2011.

If you would like to submit an agenda item for the 2011 meeting, please contact any of the following persons by June 1, 2011:

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

Please submit your issue in writing. Your submission should contain the following sections:

Recommendation: The action you are asking the Sector to take, such as a change to H44 or Publication 14 (be explicit, show added or removed text), adopt a specific procedure for field inspection (again, list details), study the effectiveness of an existing program, etc.
Discussion: Why you think your recommendation has merit? What is the problem and how will the action you are recommending overcome this problem?
Background: (optional) Additional information that will contribute to a thorough understanding of the issue or provide historical background (previous actions taken by NCWM, previous attempts to solve this problem, etc.).

We look forward to hearing from you.

National Type Evaluation Technical Committee (NTETC)
Grain Analyzer Sector
August 25-26, 2010 - Kansas City, Missouri
Meeting Summary

Agenda Items

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1. Report on the 2010 NCWM Interim and Annual Meetings

The 95th Annual Meeting of the National Conference on Weights and Measures (NCWM) was held July 11 – 15, 2010 in St. Paul, Minnesota. 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 2010 Annual Meeting.

Jim Truex, NTEP Administrator, reported that Annual Meeting attendance this year was down to approximately 250 registrants with only 35-36 states participating. There was some speculation that the attendance drop was partly due to the economy. Conference membership for 2010 is down about 200 from 2009. A similar drop in membership occurred the previous year. The National Conference on Weights and Measures is running smoothly. In spite of the drop in membership the Conference is in sound financial shape.

Other General Code items of interest to the Sector were non-voting items related to software and provisions for sealing electronic adjustable components. [See Grain Analyzer Sector Agenda Items 5, 6, and 7.]

2. 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. A Phase I evaluation is currently underway for one new grain moisture meter. Annual GMM calibration reviews were completed on schedule and updated Certificates of Conformance (CCs) were issued for six device types. Six device types are enrolled in the OCP (Phase II) for the 2010 harvest:

Bruins Instruments	OmegAnalyzerG
DICKEY-john Corporation	GAC2000 NTEP, GAC2100, GAC2100a, GAC2100b
DICKEY-john Corporation	GAC2500 (first year for this instrument)

Foss North America	Infratec 1241
Perten Instruments	AM5100
The Steinlite Corporation	SL95

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

Ms. Brenner pointed out that plans to resume work on an addition to and the remodeling of the FGIS Technical Services Division Building can have an impact on NTEP testing. Of major concern is the loss the walk-in environmental chamber. The chamber will be completely disassembled and removed to make way for utility hook-ups. It is likely to be the last item to be restored to operating condition. If started in September, the new addition is tentatively scheduled to be completed in March. Some of the labs will then be moved to the new building. The labs remaining in the old building will be rearranged to allow renovations to be made to the empty portion of the old building. Those labs will then be moved into the renovated portion so the renovation can be completed. The air-oven lab, NTEP lab, the moisture meter lab, among others, would each have to be relocated twice in the remodeling process. At least two years of renovations and disruptions are anticipated.

Other facilities are being looked into as possible interim sites where Phase I environmental testing might be performed. One possibility for manufacturers with suitable walk-in environmental chambers would be for GIPSA to perform the tests on site. There is also the possibility that facilities might be available for GIPSA to use on a short term rental basis. Alternatively, testing could be subcontracted to other NTEP laboratories. There are questions of how the added cost of on-site, rental, or subcontracting can be handled and what additional training other NTEP laboratories might require for conducting tests unique to GMMs. If these details cannot be resolved satisfactorily, testing might have to be deferred until the new facility is fully operational.

Some of the facilities suggested include: Kansas State University, Ohio Department of Agriculture, and Iowa Department of Agriculture. Additional sites are being investigated.

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

At the Sector's August 2005 meeting it was 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. These data are based on the last three crop years (2007–2009) using calibrations updated for use during the 2010 harvest season.

Four meter types were included in the comparison graphs: DICKEY-john's GAC2100, Foss's Infratec 1241, Perten's AM5100, and Steinlite's SL95. Only the GAC2100 has been identified on the comparisons. It is identified as "Official Meter". The remaining three instruments were randomly assigned numbers 1, 2 and 3, or, in the case of sunflowers, A and B.

[Note: The 2007-2009 GMM Phase II comparison graphs were distributed with the August 2010 Grain Analyzer Sector Agenda. Until completion of the NCWM Interim Meeting, held in January 2011, they can be downloaded from the NCWM web site using the following link:
http://www.ncwm.net/sites/default/files/meetings/grain_analyzer/2010/10_GMM_Bias.pdf
After that time, all Grain Analyzer Sector Meeting documents will be moved to the NCWM web site Meetings Archive Folder.]

Ms. Brenner pointed out that sunflower results were included this year. They had been eliminated last year to preserve confidentiality, because only two meters were approved for sunflowers and one

of them was the Official Meter. This year there are now two meters in addition to the Official Meter with sunflower results.

The 2009 crop year was atypical especially for Corn and Rough Rice. Many of the samples received were of low test weight per bushel (TW) or of low quality. Two of the meters showed abnormal results especially in the 14% to 16% moisture range. When performance was reviewed before calibrations were adjusted (using the calibrations from the 2009 harvest), out of five meters in the program two meters passed, and three just barely failed if 2009 data was included. When 2009 data was ignored, all meter passed.

Dr. Richard Pierce, GIPSA, expanded on Ms. Brenner's comments, explaining that they had received many more low TW samples than in previous years. Under usual circumstances GIPSA might have decided that this is not the kind of data that they wanted to use for the calibration program and they could have deleted those samples. This wasn't done because the effects of low TW differ radically from one meter type to the next. Some read low if TW is low, others may read high, and some are not affected. As a result, GIPSA didn't believe there was a valid reason for deleting those samples.
As one of the lower frequency meters, the Official Meter seems to be more sensitive to unusual grain conditions. This has shown up on the rice samples, and there have been issues in the 14% to 16% moisture range with corn.

At the last Grain Inspection Advisory Committee meeting, GIPSA was asked if there was anything they could do to improve the moisture calibrations for rice and corn. Dr. David Funk, GIPSA, told the Committee that the meter is doing as well as it can for the technology that is used. He suggested that if this is a serious problem for the Committee then GIPSA may need to look at selecting a new meter technology that performs better on these atypical crops. The Advisory Committee responded by suggesting that GIPSA move forward and explore that. Although there is presently no agency decision and no firm timeline regarding selecting a replacement for the current Official Meter, Dr. Pierce was of the belief that we are now at the point where manufacturers and agencies within GIPSA need to be made aware that this could be coming and it could be coming fairly quickly.

Dr. Funk indicated his willingness to make the same Power Point presentation to the Sector that he had given to the Grain Inspection Advisory Committee if the Sector was interested in hearing more on this subject. The Sector agreed to amend the Agenda to include Dave's presentation. [Note: See Agenda Item **14. Future Direction of Moisture Measurement Technology**.]

4. Report on New GIPSA/NIST Interagency Agreement for 2010 – 2014

The five-year Interagency Agreement that provides funding and defines the fee schedule for the NTEP Phase II Grain Moisture Meter On-going Calibration Program (OCP) expired September 30, 2009 (the end of the Federal Government's Fiscal Year 2009). At the time of the Sector's August 2009 meeting, a new Interagency Agreement was being reviewed by NIST's legal office. The new agreement was finally approved in the spring of 2010.

Dr. Richard Pierce, GIPSA, explained the fee table showing how fees are calculated based on the number of meter types in the program. With six device types presently enrolled in Phase II for the 2010 harvest the cost to manufacturers will be $8750 per device type. If a seventh meter enters the program, the cost per device type per year increases to $10,715. Rich noted that over the last 15 years the number of meters in the program each year has varied from 5 to 7.

The fee schedule for the new agreement is shown below:

NTEP On-going Calibration Program Fee Schedule For Year 2010 to 2014							
(1) Total Meters (including official meter)	(2) Meters In NTEP Pool	(3) Cost Per Pool Meter	(4) Total Program Cost	Funding Contribution From Participants			
				(5) NIST	(6) GIPSA	(7) Mfg's (total funding from mfg's)	(8) Cost Per Meter Type
2	1	22,500	22,500	7,500	7,500	7,500	3,750
3	2	22,500	45,000	15,000	15,000	15,000	5,000
4	3	22,500	67,500	22,500	22,500	22,500	5,625
5	4	22,500	90,000	30,000	30,000	30,000	6,000
6	5	22,500	112,500	30,000	30,000	52,500	8,750
7	6	22,500	135,000	30,000	30,000	75,000	10,715
8	7	22,500	157,500	30,000	30,000	97,500	12,185
9	8	22,500	180,000	30,000	30,000	120,000	13,335

Column	Explanation (or formula for calculating)
(1) Total Meters	The number of meter types (including the Official GIPSA meter) that will share in the NTEP calibration costs.
(2) Total Meters in NTEP Pool	The number of meter types other than the Official meter that will share in the NTEP calibration costs.
(3) Cost per Pool Meter	The cost associated with each pool meter in the program.
(4) Total Program Cost	A per meter type cost of $22,500 times the number of NTEP "pool" meters.
(5) NIST Contribution	One-third the total program cost up to a maximum of $30,000.
(6) GIPSA Contribution	One-third the total program cost up to a maximum of $30,000.
(7) Manufacturers Contributions (total funding from manufacturers)	Total Program Cost minus NIST Contribution minus GIPSA Contribution.
(8) Cost per Meter Type	Manufacturers' Contributions divided by Total Meters (including the Official meter).

5. Item 310-1 G-S.8. Provision for Sealing Electronic Adjustable Components, G-S.8.1., Adjustment Mode Indication, and Definitions for Adjustment and Adjustment Mode

Background: This item originated from the Southern Weights and Measures Association (SWMA) and first appeared on the S&T Committee's 2008 agenda. The proposal added requirements to G-S.8. to assure that a device could not be sealed in the configuration mode and continue to operate normally. Such a condition could facilitate fraud. The proposal as submitted required that a device continuously indicate when access to the set-up mode was not disabled.

At the 2008 Interim Meeting, the S&T Committee reviewed comments received during the open hearing and discussed alternate proposals provided by WMD and SMA. At the 2008 Annual

Meeting, the WMD suggested that the S&T Committee amend the recommendation to address some of the concerns noted by the CWMA, NTEP participating laboratories, and WMD since the 2008 Interim Meeting. The item remained Informational for the 2008 Annual Meeting

During the open hearings at the 2009 Interim Meeting, WMD stated that it had received comments questioning how the application of a physical seal (as recommended by the manufacturer and listed on the CC) ensures that the calibration and configuration modes are disabled. What does that presence of the physical seal (pressure sensitive or lock and wire) do to the device that disables the calibration and configuration modes? The S&T Committee agreed with the comments that the proposal ***was not ready*** to become a Voting item and recommended that the item remain Informational for 2009.

At the 2010 NCWM Interim Meeting, WMD stated that it remained concerned about devices which could be sealed while allowing access to calibration or configuration changes without breaking that seal. WMD agreed with the position of the NCWM S&T Committee that the current language in paragraph G-S.8. requires that a security seal be broken before a metrological change can be made to a device (or other approved means of security such as an audit trail provided). Thus, once a security seal is applied, it should not be possible to make a metrological change to the device without breaking that seal. Since this philosophy addresses provisions for protecting access to any metrological adjustment, the philosophy should be applied consistently to all device types. WMD encouraged the S&T Committee to reiterate in its Interim and Final Reports the correct interpretation of G-S.8. as the Committee and the MS have done in the past, and as demonstrated in more recent actions by the WS.

The S&T Committee agreed that a device must be equipped with an approved audit trail or that a physical seal is required to be broken before any metrological adjustments to comply with paragraph G-S.8. The Committee also believed that an indication that the adjustment mode is in operation is only necessary for devices with approved electronic methods of sealing. Additionally, the adjustment mode indicator should not be operable during normal weighing or measuring operations. The Committee agreed that if a device designed for commercial applications is capable of being "sealed" and still allows external or remote access to the calibration or configuration mode, then that device is clearly in violation of the current provisions in G-S.8. Provision for Sealing Electronic Adjustable Components and G-S.2. Facilitation of Fraud and, therefore, no change to the existing language in paragraph G-S.8. would be needed. The S&T Committee believed that type evaluation procedures have been amended in applicable sections of NCWM Publication 14 to address the issues of incorrectly applying the requirements in G-S.8. The Committee also noted that there was some confusion regarding the meaning of the terms "adjustment" and "adjustment mode" in the CWMA Annual Meeting reports.

The S&T Committee received no comments addressing potential inconsistent interpretations of the requirements by field officials, requirements for adjustment mode indications, and limitations on metrological indications while in the adjustment mode in any proposals. Consequently, the Committee developed a revised proposal that:

1. does not change the existing text in G-S.8.;

2. adds language that restates the intent of G-S.8.;

3. adds language to address metrological (legal for trade) measurements while in an adjustment mode;

4. adds a new paragraph G-S.8.1. that requires an indication and, recorded representations while in the adjustment mode (if equipped with a printer); and

5. adds new definitions for "adjustment" and "adjustment mode" from the white paper on the "Metrological Requirements for Audit Trails" adopted by NCWM in July 1993 to facilitate a common understanding of the terms.

The S&T Committee also recommended that the amended proposal be given Informational status to allow interested parties sufficient time to analyze and comment on the most recent language that appears in the "Item Under Consideration" below:

[See the 2008 NCWM Annual and 2009 Interim and Annual Reports for additional background information.]

Item Under Consideration:

Amend General Code paragraph G-S.8. and subsequent subparagraphs.

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

(a) <u>It shall not be possible to apply a physical security seal to the device while it is in the calibration and/or configuration mode nor to access the calibration and/or configuration (adjustment) mode when sealed, or</u>

(b) <u>The calibration and/or configuration adjustments are protected by an approved method for providing security (e.g. data change audit trail).</u>

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

<u>During any mode of operation in which adjustments can be made, devices shall not provide indications that can be interpreted, transmitted into memory, or printed as a usable (legal) measurement value. *</u>

(Added 1985) (Amended 1989**, ~~and~~** 1993**<u>, and 201X</u>**)
[Nonretroactive as of January 1, 1990]
<u>*[Nonretroactive as of January 1, 201X]</u>

<u>G-S.8.1. Adjustment Mode Indication. For electronic devices protected by an approved means for providing security (e.g. data change audit trail), the device shall clearly and continuously indicate and print, if equipped with a printer, that the calibration and configuration adjustment modes are enabled.</u>
<u>[Nonretroactive as of January 1, 201X]</u>

.

G-S.8.~~1~~2. Multiple Weighing or Measuring Elements that Share a Common Provision for Sealing. *– A change to any metrological parameter (calibration or configuration) of any weighing or measuring element shall be individually identified.*
[Nonretroactive as of January 1, 2010]

Note: For devices that utilize an electronic form of sealing, in addition to the requirements in G-S.8.~~1~~2., any appropriate audit trail requirements in an applicable specific device code also apply. Examples of identification of a change to the metrological parameters of a weighing or measuring element include, but are not limited to:

(1) a broken, missing, or replaced physical seal on an individual weighing, measuring, or indicating element or active junction box;

(2) a change in a calibration factor or configuration setting for each weighing or measuring element;

(3) a display of the date of calibration or configuration event for each weighing or measuring element; or

(4) counters indicating the number of calibration and/or configuration events for each weighing or measuring element.

(Added 2007)

Add applicable definitions to Appendix D from a white paper on the "Metrological Requirements for Audit Trails" adopted by NCWM in July 1993.

Adjustment mode. An operational mode of a device which enables the user to make adjustments to sealable parameters, including changes to configuration parameters.

Adjustment. A change in the value of any of a device's sealable calibration parameters or sealable configuration parameters.

Discussion: This item is a carryover from the Grain Analyzer Sector's August 2009 meeting (Agenda Item 9). At that time the changes did not appear to affect the provisions for sealing GMMs and NIR Grain Analyzers. However, if the most recent language proposed for **G-S.8.** and its sub-paragraphs, see **"Item Under Consideration"** above, is the version that will ultimately be accepted, changes will have to be made in both the GMM Code in HB44 and the GMM checklist in Pub 14.

The necessary changes could be addressed as follows:

1) Incorporate the essence of the proposed changes to G-S.8. and applicable subparagraphs; retain the simple device categories of the existing GMM Code; broaden the scope of Category 3 by removing "remotely"; and add a note to **Table S.2.5.** to explain the meaning and scope of "Remote configuration capability". This is accomplished by amending paragraph **S.2.5. Provision for Sealing** and **Table S.2.5. Categories of Device and Methods for Sealing** of HB44 **§5.56.(a) Grain Moisture Meters,** and amending all the GMM Pub 14 checklist items under the heading **Code Reference: S.2.5. Provision for Sealing** to include the proposed additions/amendments to **G-S.8.**

The suggested GMM HB44 changes are as follows:

S.2.5. Provision for Sealing. – Provision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., audit trail available at the time of inspection as defined in Table S.2.5. Categories of Device and Methods of Sealing) before any change that affects the metrological integrity of the device can be made to any ***electronic*** mechanism. ***That is:***

(a) It shall not be possible to apply a physical security seal to the device while it is in the calibration and/or configuration mode nor to access the calibration and/or configuration (adjustment) mode when sealed, or

(b) The calibration and/or configuration adjustments are protected by an approved method for providing security (e.g. data change audit trail).

During any mode of operation in which adjustments can be made, devices shall not provide indications that can be interpreted, transmitted into memory, or printed as a usable (legal) measurement value.

(Amended **201X**)
[Nonretroactive as of January 1, 201X]

Table S.2.5. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999). If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *A device shall clearly indicate that it is in the remote configuration mode and shall not be capable of operating in the measure mode while enabled for remote configuration.*	*The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999). If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *When accessed ~~remotely~~ for the purpose of modifying sealable parameters, the device shall clearly ~~**and continuously**~~ indicate that it is in the configuration mode and shall not be capable of operating in the measuring mode.*	*An event logger (**e.g., a data change audit trail)** is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants). A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)*
Category 3a: *No remote capability, but operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc.) in normal operation.*	*Same as Category 3*
Category 3b: *No remote capability, but access to metrological parameters is controlled through a software switch (e.g., password).*	*Same as Category 3*
Note: Remote configuration capability is defined in HB44 as the ability to adjust a weighing or measuring device or change its sealable parameters from or through some other device that is not itself necessary to the operation of the weighing or measuring device or is not a permanent part of that device. As used in this table, "remote configuration capability" also includes the ability of the measuring device to accept new or revised sealable parameters from a memory chip, external computer, network, or other device plugged into a mating port (e.g., USB port) on the measuring device or connected wirelessly to the measuring device. (Added 201X)	

[*Nonretroactive as of January 1, 1999* ***and January 1, 201X***]

(Amended 1998)

Note: Zero-setting and test point adjustments are considered to affect metrological characteristics and must be sealed.
(Added 1993) (Amended 1995 and 1997)

Any additions/changes to the GMM section of HB44 will also need to be made to the corresponding Sections to Pub 14.

Comments/Conclusions: Several Sector members questioned the need for adding "and continuously" to the second paragraph of Category 3 in Table S.2.5. reasoning that menu-driven devices typically allow access to a configuration mode only by password. Once in a configuration mode, it is not possible to make measurements without first leaving the configuration mode. The Sector agreed that "and continuously" should be deleted.

Please note that this proposal is in response to an informational item on the NCWM S&T agenda.

Consideration of the suggested changes and additions depends on further discussion of this item and on the final action taken by the S&T Committee on **Item 310-1**. This will remain a carryover item for the next Grain Analyzer Sector meeting.

6. Item 310-3: G-S.1. Identification. – (Software)

Purpose: This proposal is intended to amend the identification marking requirements for all electronic devices manufactured after a specified date by requiring that metrological software version or revision information be identified. Additionally, the proposal will list methods, other than "permanently marked," for providing the required information.

Background: Starting at the October 2007 meeting, the Software Sector has discussed the value and merits of required markings for software. After several iterations, the Software Sector developed a table to reflect their positions. This table was submitted to NCWM S&T Committee and was assigned Developing status in 2008. However, the Software Sector did not include a recommendation on how to incorporate the proposal into existing G-S.1. and G-S.1.1. language. In particular, WMD was concerned about properly addressing the various existing requirements and multiple non-retroactive dates.

Prior to the NCWM 2009 Interim Meeting, NIST WMD commented on S&T Item 310-3, and presented an alternate proposal with significant modifications, which were included in the Interim Meeting Agenda background for the item. There was much additional comment and various proposed versions of the table from NIST WMD, et al.

[Note: For the complete background on Item 310-3 refer to the Specifications and Tolerances Committee Interim Agenda for the 2010 NCWM Interim Meeting as it appeared in Pub 15, 2010. This is available on line at:
http://ts.nist.gov/WeightsAndMeasures/Publications/upload/08-ST-10-Pub15-FINAL.pdf.]

At the 2009 Software Sector Meeting, it was agreed that the proposed table had not accomplished the intended purpose of clarifying the requirements. To remove some of the confusion the Software Sector revisited this item from the beginning modifying the text of G-S.1 to match the Software Sector's original intent.

At its March 2010 meeting, the Software Sector, in response to comments heard during the 2010 Interim meeting, revised the proposed language changes described in the S&T Committee Interim Agenda **Item 310-3**. These revisions removed existing mention of "not-built-for purpose" and the differentiation between Type P and Type U software types. The first sentence of G-S.1. was restored to the current HB44 wording.

The Software Sector also initiated discussion on two new concepts, which may eventually result in additional recommendations to amend G-S.1. First, the Software Sector sees merit to requiring some "connection" between the software identifier (i.e., version/revision) and the software itself. The proposal was as follows (with the expectation that examples of acceptable means of implementing such a link would be included in Pub 14).

Add a new sub-subparagraph **G-S.1.(d)(3)**:

> ***"The version or revision identifier shall be directly and inseparably linked to the software itself. The version or revision identifier may consist of more than one part, but at least one part shall be dedicated to the metrologically significant software."***

Second, it seems that at each meeting of the Software Sector, the states reiterate the problems they have in the field locating the basic information required when the CC number is marked via the rather general current **HB 44** requirement of 'accessible through an easily recognizable menu, and if necessary a sub-menu' [**G-S.1.1.(b)(3)**]. The states have indicated that this is too vague and field inspectors often cannot find the certificate number on unfamiliar devices.

The Software Sector would like feedback on the proposal to specify a limited number of menu items/icons for accessing the CC number (if is not hard-marked or continuously displayed) in subparagraph (c) as follows:

(b) The CC Number shall be:

(3) accessible through ***<u>one or, at most, two levels of access.</u>***

<u>(i) For menu-based systems, "Metrology", "System Identification", or "Help".</u>

<u>(ii) For systems using icons, a metrology symbol ("M" or "SI"), or a help symbol ("?," "I," or an "i" within a magnifying glass).</u>

To facilitate a review of the suggested amendments, additions, and changes to G-S.1. and its sub-paragraphs, the current HB44 language has been marked up below to show all of the suggested modifications.

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

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

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

(1) The model identifier shall be prefaced by the word "Model," "Type," or "Pattern." These terms may be followed by the word "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.). The abbreviation for the word "Model" shall be "Mod" or "Mod." Prefix lettering may be initial capitals, all capitals, or all lowercase.
[Nonretroactive as of January 1, 2003]

(Added 2000) (Amended 2001)

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

(Amended 2003 **<u>and 201X</u>**)

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

(2) Abbreviations for the word "Serial" shall, as a minimum, begin with the letter "S," and abbreviations for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., S/N, SN, Ser. No., and S. No.).
[Nonretroactive as of January 1, 2001]

(d) the current software version or revision identifier for ~~not-built-for-purpose~~ ***software-based electronic*** *devices;*
[Nonretroactive as of January 1, 2004]
(Added 2003) **(Amended 201X)**

(1) The version or revision identifier shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision.
[Nonretroactive as of January 1, 2007]
(Added 2006)

(2) Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number." Abbreviations for the word "Revision" shall, as a minimum, begin with the letter "R" and may be followed by the word "Number." The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).
[Nonretroactive as of January 1, 2007]
(Added 2006)

(3) The version or revision identifier shall be directly and inseparably linked to the software itself. The version or revision identifier may consist of more than one part, but at least one part shall be dedicated to the metrologically significant software. (Added 201X)

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

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device.
(Amended 1985, 1991, 1999, 2000, 2001, 2003~~, and~~**,** 2006 **and 201X**)

G-S.1.1. Location of Marking Information for ~~Not-Built-For-Purpose~~ Software-Based Electronic Devices. – *For ~~not-built-for-purpose,~~ software-based devices either:*

(a) The required information in G-S.1. Identification. ~~(a), (b), (d), and (e)~~ shall be permanently marked or continuously displayed on the device; or

(b) The Certificate of Conformance (CC) Number shall be:

(1) permanently marked on the device;

(2) continuously displayed; or

(3) accessible through ~~***an easily recognized menu and, if necessary, a submenu. Examples of menu and submenu identification include, but are not limited to, "Help," "System Identification," "G-S.1. Identification," or "Weights and Measures Identification."***~~ ***one or, at most, two levels of access.***

(i) For menu-based systems, "Metrology", "System Identification", or "Help".

(ii) For systems using icons, a metrology symbol ("M" or "SI"), or a help symbol ("?," "I," or an "i" within a magnifying glass).

Note: *For (b), clear instructions for accessing the information required in G-S.1. (a), (b),* ***(c),*** *and (d) shall be listed on the CC, including information necessary to identify that the software in the device is the same type that was evaluated.*

[Nonretroactive as of January 1, 2004 ***and 201X****]*

(Added 2003) (Amended 2006 **and 201X**)

Discussion: It should be noted that these new ideas are in the developmental stage, and are included here at the request of the Software Sector, which is seeking comments from interested parties. The GA Sector is asked to comment on the proposed changes to G-S.1. and G-S.1.1. shown above, specifically those that will most affect Grain Analyzers.

1. G-S.1.(d) and its sub paragraphs will require a software version or revision identifier that is directly and inseparably linked to the software itself; and

2. G-S.1.1. and its sub paragraphs will allow the identifiers required in G-S.1. to be either permanently marked or continuously displayed for software-based electronic devices. This includes the software version or revision identifier. It also allows display of the CC number to be accessible by menu or icon (as opposed to continuously displayed.)

3. If not either permanently marked or continuously displayed, the CC Number will have to be accessible through one or two levels of access identified by the labels, "Metrology", "System Identification", or "Help" in menu based systems, or for systems using icons, a metrology symbol ("**M**" or "**SI**"), or a help symbol ("**?**," "**I**," or an "**i**" within a magnifying glass). Note that this is not suggested to be the final list of valid options; the Software Sector would like to have feedback specifically on additional menu text/icon images that should be considered acceptable. The Software Sector feels that the number of acceptable options is less of an issue (within reason) than the fact that the list is finite.

Comments/Recommendations: The GA Sector found the wording of G-S.1.1. confusing. It seemed to say that the markings spelled out in G-S.1. were to be ***EITHER*** *permanently marked or continuously displayed on the device* ***OR*** *the Certificate of Conformance (CC) Number shall be either: permanently marked or continuously displayed, or accessible through menu or icon.* To some, this implied that the software version identifier did NOT have to be displayed. Others believed that the "***OR***" phrase meant that only the CC had three options for marking (permanent, continuously displayed, or accessible via menu or icon), and that the software/firmware version/revision number must be either permanently marked or continuously displayed.

Regardless of how the wording is interpreted, the GA Sector agreed that it was not practical to permanently mark or continuously display the software/firmware version/revision identifier for GMMs. The GA Sector recommends that G-S.1.1.(b) be amended to include accessing the software version or revision identifier by menu or icon. At present all NTEP GMMs are built-for-purpose. They all have permanently marked CC numbers. Software version/revision identifiers, however, are accessible by menu or icon. GMM displays are of limited size. Some existing devices don't have room to display the software version/revision identifier on every "screen". Hard marking of that identifier is not practical, because it precludes updating software without also replacing the hard-marked label.

7. Other Software Requirements That May Impact Grain Analyzers

The items under this heading are mostly excerpts from the Software Sector's March 2010 meeting summary intended to keep Grain Analyzer Sector Members informed of developmental software requirements that may impact grain analyzers. For more detailed information, see the complete Software Sector meeting summary at:
http://www.ncwm.net/sites/default/files/meetings/software/2010/10_Software_Summary.pdf

a. Identification of Certified Software

[Note: This item is now partially covered by the provisional proposal to make G-S.1.(d) applicable to software-based electronic devices and by adding the following new sub-subparagraph **G-S.1.(d)(3)**:]

"The version or revision identifier shall be directly and inseparably linked to the software itself. The version or revision identifier may consist of more than one part, but at least one part shall be dedicated to the metrologically significant software."

Also the Software Sector recommends the following information be added to Pub. 14 as explanation/examples:

- *Unique identifier must be displayable/printable on command or during operation, etc.*
- *At a minimum, a version/revision indication (1.02.09, rev 3.0 a, etc). Could also consist of / contain checksum, etc. (crc32, for example)*

Software Sector Conclusions: The item needs additional discussion and development by the Software Sector. Outstanding questions: If we allow hard-marking of the software identifier (the Sector has wavered on this in the past), does the above wording then imply that some mechanical means is required (i.e. physical seal) to 'inseparably link' the identifier to the software? Do we still have to be able to display/print the identifier if it is hard-marked?

b. Software Protection / Security

Background: The Software Sector derived a trial Pub 14 checklist based on the OIML checklist to verify that the software adequately protected against fraudulent modification as well as accidental or unintentional changes. The checklist has been distributed to current NTEP labs for use on a trial basis for new type approval applications.

Devices with embedded software TYPE P (aka built-for-purpose)			
	Declaration of the manufacturer that the software is used in a fixed hardware and software environment, and		Yes☐ No ☐ N/A ☐
	cannot be modified or uploaded by any means after securing/verification		Yes☐ No ☐ N/A ☐
	Note: *It is acceptable to break the "seal" and load new software, audit trail is also a sufficient seal.*		
	The software documentation contains:		
		description of all ~~the metrologically significant~~ functions, **designating those that are considered metrologically significant** ~~*OIML states that there shall be no undocumented functions*~~	Yes☐ No ☐ N/A ☐
		description of the securing means (evidence of an intervention)	Yes☐ No ☐ N/A ☐
		software identification	Yes☐ No ☐ N/A ☐
		description how to check the actual software identification	Yes☐ No ☐ N/A ☐
	The software identification is:		
		clearly assigned to the metrologically significant software and functions	Yes☐ No ☐ N/A ☐
		provided by the device as documented	Yes☐ No ☐ N/A ☐
Personal computers, instruments with PC components, and other instruments, devices, modules, and elements with programmable or loadable metrologically significant software TYPE U (aka not built-for-purpose)			
	The *metrologically significant* software is:		
		documented with all relevant (see below for list of documents) information	Yes☐ No ☐ N/A ☐
		protected against accidental or intentional changes	Yes☐ No ☐ N/A ☐
	Evidence of intervention (such as, changes, uploads, circumvention) is available until the next verification / inspection (e.g. physical seal, Checksum, CRC, audit trail, etc. means of security)		Yes☐ No ☐ N/A ☐
Software with closed shell (no access to the operating system and/or programs possible for the user)			
	Check whether there is a complete set of commands (e.g. function keys or commands via external interfaces) supplied and accompanied by short descriptions		Yes☐ No ☐ N/A ☐
	Check whether the manufacturer has submitted a written declaration of the completeness of the set of commands		Yes☐ No ☐ N/A ☐
Operating system and / or program(s) accessible for the user:			
	Check whether a checksum or equivalent signature is generated over the machine code of the metrologically significant software (program module(s) subject to legal control W&M jurisdiction and type-specific parameters)		Yes☐ No ☐ N/A ☐
	Check whether the metrologically significant software will detect and act upon any unauthorized alteration of the metrologically significant software using simple software tools e.g. text editor.		Yes☐ No ☐ N/A ☐
Software interface(s)			
	Verify the manufacturer has documented:		
		the program modules of the metrologically significant software are defined and separated	Yes☐ No ☐ N/A ☐
		the protective software interface itself is part of the metrologically significant software	Yes☐ No ☐ N/A ☐
		the *functions* of the metrologically significant software that can be accessed via the protective software interface	Yes☐ No ☐ N/A ☐
		the *parameters* that may be exchanged via the protective software interface are defined	Yes☐ No ☐ N/A ☐

		the description of the functions and parameters are conclusive and complete	Yes☐ No ☐ N/A ☐
		there are software interface instructions for the third party (external) application programmer.	Yes☐ No ☐ N/A ☐

Software Sector Discussion: The labs again indicated they had not had a chance to utilize the checklist. The list was reviewed and some minor modifications to the checklist text were incorporated as shown above.

Software Sector Conclusion: Work is ongoing on this item with the intent that it eventually be incorporated as a checklist in Pub 14; again the labs are requested to try utilizing this checklist for any evaluations on software-based electronic devices.

c. Software Maintenance and Reconfiguration

Background: The Software Sector agreed that the two definitions below for Verified update and Traced update were acceptable.

> **Verified Update:** A verified update is the process of installing new software where the security is broken and the device must be re-verified. Checking for authenticity and integrity is the responsibility of the owner/user.
>
> **Traced Update:** A traced update is the process of installing new software where the software is automatically checked for authenticity and integrity, and the update is recorded in a software update log or audit trail.

The Software Sector also worked towards language proposed for defining the requirements for a Traced Update (currently considered as relevant for Pub 14):

<u>For a Traced Update, an event logger is required. The logger shall be capable of storing a minimum of the 10 most recent updates. An entry shall be generated for each software update.</u>

<u>Use of a Category 3 audit trail is required for the Traced Update. If software update is the only loggable event, then the Category 3 audit trail can be limited to only 10 entries. A log entry representing a software update shall include the software identification of the newly installed version.</u>

Software Sector Conclusions: The general consensus of the group after considering feedback from external interested parties is that a new G-S.9. with explicit requirements [for Metrologically Significant Software] is not necessary (nor likely to be adopted by the Conference) and that this requirement belongs in the Pub. 14 lists of sealable parameters rather than in Handbook 44; i.e.,

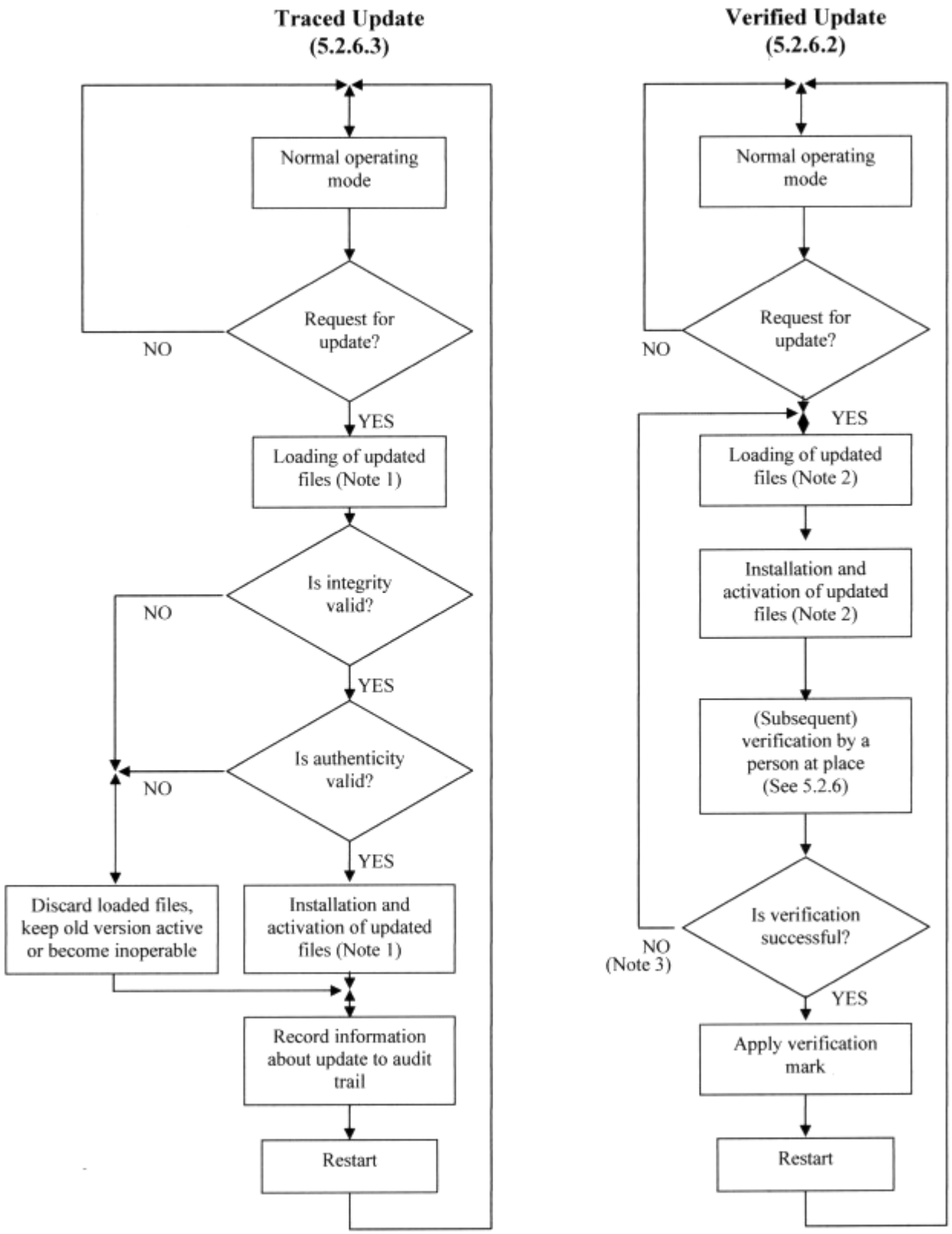
<u>The updating of metrologically significant software shall be considered a sealable event.</u>

Additional work is to be done to further develop the proposed text toward inclusion in Pub 14

Grain Analyzer Sector Discussion: At its August 2009 meeting the GA Sector questioned the need for a definition of "Traced Update". The traced update was initially intended to cover cases in Europe where the National Body controls a network of devices and wants to

update all the devices simultaneously from a central location. Denmark and France do this with NIR Grain Analyzers. Even though individual states may still require that a device updated via a "Traced Update" must be "returned to service" by a registered serviceperson before it can be used, the Sector may want to consider adopting "Traced Update" requirements for all Category 3 Grain Analyzers. The device is still subject to later inspection by state Weights and Measures personnel. By designing to the requirements for "traced update", states might be encouraged to allow devices updated to those requirements to be returned to service without requiring a visit by a registered serviceperson.

Logic flow charts illustrating "traced update" and "verified" update are shown on the following page.



Software Update Procedure – from OIML D 31:2008 (E)

Notes:

(1) In the case of a Traced Update updating is separated into two steps: "loading" and installing/activating". This implies that the software is temporarily stored after loading without being activated because it must be possible to discard the loaded software and revert to the old version, if the checks fail.

(2) In the case of a Verified Update, the software may also be loaded and temporarily stored before installation but depending on the technical solution loading and installation may also be accomplished in one step.

(3) Here, only failure of the verification due to the software update is considered. Failure due to other reasons does not require re-loading and re-installing of the software, symbolized by the NO-branch.

Note: GA Agenda Item 7 was for information only. No action was taken. No comments or recommendations were made

8. Report on OIML TC17/SC1 R59 "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. In October 2008, the Secretariat of TC 17/SC 1 was jointly allocated to China and the United States. The Co-Secretariats (China and the United States) are working closely with an IWG to revise OIML R 59 "Moisture meters for cereal grains and oilseeds." The 5 CD of **OIML R 59**, revised to comply with OIML's Guide ***Format for OIML Recommendations*** and to incorporate tests for the recommended disturbances of **OIML D 11** ***General Requirements for Electronic Measuring Instruments***, was distributed to the Subcommittee in February 2009.

Comments: Diane Lee, NIST/WMD, reported that comments on the 5 CD of **OIML R 59** have been received 10 countries including the U.S. Diane is working on a draft 6 CD based on those comments. It will reflect the U.S. recommendation to remove the Sand & Dust test (one of the disturbance tests of OIML D 11) on the basis that the sand and dust concentration specified for that test far exceeds the concentrations encountered by GMMs in normal use. The equipment diagrams of 5 CD will be replaced by generic block diagrams and, at the request of Japan, a block diagram will be added for a resistance type GMM.

A meeting of TC17/SC1 to review the draft 6 CD will be held in Orlando, Florida following the CIML meeting. Diane noted that, in addition to herself, TC17/SC1 meetings are usually attended by Rich Pierce, Cathy Brenner, and Cassie Eigenmann. She will arrange a conference call to go over the draft 6 CD before the changes are made permanent for discussion at the meeting.

Richard Cantrill, AOCS, recommended that TC17/SC1 become aware of the work that ISO Food Group Technical Committees, TC 34/SC2 – Oil Seeds, and TC34/SC4 – Cereals and Pulses, have done that relates to the use of moisture meters.

Editor's Note: The related Standards are:

ISO 7700-1:2008 -- Checking the performance of moisture meters in use
-- Part 1: Moisture meters for cereals
ISO/DIS 7700-2 -- Checking the performance of moisture meters in use
-- Part 2: Moisture meters for oilseeds

(ISO/DIS 7700-2 is a Draft International Standard. When approved it will replace ISO 7700-2:1987.)

Editor's Note: At the September 28-29, 2010 TC17/SC1 meeting in Orlando, Florida the participants reviewed a preliminary copy of OIML R 59 6 CD and comments to R59 5 CD. Changes to R59 6 CD will include the changes that were agreed to at the September 2010 meeting.

9. Report on OIML TC 17/SC 8 "Protein Measuring Instruments for Cereal Grain and Oil Seeds"

Background: This item was included on the Sector's agenda to provide a summary of the activities of OIML TC17/SC8. A new subcommittee was formed to study the issues and write a working draft document "Protein Measuring Instruments for Cereal Grain and Oil Seeds." Australia is the Secretariat for this new subcommittee. A TC 17/SC 8 meeting was hosted by NIST in September 2007 to discuss the 2 CD. 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. The secretariat distributed a 2 CD N6 of the document in February 2010. Comments were due in May 2010.

Discussion/Comments: Diane Lee, NIST/WMD, reported that 2 CD N6 reflects major changes to harmonize with R59-5CD. A meeting of TC 17/SC8 will be held September 27-28, 2010 in Orlando, Florida to address the comments to 2 CD N6.

Rich Pierce noted that there is still resistance to accepting the U.S. recommendation that two instruments be submitted for type evaluation. He asked those who had been with the Sector from the early days, to explain what had led the Sector to decide that type evaluation would require two instruments as opposed to one or three. At least two Sector members remembered the reasoning: It is easy to make one instrument. The problem is to make two that read alike. The Sector originally considered three instruments but that was too expensive. Three would have been ideal, because if one fails during testing, you usually have two that agree with each other, so you know immediately which one is wrong.

GIPSA has seen numerous instances in NTEP testing where one test instrument passes a test and the second instrument does not (for the NTEP Power Supply test, since 1994, in 24% of the tests one instrument failed while the other passed; in 3% of the tests both instruments failed). The failures appear not to be random events. They appear to identify legitimate deficiencies.

Editor's Note: At the September 27-28, 2010 TC17/SC8 meeting comments to the Recommendation on Protein Measuring Instruments for Cereal Grain and Oil Seeds 2 CD were reviewed. It was agreed at this meeting that two instruments will be submitted for OIML type approval. This agreed change and other changes from the September 2010 meeting will be included in 3 CD.

10. Standardization of Grain Moisture Meters – Traceability of GMMs used in Meter to Like-Meter testing.

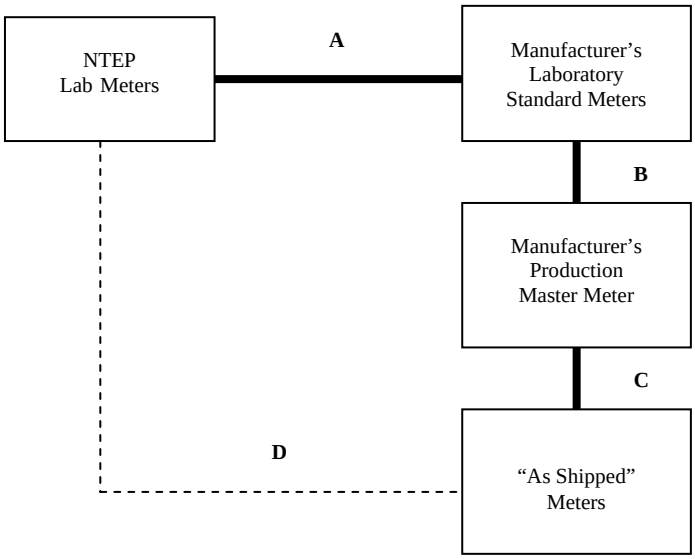
Background: This item is a carry-over from the Sector's August 2009 meeting (Item 9.5). For NTEP meters Handbook 44 permits meter to like-meter testing using "Properly Standardized Reference Meters". Karl Cunningham, Illinois Department of Agriculture/Weights & Measures, asked for a definition of a "Properly Standardized Reference Meter". He also wanted to know what criteria these "Reference Meters" must meet.

He was referred to **Section VI. Standardization of Instruments** in the GMM chapter of Publication 14 that shows the relationship and maximum permissible errors between the NTEP Lab meters, Manufacturer's Laboratory Standard Meters, Manufacturer's Production Master Meter, and "As Shipped" meters. It was explained that a properly standardized reference meter for a Service

Company should have the same traceability to the NTEP Lab Meters as the Manufacturer's Production Master Meter has.

Section VI. Standardization of Instruments in the GMM chapter of Pub 14 requires manufacturers to demonstrate that their methods for standardizing units in production result in "as shipped" units which agree with the corresponding NTEP Laboratory units (path D in the accompanying **Figure 1**) within ± 0.3 x the Handbook 44 acceptance tolerance. They are also required to show that the mean moisture difference between Manufacturer's Laboratory Standard Meters and the corresponding NTEP Laboratory Meters (path A in the accompanying **Figure 1**) does not exceed ± 0.2 x the Handbook 44 acceptance tolerance.

Figure 1



During a discussion of potential agenda items for the Sector's 2010 meeting, Dr. Richard Pierce, FGIS/GIPSA, representing the NTEP Participating Laboratory for Grain Analyzers, suggested that the Sector may want to explore how the NTEP program (or lab) can assist manufacturers who are asked to demonstrate traceability of field instruments back to the air oven reference method. The NTEP Lab has manufacturers' instruments in the NTEP Phase II program that are directly traceable to the GIPSA air oven reference lab. There is, however, no documentation demonstrating alignment of NTEP instruments with manufacturers' master instruments or field instruments. The NTEP lab is not involved in this process. There are no criteria for the grain types, the number of analyses, or the number of samples that should be used in side-by-side testing.

The Sector co-Technical Advisor suggested that a first step in acquiring documentation demonstrating alignment of NTEP instruments with manufacturers' master instruments or field instruments would be adding language to the NTEP Application to require submission of the documentation required by §VI., and adding a check list of the Required Documentation to the existing GMM Checklist of Pub 14.

A related issue mentioned by Dr. Pierce was authorized repair facilities providing states with documentation that their "standard" instrument is traceable to the air oven reference. He was of the opinion that this was not directly an NTEP lab issue, but believed that manufacturers should be able to trace these standards back to NTEP Phase II instruments.

Proposed: Amend the Application Instructions Section of the Grain Analyzer NTEP Application as shown below:

- Submit details of procedures and tests for maintaining reference meters and standardizing units in production to meet the requirements of §IV of the GMM Chapter of Pub 14.

And insert the following Check List of Required Documentation just in front of the **General** section [but still under the "Checklist" Heading in the Table of Contents] of the GMM chapter of Pub 14:

Required Documentation (Refer to NCWM Publication 14, Grain Moisture Meter Chapter, §VI. Standardization of Instruments)			
Doc1.	Manufacturer has submitted specific details of the proposed test procedures to be used for the comparison between their reference standard instruments and instruments of like type in the NTEP Participating Laboratory.		Yes☐ No ☐ N/A ☐
	(a)	Comparisons will be made "side-by-side	Yes☐ No ☐ N/A ☐
	(b)	Comparisons will be made by an exchange of grain samples	Yes☐ No ☐ N/A ☐
Doc2.	Manufacturer has shown that the mean moisture difference between Manufacturer's Laboratory Standard Meters and the corresponding NTEP Laboratory Meters (path A in figure below) does not exceed ± 0.2 x the Handbook 44 acceptance tolerance.		Yes☐ No ☐ N/A ☐
Doc3.	Manufacturer has demonstrated that its methods for standardizing units in production result in "as shipped" units which agree with the corresponding NTEP Laboratory units (path D in Figure 1 of §VI) within ± 0.3 x the Handbook 44 acceptance tolerance.		Yes☐ No ☐ N/A ☐
Doc4.	Manufacturer has also demonstrated that once units are standardized, moisture results between units of like type will not exceed these tolerances when a grain calibration change is made.		Yes☐ No ☐ N/A ☐

Discussion: Rich Pierce suggested that there are two issues being presented here:

1. For Phase I, a clarification of what information is being obtained at the time of initial type evaluation. At present, manufacturers are asked for a general description of the process (not all the details) they intend to use to standardize instruments.

2. For Phase II, whether there should be some kind of semi-official document signed by the NTEP laboratory attesting to the fact that a side-by-side test (or by grain sample exchange) demonstrated that manufacturer "A's " working masters line up with the two calibration instruments at the NTEP laboratory within 0.x% moisture. This might be issued each year (or every two years) as part of the Phase II program. If the laboratory provided this service, Rich noted that they would have to specify the test procedure that had been used including the grain type(s), number and sequence of drops, etc.

When manufacturers were asked if this addition to Phase II was needed, Tim Kaeding, Perten Instruments, responded that, with the exception of an NTEP lab issued certificate, what Rich described was very much like what they were already doing. Perten takes their working standard instruments to the NTEP lab, performs a side-by-side comparison with the NTEP instruments using corn, soybeans, and wheat, analyzes the data, determines that they match statistically, and prepares a report showing the traceability of their working standards to the corresponding NTEP instruments lab. This has apparently satisfied the Illinois Department of Agriculture's request for traceability.

Cassie Eigenmann outlined the procedures used by DICKEY-john. Twice a year the base parameters of three laboratory standard meters, which never leave DICKEY-john's temperature and humidity

controlled laboratory, are measured to ensure that they are aligned. Records are kept of every test, adjustment, etc. performed on the lab standards. Three working standards, used on the production line, are taken to the laboratory once a month for a check against the three lab standards. In side-by-side comparisons of six drops of grain per unit, the average moistures must agree within 0.08. Similarly, three Product Service working standards are brought to the laboratory twice a year to be checked against the lab standards using the same criteria as the production line standards. Additionally, two transfer standards are checked against the lab standards. These are held to a tighter tolerance than 0.08. The transfer standards are hand carried to Kansas City and checked against all the like instruments at FGIS (including the two NTEP lab units). Anyone requiring a document showing comparative data between a GAC 2100 and the lab standards can bring their GAC 2100 to DICKEY-john's moisture lab for checking.

With no one from Steinlite to report, Rich Pierce recalled that Steinlite typically picked up their two NTEP lab meters and took them back to Atchison, Kansas for testing.

With manufacturers already running comparative tests and providing the requested documentation, it didn't appear that the NTEP laboratory needed to be involved. Manufacturers were not in agreement that the testing be standardized. Some questioned whether the testing could be standardized because it would be technology dependent. Others saw some merit in standardizing comparative tests using specified grains and procedures (number and sequence of drops, etc.) and of standardized reports. No action was taken on this issue.

Some Sector members objected to the proposed amendments to the Grain Analyzer NTEP Application and the GMM check-list. Manufacturers were of the opinion that they were already providing the information required in the Section VI of the GMM Chapter of NCWM Pub 14. Further, Section IV relates more to Phase II than to Phase I. No Phase I testing is required by Section IV, so the addition of check-list items was not required.

Decided: The Sector decided that the proposal to amend the Application Instructions Section of the Grain Analyzer NTEP Application and to insert a Checklist of Required Documentation in the Checklist of the GMM chapter of Pub 14 was a Phase II issue not a Phase I issue. The Proposal will be withdrawn.

11. Air-Oven Collaborative Study – Analysis of results

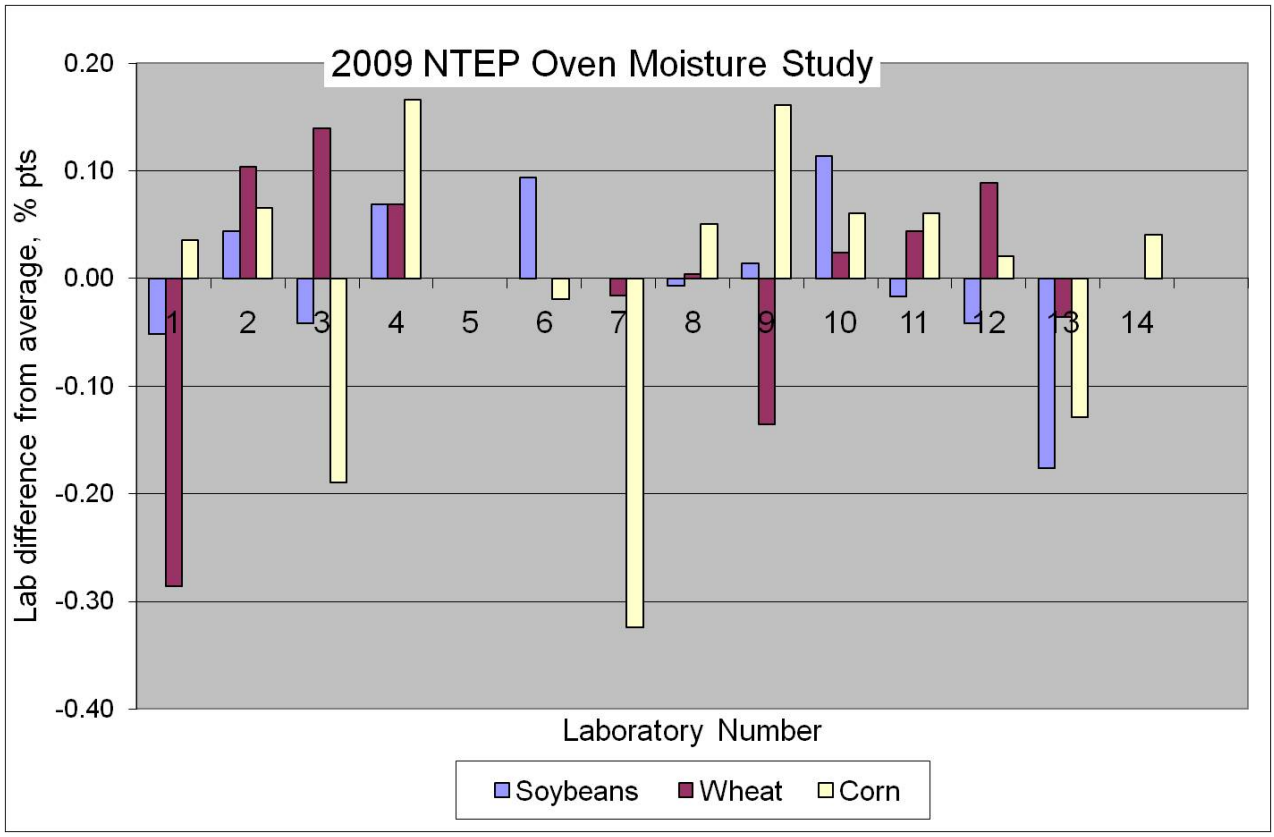
Background: At its August 2008 meeting, the Sector agreed that a collaborative study was long overdue. It was also noted that such a study addresses the measurement traceability requirements of **ISO 17025** ***General requirements for the competence of testing and calibration laboratories***. Karl Cunningham subsequently agreed that the State of Illinois Moisture Meter Laboratory would serve as the "pivot" laboratory. At the August 2009 meeting, he reported that 14 laboratories participated in this study. Participants included: USDA/GIPSA (as reference laboratory), Arkansas, Colorado, Illinois, Iowa, Maryland, Mississippi, Missouri, North Carolina, South Carolina, Wisconsin (corn only), Wyoming, and DICKEY-john. Perten was sent samples but didn't return results. With the exception of one or two outliers, results were fairly good. Histograms showing the distribution of Lab error (Participant Lab result minus Reference Lab result) for each of the grain samples were presented (see August 2009 Sector Meeting Summary).

Discussion: Dr. Charles Hurburgh, Iowa State University, was unable to attend the Sector meeting. He forwarded a statistical analysis of the results, and supplied the following comments:

The results were quite good. Two outliers were removed. Outliers are detected by calculating the SD with the questionable point removed. If the questionable point is 3 SDs out after being removed it is considered an outlier. When you don't have many data points this prevents a bad data point from making the SD very large and protecting itself, so to speak. Standard deviations across labs of less than 0.20 percentage points are good. The sample handling and prep were clearly done well.

Overall, the individual Labs did well; there were only two cases where the lab average was significantly different from the average of the labs but none of the information values (temperatures, humidity, etc. seemed to correlate with errors. No attempt was made to analyze the information data; it would be helpful in the future to require all the temperatures in one type of units (C or F) and all the times in minutes and so on.

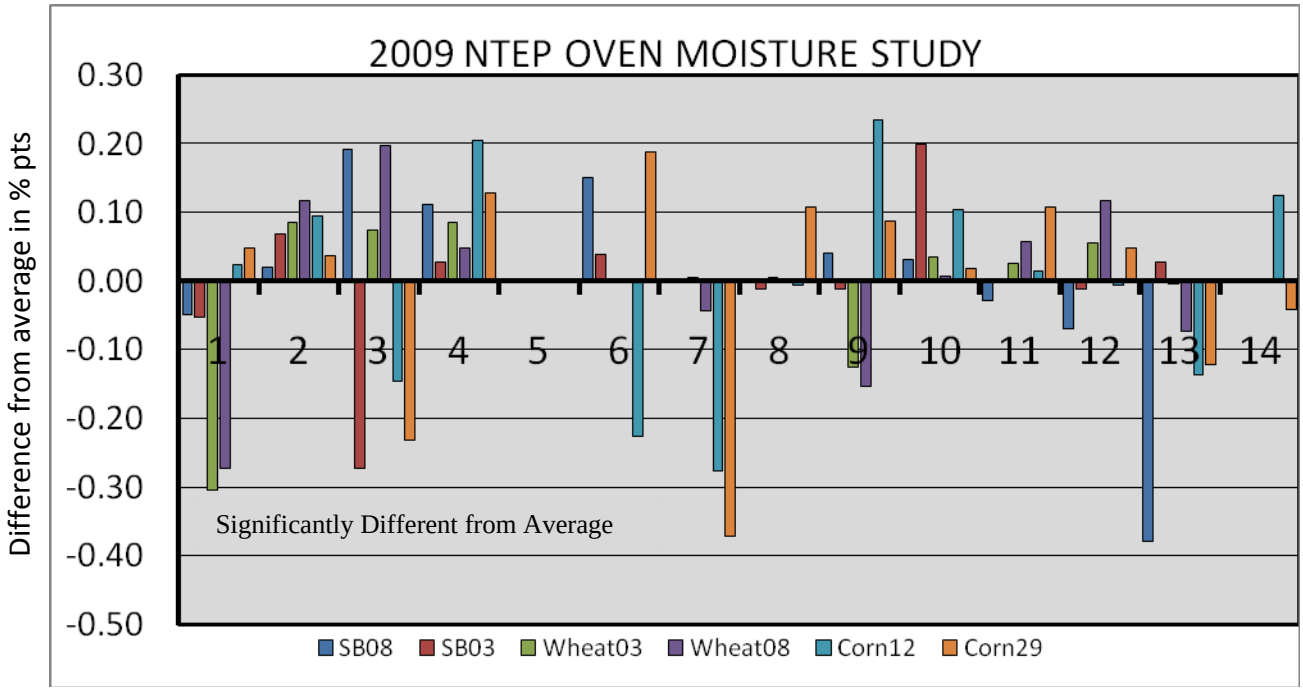
The chart below shows the deviation from the average. Most are within 0.2% of the Average.



Discussion: Several Sector members asked why the lab difference from average was averaged across two samples of each grain type. They wondered what the chart would look like if results were shown for individual samples. The concern was that in some cases the averaging over two samples might lead to significantly understating errors.

Several weeks after the Sector's meeting, the co-Technical Advisor prepared a chart showing the lab difference from average for each individual sample (see chart following). One of the most dramatic differences showed up in Lab 3's results for soybeans . Averaged over two samples, the difference was only 0.04, while individual differences from individual averages were 0.19 for SB08 and 0.27 for SB03. A similar phenomenon was observed in Lab 6's results for corn. Averaged over

two samples, the difference was only 0.02 while the individual differences were 0.23 for Corn12 and 0.19 for Corn29.



12. Proficiency Testing

[Submitted by Amy L. Johnson, SQT Program Manager, American Oil Chemists Society (AOCS)]

Background: At the Sector's August 2009 Meeting Dr. Charles Hurburgh, Iowa State University, urged the representatives from the American Oil Chemists Society (AOCS) to prepare a proposal so that the collaborative (air-oven) study could be conducted on an on-going basis rather than on an ad hoc basis. He cautioned that the proposal would have to include corn and wheat as well as soybeans.

Several years ago the AOCS in conjunction with the United Soybean Board (USB) established the AOCS-USB Soybean Quality Traits Analytical Standards Program (SQT), a system of verification of analytical measurements. This program provided the infrastructure for the generation of reliable analytical results at all levels of the soybean industry by establishing industry-wide acceptance of analytical methods and protocols and their implementation under internationally accepted quality management standards. The AOCS has proposed the addition of an air-oven/grain moisture meter proficency testing (PT) series to their Analytical Standards Program (ASP). Proficency testing is a continuous program, samples are sent out in regular intervals (e.g. 2-4 times/year). Participants are able to join on a continuous basis.

Discussion: Amy Johnson, AOCS, proposed an air-oven/GMM proficiency testing series designed specifically to address the needs of GMM manufacturers and states maintaining a grain moisture laboratory. AOCS would administer the program, oversee distribution of samples, compile results, perform statistical analysis of results, and distribute a report to participants. AOCS does not collect the samples. This is subcontracted to suitable providers. AOCS does not have laboratories. Since GIPSA/FGIS is a certified laboratory already participating in the SQT program, GIPSA air-oven results could be reported for comparison if desired.

The Sector decided that a program that included distribution of 2 samples each of corn, wheat (preferably of one type), and soybeans per year would be adequate. A final report by mid July is desirable, so sample distribution would have to take place in early spring (March – April). The annual cost of such a program was estimated to be in the range of $80 - $100 per participant.
Sector chair, Cassie Eigenmann, asked Ms. Johnson to put together a formal proposal based on the above criteria. Ms. Johnson will contact all those on the GA Sector mailing list as well as those on the NIST/WMD list of state W&M officials interested in grain moisture with details of the proposed program.

13. Time and Place for Next Meeting

The next meeting is tentatively planned for Wednesday, August 24 and Thursday, August 25, 2011, at the Chase Suites by Woodfin at KCI in Kansas City, MO. 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 2010.

If you would like to submit an agenda item for the 2011 meeting, please contact any of the following persons by June 1, 2011:

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

14. Future Direction of Moisture Measurement Technology

The Grain Inspection Advisory Committee (GIAC) meets twice annually to advise GIPSA on the programs and services it delivers under the U.S. Grain Standards Act. Recommendations by the committee help GIPSA to better meet the needs of its customers who operate in a dynamic and changing marketplace.

The committee is comprised of 15 members and 15 alternate members appointed by the Secretary of Agriculture. Committee members and alternates represent all segments of the grain industry. They include grain producers, processors, merchandisers, handlers, exporters, consumers, grain inspection agencies, and scientists. Committee members serve without compensation, but are reimbursed for travel expenses.

Meetings typically follow a format of a day of presentations followed by a morning during which committee members digest the material they have heard to produce resolutions addressing the significant issues. The resolutions are subjected to a vote by the committee. Those that are adopted are taken seriously by GIPSA's administer in considering how to respond to these resolutions.

On June 16, 2010, David B. Funk, GIPSA/FGIS Associate Director for Methods Development, made a presentation to the GIAC entitled, "Future Direction of Moisture Measurement Technology." He repeated this presentation on August 26, 2010, at the NTETC Grain Analyzer Sector meeting in Kansas City. Following is a digest of Dr. Funk's presentation.

In November of 2009 the GIAC approved the following resolution:

> The Advisory Committee recommends that GIPSA evaluate the current moisture calibration for high moisture rough rice for accuracy when compared to the air oven reference.

The FGIS Annual Calibration Study was already doing this. Each year approximately 1100 samples are collected to evaluate and enhance official moisture meter accuracy. For 15 major grains, all NTEP-certified models are tested with the same set of grain samples. Grain calibrations are optimized to the most recent 3 years of data with consideration of abnormal conditions. To minimize "hunting", calibrations are changed only if certain error thresholds are exceeded, but there are problems. The long gain rough rice accuracy for 2007-2009 crops shows a large scatter above 20% moisture and for 2009 a very strange pocket of data between 14% and17% moisture with significant negative bias. Similar problems appeared in corn. The crop year 2009 was a year of extremely low quality and low test weights. Many samples were well under 50 pounds per bushel.

The conclusions reached from the 2009 crop calibration study revealed:

- Year-to-year differences contribute significant instability to GMM calibrations.
- Rice is one of the more difficult grains for accurate moisture measurements.
- Growing conditions in 2009 resulted in some grain samples not being measured accurately by current official moisture meters.
- It is impossible to significantly improve the official meter's accuracy for the "problem" samples without degrading overall accuracy.

So GIPSA's response to the GIAC Resolution was that FGIS is continually evaluating and trying to improve moisture calibrations. FGIS has expert knowledge of moisture measurement technologies and the current official technology is doing the best that it can. If the market needs better performance, FGIS needs to select and implement different technology. If FGIS is going to implement different moisture technology, it needs to happen soon.

New technology offers improved accuracy, better stability over time and crop conditions, easier calibration development, reduced support cost, and provides competition (it can be duplicated by any manufacturer).

It needs to happen soon to avoid being caught in a technology "rut" for decades as with the older dielectric instruments which required look-up tables. It needs to happen soon to be able to utilize current FGIS expertise before it is depleted by retirements. It needs to happen soon to create and implement a sustainable official moisture measurement system based on up-to-date technology.

New technology will be selected using the following steps:

- Develop and prioritize criteria for the selection.
- Develop a procurement document.
- Solicit proposals.
- Evaluate proposals and submitted performance data.
- Conduct further testing of the proposed technologies.
- Announce selection and establish contract(s).
- Develop and validate official standardization processes.
- Procure new moisture measurement instruments.
- Conduct a pilot test to validate system readiness for the transition.
- Implement the switch to the new instrumentation.

The criteria used to select a new official meter will most likely include the following criteria used in 1997:

- Best value to the government

    - Procurement costs
    - Support costs
- NTEP certification
- Accuracy over moisture and temperature ranges
- Repeatability
- Suitability for all grain type officially tested
- Suitability for automation
- Consistency among units
    - Transferability of calibrations
    - Precision of standardization
    - Ease of standardization
    - Stability over time

Other possible criteria might include:

- Speed of test
- Multiple-factor capability
- Accuracy of tests on abnormal samples such as "green soybeans"
- Availability of multiple sources for equivalent technology
- Prior commercial acceptance of technology

Dr. Funk offered the following time line for fully implementing a new technology:

- October 2010 – Agency decision on whether to pursue new moisture technology
- June 2011 – Develop criteria and procurement documents and issue solicitation for proposals
- February 2012 – Announce decision
- May 2013 – Implement new technology for initial grains
- September 2013 and later – Implement new technology for other grains.

Following his presentation to the GIAC, the following resolution was adopted:

> The Advisory Committee recommends that GIPSA/FGIS move forward with expediency to determine the feasibility and selection of a new federal standard moisture measurement technology and/or instrument(s) for use in the official system.

Following Dr. Funk's presentation to the GA Sector, he conducted a question and answer session. Some of the questions and Dr. Funk's responses are shown below:

Question: Will the new technology require any changes to existing HB44 or Pub14 requirements or procedures?

Answer: Basically, No …. and Yes. We have choices of technology, but the technologies out there are already represented in the NTEP program. We're not going to select a technology that hasn't proven itself. If it's not out there as a commercial technology that's proven itself in the marketplace we're not going to consider it. In the NTEP program we have two technologies represented: dielectric RF methods and NIR methods. Right now we have two instruments that represent the technology I'm talking about that have been NTEP certified. That was the trigger point at which we could consider adopting a new technology. That is not to say that is the technology we are going to select, but until we had proven that we could have two instruments using that technology we were not ready to even consider adopting a new technology.

Question: You've answered the "Yes" half of the previous question. Could you please address the "No"?

Answer: The answer is, to the extent that industry migrates to this technology hopefully we will get to the point where we don't need a Phase II evaluation. When all USDA instruments are using the same calibrations, and they are not being yanked around year by year, we may be looking to a more technical evaluation of instruments where we just evaluate the ability of an instrument to accurately measure density corrected dielectric constants. If the new technology is widely accepted we may get to a point in 5 to 10 years where the NTEP looks significantly different from what it is now. The current 5-year interagency agreement may be the last one.

[Note: Rich Pierce commented that he believed they were committed to finishing the current 5-year agreement.]

Question: Do you think this new technology will eliminate a lot of complaints we get about such things as the "rebound" effect in soybeans?

Answer: It will help. It's not going to eliminate green soybeans effect nor will it eliminate test weight sensitivity in corn, but it will reduce the effects. It has about half the effect as the current official meter. I'm not saying this is the best technology possible. The goal is not to come up with the best possible technology. The goal here is to come up with a simple, well documented, public technology that anybody can use successfully and get equivalent results. We do want it to be accurate, and it is accurate. We want it to be stable, and it is much more stable. Is it perfect? Absolutely not! There is a microwave technology out there that is probably very good, but it also requires an exclusive license. It is not open for anyone to use royalty free. The goal here is to have something that is royalty free by anybody that wants to make it.

National Type Evaluation Technical Committee (NTETC) Grain Analyzer Sector Meeting Summary

August 22-23, 2012 / Kansas City, Missouri

INTRODUCTION

The charge of the NTETC Grain Analyzer Sector is important in providing appropriate type evaluation criteria based on specifications, tolerances and technical requirements of *NIST Handbook 44* Sections 1.10. General Code, 5.56. Grain Moisture Meters and 5.57. Near-Infrared Grain Analyzers. The sector's recommendations are presented to the National Type Evaluation Program (NTEP) Committee each January for approval and inclusion in *NCWM Publication 14 Technical Policy, Checklists, and Test Procedures* for national type evaluation.

The sector is also called upon occasionally for technical expertise in addressing difficult *NIST Handbook 44* issues on the agenda of National Conference on Weights and Measures (NCWM) Specifications and Tolerances (S&T) Committee. Sector membership includes industry, NTEP laboratory representatives, technical advisors, and the NTEP Administrator. Meetings are held annually, or as needed and are open to all NCWM members and other registered parties.

Suggested revisions are shown in **bold face print** by ~~**striking out**~~ information to be deleted and **underlining** information to be added. Requirements that are proposed to be nonretroactive are printed in ***bold faced italics***.

Table A
Table of Contents

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
BIML	International Bureau of Legal Metrology	NTETC	National Type Evaluation Technical Committee
CD	Committee Draft	OCP	Ongoing Calibration Program
CIML	International Committee of Legal Metrology	OIML	International Organization of Legal Metrology
CIPM	International Committee of Weights and Measures	OWM	Office of Weights and Measures
D	Document	R	Recommendation
EMRP	European Metrology Research Program	S&T	Specifications and Tolerances
FGIS	Federal Grain Inspection Service	SC	Subcommittee
GA	Grain Analyzer	SD	Secure Digital
GIPSA	Grain Inspection, Packers and Stockyards Administration	TC	Technical Committee
GMM	Grain Moisture Meter	TW	Test Weight
MRA	Mutual Recognition Agreement	UGMA	Universal Grain Moisture Algorithm
NCWM	National Conference on Weights and Measures	USB	Universal Serial Bus
NIR	Near Infrared Grain Analyzer	USDA	United States Department of Agriculture
NIST	National Institute of Standards and Technology	USNWG	United States National Working Group
NTEP	National Type Evaluation Program		

Details of All Items
(In order by Reference Key)

1. Report on the 2012 NCWM Interim and Annual Meetings

The 2012 NCWM Interim Meeting was held January 22-25, 2012 in New Orleans, LA. At that meeting, the NTEP Committee accepted the sector's recommended amendments and changes to the 2011 Edition of *NCWM Publication 14*. These changes appear in the 2012 Edition.

The changes are detailed in the table below. For additional background/details refer to Agenda Item 4 in the Sector's August 2011 Meeting Summary.

The 2012 NCWM Annual Meeting was held July 16-19, 2012 in Portland, ME. There were no Grain Analyzer Sector Voting Items on the agenda. **Item 351-1, UR.3.4. Printed Tickets** remains an Informational Item on the NCWM Agenda. See Grain Analyzer Agenda Item 10, below, for details.

Mr. Jim Truex, NTEP Administrator, reported that attendance this year at both the Interim and Annual Meetings was better than that of the last few years. Paid membership in the NCWM is now in the 2,200-2,300 range.

Amendments/Changes to the Grain Moisture Meters Chapter in the 2011 Edition of NCWM Publication 14			
Section Number	**Amendment/Change**	**Page (2011 Edition)**	**Source: 2011 Grain Analyzer Sector Meeting Summary**
§ II. Sample Temperature Sensitivity	Amend §II to accommodate cold grain temperatures down to –0 °C and to specify the conditions under which an intermediate manufacturer-specified cold grain temperature must be specified.	GMM-2	Agenda Item 4.a.
Appendix A Test: Sample Temperature Sensitivity	Modify Sample Temperature Sensitivity Test to reflect the expanded cold grain temperatures described in § II.	GMM-34	Agenda Item 4.b.
Appendix E – Sample Temperature Sensitivity	Modify Sample Temperature Sensitivity Test for grains/oilseeds other than corn, soybeans and hard red winter wheat to reflect the expanded cold grain temperatures described in § II.	GMM-45	Agenda Item 4.c.
GMM Checklist 3. Code Reference: S.1.3. Operating Range	Add Paragraph 3.10.2.1 to require that grains or seeds with an extended temperature range neither display nor print moisture results if outside applicable moisture OR temperature ranges.	GMM-19	Agenda Item 4.d.

2. Report on NTEP Evaluations and Ongoing Calibration Program (OCP) (Phase II) Testing

Ms. Cathleen Brenner, Grain Inspection, Packers and Stockyards Administration (GIPSA), brought the sector up to date on NTEP Evaluation (Phase I) activity. Renovation of the laboratory is nearly complete. The process of moving and installing the environmental chamber, air ovens, and other equipment into the new area will begin shortly after Labor Day. Because of the renovations, the laboratory has been without an environmental chamber for over a year. Once the move is underway, the NTEP lab can begin accepting applications for Phase I testing.

Ms. Brenner also reported on the collection and analysis of Grain Moisture Meter OCP (Phase II) data on the 2011 crop. For the 2012 harvest there are 7 models enrolled in Phase II. (Perten Instruments elected not to continue model AM5100 in Phase II this year. Their CC for the AM5100 will expire in June 2013.) The manufacturers will be charged on the basis of 6 models because, using GAC2500-UGMA data, DICKEY-john can automatically back calculate calibrations to the GAC2500 without having to run samples on the GAC2500*. Phase II data collection for the 2012 harvest began in early August.

The 7 meters:

1. Bruins Instruments - OmegAnalyzerG
2. DICKEY-john Corp. - GAC2000 (NTEP Version), GAC2100a and GAC2100b
3. DICKEY-john Corp. - GAC2500 (*See note above. Will not run samples on this model.)
4. DICKEY-john Corp. - GAC2500-UGMA
5. Foss North America - Infratec 1241
6. Perten Instruments Inc. - AM5200 and AM5200-A (The AM5200-A is UGMA Certified.)
7. The Steinlite Corporation - SL95

The 2012 Phase II enrollment cost to each manufacturer, based on 6 device types, is $8,750.

3. Review of OCP (Phase II) Performance Data

At the sector's August 2005 meeting it was 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, Ms. Brenner, GIPSA, presented data showing the performance of NTEP meters compared to the air oven. This data is based on the last three crop years (2009–2011) using calibrations updated for use during the 2012 harvest season. The 2009-2011 Grain Moisture Meter (GMM) Phase II comparison graphs may be viewed or downloaded for printing at the following web address:

http://ncwm.net/sites/default/files/meetings/grain_analyzer/2012/12_GMM_Bias.pdf

Ms. Brenner pointed out that the data identified as the "Official Meter" is based on the GAC 2100. The Official Meter data is in blue for all the charts. A randomized assignment of colors was used for the individual manufacturers, so the violet color identified as "Meter 1"on the charts represents a different manufacturer on each chart; "Meter 2" is a different manufacturer on each chart; etc.

Overall, the performance of the meters looked good for all the grains except Long Grain Rough Rice. It had the most variation between meters.

The sector was reminded that effective September 1, 2012, [editor's note: The effective date was subsequently delayed to September 10, 2012.] the DICKEY-john GAC2100 will no longer be the Official Meter for the following four grains: corn, soybeans, sunflower and sorghum. These four grains will have official calibrations from the two Official Meters, the GAC2500-UGMA and the AM5200-A. The remaining grains are scheduled to switch to the GAC2500-UGMA and the AM5200-A for Official Inspection on May1, 2013.

Discussions have been held at GIPSA as to how comparison data might be displayed next year since the Official Meter is changing. Present thinking is that meters will be randomly identified as Meter 1, Meter 2, Meter 3, etc. for each grain. The Official Meters will be included in that random assignment once they have accumulated 3 years of data.

4. Amend Table S.2.5. of §5.56.(a) in NIST Handbook 44

Source:
NTETC Grain Analyzer Sector

Purpose:
Delete "remotely" from the second paragraph of Category 3 requirements that begins, "When accessed remotely …" to make it clear that the requirements of Category 3 apply whether accessed manually using the keyboard or accessed by remote means, and add the modified second paragraph of Category 3 requirements to Categories 3a and 3b to make it clear that these requirements apply to all the subcategories of Category 3.

Item Under Consideration:

Table S.2.5. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999). If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *A device shall clearly indicate that it is in the remote configuration mode and shall not be capable of operating in the measure mode while enabled for remote configuration.*	*The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999). If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *When accessed* ~~***remotely***~~ *for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measuring mode.*	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants). A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)*
Category 3a: *No remote capability, but operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc.) in normal operation.* ***When accessed for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measuring mode.***	*Same as Category 3*
Category 3b: *No remote capability, but access to metrological parameters is controlled through a software switch (e.g., password).* ***When accessed for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measuring mode.***	*Same as Category 3*

[*Nonretroactive as of January 1, 1999* ***and January 1, 201X***]
(Amended 1998 **and 201X**)

Note: Zero-setting and test point adjustments are considered to affect metrological characteristics and must be sealed.

(Added 1993) (Amended 1995 and 1997)

Background / Discussion:
All of the GMMs in Categories 3, 3a, and 3c of Table S.2.5. use an electronic method of sealing, and most of them also offer access to the configuration mode thorough a keyboard entered password. In this mode, sealable parameters can also be changed locally through the keyboard. Category 3 of Table S.2.5. currently includes the following requirement:

> When accessed remotely for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measuring mode.

At its 2011 Grain Analyzer Sector Meeting the sector agreed by consensus that the following changes to Table S.2.5. of §5.56.(a) of *NIST Handbook 44* should be forwarded to the S&T Committee for consideration:

- Add a note to Table S.2.5. to recognize the expanded scope of "remote capability".
- Delete "remotely" from the second paragraph of Category 3 requirements that begins, "When accessed remotely …" to make it clear that the requirements of Category 3 apply whether accessed manually using the keyboard or accessed by remote means.
- Add the modified second paragraph of Category 3 requirements to Categories 3a and 3b to make it clear that these requirements apply to all the subcategories of Category 3.

At the suggestion of National Institute of Standards Technology (NIST), Office of Weights and Measures (OWM), the Table S.2.5. changes approved by the sector in 2011 have been separated into two independent items: one dealing with the changes to Category 3 and its subcategories (as shown in Item Under Consideration) and one dealing with the modification of the definition of remote configuration capability appearing in Appendix D of *NIST Handbook 44* to recognize the expanded scope of "remote capability". This independence insures that one item will not hold up the other from consideration.

Contingent upon approval of the Item Under Consideration by NCWM, a number of related changes will be required to both the GMM Chapter and the Near Infrared (NIR) Grain Analyzer Chapter of *NCWM Publication 14*. These changes are shown in Items 4(a), 4(b), and 4(c) following:

4.a. Proposed Changes to Table S.2.5. in Appendix C of the GMM Chapter of Publication 14

[Changes shown below are contingent upon acceptance of Item Under Consideration]

Table S.2.5. Categories of Device and Methods of Sealing

Categories of Device		Method of Sealing
Category 1:	No remote configuration capability	Seal by physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999.) If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.
Category 2:	Remote configuration capability, but access is controlled by physical hardware. Device shall clearly indicate that it is in the remote configuration mode and shall not be capable of operating in the measure mode while enabled for remote configuration.	The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters; one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999.) If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.
Category 3:	Remote configuration capability, access may be unlimited or controlled through a software switch (e.g. password.) When accessed ~~**remotely**~~ for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measure mode.	An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants.) A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)
Category 3a:	No remote capability, but operator is able to make changes that affect the metrological integrity of the device (e.g. slope, bias, etc.) in normal operation. **When accessed for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measure mode.**	Device shall clearly indicate that it is in the remote configuration mode and shall not be capable of operating in the measure mode while enabled for remote configuration.
Category 3b:	No remote capability, but access to metrological parameters is controlled through a software switch (e.g. password.) **When accessed for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measure mode.**	Remote configuration capability, access may be unlimited or controlled through a software switch (e.g. password.)

Non-retroactive as of January 1, 1999. Amended 1998 ***and 201X***

4.b. Proposed Changes to the Checklist of the GMM chapter of Publication 14

[Changes shown below are contingent upon acceptance of Item Under Consideration]

For Category 3 Devices

4.6.36. If a measurement is in process when the device is accessed ~~**remotely**~~ for the purpose of modifying sealable parameters, the measurement is either: ☐ Yes ☐ No ☐ N/A

- Terminated Before Results can be Displayed or Printed. **OR**
- Completed Before Entering the Configuration Mode

4.6.37. When accessed ~~**remotely**~~ for the purpose of modifying sealable parameters, the device clearly indicates that it is in the configuration mode and is not capable of operating in the measure mode. ☐ Yes ☐ No ☐ N/A

4.6.37.1 Describe the method used to seal the device or access the audit trail information:

_____

_____

4.c. Proposed Changes to the Checklist of the NIR Grain Analyzer Chapter of Publication 14

Near Infrared (NIR) Grain Analyzers use an electronic method of sealing similar to those of GMMs, and most of them also offer access to the configuration mode thorough a keyboard entered password. In this mode, sealable parameters can be changed locally through the keyboard. At the 2011 NTETC Graina Analyzer Sector Meeting the sector agreed that contingent upon acceptance of Item Under Consideration the NIR Check List of *NCWM Publication 14* should be modified to delete "remotely" from §4 Design of NIR Analyzers, ¶ 4.9.16 as shown below.

[The change shown below is contingent upon acceptance of Item Under Consideration]

4.9.16. If a measurement is in process when the device is accessed ~~**remotely**~~ for the purpose of modifying sealable parameters, the measurement is either:

4.9.16.1 Terminated Before Results can be Displayed or Printed. **OR** ☐ Yes ☐ No ☐ N/A

4.9.16.2 Completed before entering the configuration mode ☐ Yes ☐ No ☐ N/A

4.9.16.3 Describe the method used to seal the device or access the audit trail information:

_____

_____

Conclusion:
The sector agreed by consensus to accept the Item Under Consideration and recommended that a Form 15 be drafted for forwarding this item to the S&T Committee for consideration. Mr. Truex, NTEP Administrator, indicated that Items 4.a., 4.b., and 4.c. would automatically be considered by the NTETC upon approval of the Item Under Consideration by the NCWM.

5. Modify the Definition of Remote Configuration Capability Appearing in Appendix D of NIST Handbook 44 to Recognize the Expanded Scope of "Remote Configuration Capability"

Source:
NTETC Grain Analyzer Sector

Purpose:
Table S.2.5. *Categories of Device and Methods of Sealing* that appears in §5.56.(a) of *NIST Handbook 44* lists acceptable methods of sealing for various categories of GMMs. When the sector first recommended adding the table to *NIST Handbook 44* at their September 1996 meeting, the concept of making a change to a GMM from a remote site involved information " …sent by to the device by modem (or computer)." In 2011 this concept has expanded to include the ability of the measuring device to accept new or revised sealable parameters from a memory chip (e.g., an SD Memory Card that may or may not itself be necessary to the operation of the device), external computer, network, or other device plugged into a mating port (e.g., Universal Serial Bus (USB) port) on the measuring device or connected wirelessly to the measuring device. The changes proposed in Item Under Consideration expand the scope of "remote configuration capability" to cover instances where the "other device" may be necessary to the operation of the weighing or measuring device or which may be considered a permanent part of that device.

Item Under Consideration:

remote configuration capability. – The ability to adjust a weighing or measuring device or change its sealable parameters from or through some other device that ~~**is not**~~ **may or may not** itself **be** necessary to the operation of the weighing or measuring device or ~~**is not**~~ **may or may not be** a permanent part of that device.[2.20, 2.21, 2.24, 3.30, 3.37, 5.56(a)]

(Added 1993, **Amended 20XX**)

Background / Discussion:
Two common types of removable data storage devices are the USB flash drive and the Secure Digital (SD) memory card. A USB flash drive is a data storage device that includes flash memory with an integrated USB interface. USB flash drives are typically removable and rewritable, and physically much smaller than a floppy disk. A SD card is a non-volatile memory card format originally designed for use in portable devices. The SD standard is maintained by the SD Card Association.

Removable digital storage devices can be used in GMMs as either "data transfer" devices which are not necessary to the operation of the GMM or as "data storage devices" which are necessary to the operation of the GMM.

A USB flash drive is most likely to be used as a "data transfer" device. In a typical "data transfer" application, the USB flash drive is first connected to a computer with access to the web. The computer visits the GMM manufacturer's web site and downloads the latest grain calibrations that are then stored in the USB flash drive. The USB flash drive is removed from the computer and plugged into a USB port on the GMM. The GMM is put into "remote configuration" mode to copy the new grain calibration data into the GMM's internal memory. When the GMM has been returned to normal operating (measuring) mode the USB flash drive can be removed from the GMM.

Although an SD memory card could also be used as a "data transfer device" it is more likely to be used as a "data storage device". In a typical "data storage device" application, the SD memory card stores the grain calibrations used on the GMM. The SD memory card must be plugged into an SD memory card connector on a GMM circuit card for the GMM to operate in measuring mode. To install new grain calibrations the GMM must be turned "off" or put into a mode in which the SD memory card can be safely removed. The SD memory card can either be replaced with an SD memory card that has been programmed with the new grain calibrations or the original SD memory card can be re-programmed with the new grain calibrations in much the same way as that described in the preceding paragraph to copy new grain calibrations into a USB flash drive. In either case, the SD memory card containing the new calibrations must be installed in the GMM for the GMM to operate in measuring mode. In that regard, the SD memory card) can be considered a "permanent part" of the GMM in that the GMM cannot operate without it.

Note: In the above example "SD memory card" could be any removable flash memory card such as the Secure Digital Standard-Capacity, the Secure Digital High-Capacity, the Secure Digital eXtended-Capacity, and the Secure Digital Input/Output, which combines input/output functions with data storage. These come in three form factors: the original size, the "mini" size, and the "micro" size. "Memory Stick" is a removable flash memory card format, launched by Sony in 1998, and is also used in general to describe the whole family of Memory Sticks. In addition to the original Memory Stick, this family includes the Memory Stick PRO, the Memory Stick Duo, the Memory Stick PRO Duo, the Memory Stick Micro, and the Memory Stick PRO-HG.

Conclusion:
The sector agreed by consensus to accept the Item Under Consideration and recommended that a Form 15 be drafted for forwarding this item to the S&T Committee for consideration.

6. Test Weight per Bushel Acceptance and Maintenance Tolerances

Source:
Mr. Jeffrey D. Adkisson, Grain and Feed Association of Illinois

Purpose:
Due to problems cited in the grain and feed industry, review and make any needed changes to the test weight per bushel tolerances in *NIST Handbook 44* Section 5.56(a).

Item Under Consideration:
Re-form a task group to study the test weight per bushel measurement system to include issues with field inspection and grain moisture meters and provide the sector with recommendations for any needed changes to the test weight per bushel tolerances in *NIST Handbook 44* Section 5.56(a).

Background / Discussion:
This is a carryover from the sector's 2011 meeting. Mr. Adkisson, Grain and Feed Association of Illinois, cited problems his industry is having regarding Test Weight (TW) per bushel. GMMs that have failed TW during field inspection are sent to the manufacturer for repair. When the meters are returned, the reports indicate that no problems have been found. There are also situations where a meter has failed TW. When the state inspector subsequently tested the elevator's quart kettle it matched the meter, but it didn't match the state inspector's sample. This is particularly frustrating for the country elevators in Illinois that are using the GMM TW only as a screening tool.

At the Sector's August 2011 meeting a task group was formed to investigate the whole TW system with the goal of defining procedures that would improve TW both for the user and for the inspection system. Past data obtained by the Sector had indicated that the existing tolerances were reasonable. It was felt that increasing TW tolerances would only cover up the problems. What was needed was an investigation of the whole system of calibrating meters, then translating that calibration into the field, and then keeping it that way.

Dr. Charles R. Hurburgh, Jr., Iowa State University, agreed to head the task group. Other TW Task Group members included:

- Mr. Jeffery Adkisson – Grain and Feed Association of Illinois
- Ms. Diane Lee – NIST, OWM
- Ms. Cassie Eigenmann – DICKEY-john Corporation
- Mr. Ivan Hankins – Iowa Department of Agriculture/Weights and Measures
- Mr. Tim Kaeding – Perten Instruments, Inc.
- Mr. Karl Cunningham – Illinois Department of Agriculture

Further action on the issue of tolerances was postponed until the TW Task Group was able to recommend appropriate action.

Earlier this year the TW Task Group developed the following list of Action Items:

- Survey the grain industry as to the frequency of discounting each of the major grains (wheat, corn, and soybeans) for test weight, and within those discounted the frequency of use of the meter test weight versus the cup-bucket test weight.
- Survey the industry for comparative data between meters and an Official GIPSA agency on the same samples.
- Develop a draft procedure for sample selection and pre-qualification

Dr. Hurburgh reported that discounting for low TW was not an issue in either 2010 or 2011. TWs for corn were so high that discounting was not an issue. Within Iowa most grain elevators were using the TW reported by their GMM. Only a few were using the standard quart kettle method. This is likely to change in the 2012 harvest as low TWs are likely to be more common. Also, there may not be as much TW increase in drying as would normally be expected. TW may come up again as a discount factor.

Same sample TW data has not been collected comparing grain elevator GMMs with an Official GIPSA agency. Dr. Hurburgh explained that this information should be relatively easy to obtain, because in almost every case when a train is officially graded the samples are run at the grain elevator first. Since last year's sector meeting, the rapid acceptance of the new UGMA GMMs as Official Meters for corn, soybeans, sunflowers, and grain sorghum (with the remaining grains scheduled to switch to UGMA GMMs for Official Inspection on May1, 2013), has altered some of the issues. The new technology not only provides a better moisture measurement, but a better TW measurement as well.

The remaining action item that the task group believed was necessary was a procedure for pre-qualifying TW samples as being good predictors for the TW function as well as moisture function. Most States pre-screen moisture samples to get the outliers out of the system. That pre-qualification would have to be expanded if TW is to be actively used to reject meters on the basis of TW.

Dr. Hurburgh recommended that the sector not adjust TW tolerances at this time, because the system is rapidly changing over to the new technology which is going to result in the improvement in TW readings. The problem should resolve itself as older instruments are retired.

Mr. Karl Cunningham, Illinois Dept of Agriculture, informed the Sector that Illinois's TW rejection rate has gone down in the last two years. He has no problem with TW on the meters in his laboratory and doesn't think the present tolerances are a problem. Many of the field problems may be due to rough handling of the meters during shipping. Mr. Cunningham advises elevators who have to have their devices worked on to take them to the manufacturer's service department themselves if at all possible.

Mr. Tim Kaeding, Perten Instruments, suggested that there might be value in expanding the Phase II OCP grain moisture comparison charts to include TW. Dr. Hurburgh recommended that a TW comparison chart showing the spread of TW measurements for individual meters against the corresponding official quart kettle TW measurements would address the tolerance issue, whereas a bias plot would not. He suggested plotting meter TWs on the x-axis and quart kettle results on the y-axis. A best-fit line could be drawn for each meter.

The sector agreed that TW comparison charts should be prepared for the 3 grains which are most likely to be subject to discounts on the basis of TW: Corn and two wheat classes. The wheat classes selected were: Hard Red Winter and Soft Red Winter. Manufacturer approval is required for NTEP Phase II TW performance data to be released for publication even if individual instruments are not identified. The two meter manufacturers present indicated that they would approve the release of this data. Permission would have to be obtained from the other manufacturers.

Conclusion:
Ms. Brenner will send letters, to all GMM manufacturers outlining the way TW data will be displayed for each meter for corn and two classes of wheat. The letters will request formal approval for release of NTEP Phase II TW performance data. Meters will NOT be identified.

The sector agreed to postpone further action on changing TW tolerances until more information was available.

7. Report on International Organization of Legal Metrology (OIML) TC 17/SC 1 R 59 Moisture Meters for Cereal Grains and Oilseeds

Background / Discussion:
This item was included on the sector's agenda to provide a summary of the activities of OIML TC17/SC1. The Co-Secretariats (China and the United States) are working closely with an International Work Group to revise OIML Recommendation R 59 *Moisture Meters for Cereal Grains and Oilseeds*. The 5 Committee Draft (CD) of OIML R 59, revised to comply with OIML's Guide *Format for OIML Recommendations* and to incorporate tests for the recommended disturbances of OIML Document D 11, *General Requirements for Electronic Measuring Instruments*, was distributed to the Subcommittee in February 2009. Comments to R 59 5 CD were received from 10 countries including the United States. A preliminary R 59 6 CD addressing those comments was prepared for discussion at the September 2010 TC 17/SC 1 meeting in Orlando, FL. Per discussions at that meeting, Germany submitted suggestions for additional software requirements that will be included in the final draft of R 59 6 CD.

Ms. Diane Lee, NIST, OWM, reported that the preliminary 6 CD will have to be revised to address the comments received at the September 2010 TC 17/S1 meeting and to incorporate Germany's additional software requirements. The final draft of 6 CD will then be circulated to the TC members for comment and a possible vote. The earliest anticipated date for the final draft of 6 CD is the Spring of 2013.

8. Update on Efforts to Establish Recognized Traceability under the International Committee of Weights and Measures (CIPM) Mutual Recognition Agreement (MRA) for Moisture in Grain Measurements

Background / Discussion:
At the 2011 NTETC Grain Analyzer Sector Meeting, Ms. Lee, NIST, OWM, reported that there is a proposal on the international front to do a study of moisture measurement methods with the apparent purpose of establishing a universal standard method "internationally accepted by competent authorities in the field of moisture measurements in grains and cereal." During the September 2010 TC 17/SC 1 meeting Mr. Jean–Francois Magana, International Bureau of Legal Metrology (BIML), gave an overview of a discussion paper titled, *Efforts to Establish Recognized Traceability Under the International Committee of Weights and Measures (CIPM) Mutual Recognition Arrangement (MRA) for 'moisture-in-grain' measurements*." This document discusses National Measurement Institutes having their measurement capabilities internationally recognized for moisture. It also discusses key comparisons for moisture, and the use of *ISO 712, Cereals and cereal products -- Determination of moisture content -- Reference method (not applicable to maize and pulses).* In November 2011 the United States and China received a notice for a proposal for a new project within TC 17/SC 1 to create a new OIML recommendation to define the measurand "moisture mass fraction in grain" by a globally recognized measurement method. In the United States, NIST, OWM and United States Department of Agriculture (USDA), with management from both agencies, held a conference call to discuss technical issues concerning establishing a globally recognized reference method. After which the United States and China responded and elaborated on technical and economic issues. A copy of the response is shown below:

> "….On the matter of International Committee of Legal Metrology (CIML) approval of this proposed project, we feel that the draft letter that you have prepared does not provide enough information to CIML Members for them to make an informed decision. We have consulted with members of the United States "mirror" committee, USDA, GIPSA, and they have informed us that studies of the type being proposed here have already been carried out in the 1980's, and so it is questionable whether it makes sense to try and 'reinvent the wheel' with this project. The results of the studies have shown that this issue involves not only the technical feasibility of developing an acceptable global measurement method for moisture mass fraction in grains (i.e., defining the measurand), but equally (if not more) importantly involves the economic (and hence political) feasibility of developing and implementing a single global standard. The anticipated global costs associated with making the changes that this project could lead to are staggering, and would quite likely not be acceptable to the stakeholder communities.
>
> Therefore, we believe that the initial letter to the CIML Members should ask not only the technical questions that you have posed (and perhaps others as well), but should also ask what the national agencies and customers in the different Member States have to say about the idea of possibly changing the test method in their country

to accommodate a single global standard measurement method. We feel that such information should be obtained (through a formal survey, not in the informal way posed in your draft letter) and then shared with the CIML Members before asking them to vote on approval of this proposal. We would be happy to assist you in the re-drafting of your letter and preparation of the survey.

Elaborating on what we see as the technical issues, it is well recognized that no universal method can be used for all grains and seeds. The main steps of the experimental procedure, i.e., pre-drying, grinding, drying time, and temperature, generally differ from one grain type to the next as dictated by physical and chemical composition. Thus, a critical study of the procedure would be required for each grain type. A wide range of grain moisture reference methods are used by major grain exporting and importing countries. Grain moisture reference methods were adopted decades ago and are well established within these countries. Comparison studies have shown that no methods are identical and that differences can be significant between some methods. The extent to which the methods agree will vary by grain type.

Elaborating on what we see as the economic issues, it is challenging to identify economic benefits of moving to an international moisture reference method. Persuasive arguments have been presented that market prices have already adjusted to reflect differences in grain moisture reference results. It is easier, and fairly daunting, to predict costs associated with making a change to grain moisture reference methods for an individual country. It would be necessary to develop new moisture meter calibration coefficients for each grain type. In some cases, grain drying costs could be increased in order to meet moisture specifications. Perhaps most significantly, price structures would need to be modified…"

This was discussed further at the OIML Presidential Council meeting March 5-7, 2012, and it was included in the meeting minutes that there was insufficient evidence that the latest developments described in the NIST, OWM newsletter article would result in an instrument/procedure that could be used as an international standard for moisture mass fraction of grain measurements.

In a conversation with Mr. Patoray, BIML Director, Dr. Erhlich, NIST, OWM was informed that the OIML is no longer pursuing the new project to create an OIML recommendation to define the measurand "moisture mass fraction in grain".

Subsequently, the United States and China, secretariats of OIML Technical Committee (TC) 17/Technical Subcommittee (SC) 1, received a document from Ms. Stephanie Bell of the National Physical Laboratory in the UK with reference to a proposed research topic to submit to the current call of the European Metrology Research Program (EMRP) to address the need for a more effective metrology infrastructure for measurements of moisture in materials. The United States and China responded including excerpts from the response provided for the OIML Proposal to create a new OIML recommendation to define the measurand "moisture mass fraction in grain". OIML TC 17/SC 1 was not listed in support of these efforts.

Ms. Diane Lee, NIST, OWM reported that she is developing an article on grain moisture measurements in the U.S. that has been reviewed by Dr. Richard Pierce of USDA, GIPSA. This article provides information on U.S. air-oven reference methods to include historical information and a summary of the various test methods used for different grains and types of commodities. This article may also serve to provide the international community with information on the air-oven reference test methods used in the U.S.

9. Report on OIML TC 17/SC 8 Protein Measuring Instruments for Cereal Grain and Oil Seeds

Background / Discussion:

This item was included on the sector's agenda to provide a summary of the activities of OIML TC 17/SC 8. Subcommittee SC 8 was formed to study the issues and write a working draft document *Measuring Instruments for Protein Determination in Gra*ins. Australia is the Secretariat for this subcommittee. A TC 17/SC 8 meeting was hosted by NIST, OWM in September 2007 to discuss the 2 CD. Discussions on 2 CD dealt mostly with Maximum Permissible Errors and harmonization of the TC 17/SC 8 Recommendation for protein with the TC 17/SC 1 Recommendation for moisture. The Secretariat distributed a 2 CD of the document in February 2010. A meeting of TC 17/SC 8 was held September 2010 in Orlando, FL. At the September meeting comments to the

Recommendation on Protein Measuring Instruments for Cereal Grain and Oil Seeds 2 CD were reviewed. It was agreed at this meeting that two instruments will be submitted for OIML type approval.

Diane Lee, NIST/OWM, reported that the 3rd CD of the OIML Recommendation on Protein was distributed to members of the USNWG via e-mail on July 3, 2012. Comments to the 3rd CD were requested by September 8, 2012. The 3rd CD incorporates the changes to 2nd CD that were agreed to at the 2010 TC17/SC8 meeting in Orlando, Florida. Changes were also made to the 3rd CD to harmonize some section with OIML R 59 and include requirements of OIML D 11. Further discuss is needed to address wheather or not all of the OIML D11 requirements that were added to the 3rd CD are necessary for protein analyzers. In response to a question: "How many revisions are associated with OIML Recommendations?" Ms. Lee responded that typically, if comments to an OIML Recommendation can be resolved by voice or e-mail the next version of the Recommendation could be forwarded for to the participating member countries for a vote.

10. Item 356-1 Printed Ticket User Requirements - Update

Source:
Grain and Feed Association of Illinois (2012)

Purpose:
Change the mandatory printing of tickets from grain moisture meters to an "on demand at the time of transaction" printing and remove the requirement of printing the calibration version identification. Note that the S&T Committee did not agree with proposed removal of the requirement to print the calibration version identification; this position is reflected in the version of the proposal currently under consideration by the committee.

Item Under Consideration:
Amend *NIST Handbook 44*, Grain Moisture Meter Code 5.56.(a) as follows:

UR.3.4. Printed Tickets.

(b) The customer shall be given a printed ticket **at the time of the transaction or as otherwise specified by the customer.** The printed ticket shall include the date, grain type, grain moisture results, and test weight per bushel, and calibration version identification. The ticket **information** shall be generated by the grain moisture meter system.

(Amended 1993, 1995, ~~and~~ 2003, **and 20XX**)

Background:
According to the submitter, the user requirement to provide a printed ticket for every single load is unrealistic in the country elevator industry. Traffic patterns at country elevators do not lend themselves to providing a printed ticket to all customers and customers really don't want them. As the speed and capacity increases in the industry, outbound scales are being located at a distance from the inbound scale and the scale house where the moisture tester is located to alleviate traffic bottlenecks. When the outbound scale is located away from where the ticket is printed, the truck driver must circle back around to pick up the ticket, thus, causing logistical problems. In addition, since meters are sealed, inspected and required to have the correct calibration, there is no need for the calibration version identification to be printed on the ticket. Also, most customers are not going to know if it is the correct calibration version identification or not. There have been problems getting the information from the grain moisture meter to the grain accounting system – especially the calibration version identification. Some grain accounting systems have to be "hard coded" for calibration version identification which must be changed whenever the calibration changes. The change will be at an added cost for the industry.

When a consumer pays at a gas pump, they have the option of a receipt on demand at the time of transaction or not receiving a receipt. There would be a cost savings to moisture meter users as they would save on paper and filing space, and in the situation where the calibration version identification is "hard coded," there will be a cost savings of the expense to have the grain accounting software provider make those changes.

Since moisture meters are capable of printing the ticket, some would argue that they should just go ahead and print them and provide them to the customer. In addition, the requirement does not say when the ticket shall be given to the customer; thus, the printed tickets could be saved for weeks, months, or even years in case the customer had a concern at some point. Printing the calibration version identification ensures the correct calibration is being used.

The submitter proposed amendments to paragraph UR.3.4. Printed Tickets as follows:

UR.3.4. Printed Tickets.

(b) The customer shall be given a printed ticket on **demand at the time of the transaction** showing the date, grain type, grain moisture results, **and** test weight per bushel~~**, and calibration version identification**~~. The ticket **information** shall be generated by the grain moisture meter system.

(Amended 1993, 1995, ~~**and**~~ 2003, **and 20XX**)

At the 2011 Central Weights and Measures Association (CWMA) Interim Meeting some jurisdictions opposed the proposal citing that it is a fundamental element of a point of sale transaction that there is either a witness to the transaction or that a receipt is made available. Others supported the item and recognized that many customers refuse to take the printed tickets. The CWMA believes that the calibration version identification is not necessary on the ticket since most jurisdictions are already verifying the calibrations version when the device is inspected. This proposal is not eliminating the opportunity for the seller to obtain a printed ticket. The CWMA forwarded the item to NCWM, recommending it as a Voting Item.

At the 2011 Western Weights and Measures Association (WWMA) Annual Meeting the committee heard no comments on this item. The WWMA amended the proposal to make the language consistent with other codes such as 3.32. LPG and Anhydrous Ammonia Liquid-Measuring Devices Code paragraph UR.2.6. Ticket Printer: Customer Tickets. The WWMA forwarded the modified version below to NCWM, recommending it as a Voting Item.

UR.3.4. Printed Tickets.

(b) The customer shall be given a printed ticket ~~showing~~ at the time of the transaction or as otherwise specified by the customer. The printed ticket shall include the date, grain type, grain moisture results, and test weight per bushel, ~~and calibration version identification~~. The ticket information shall be generated by the grain moisture meter system.

(Amended 1993, 1995, ~~**and**~~ 2003, **and 20XX**)

At the 2011 Northeastern Weights and Measures Association (NEWMA) Interim Meeting there were no comments. Deferring to the expertise of the NTETC Grain Analyzer Sector, NEWMA forwarded the item to NCWM, recommending it as a Developing Item.

At the 2011 Southern Weights and Measures Association (SWMA) Annual Meeting, Ms. Butcher, NIST Technical Advisor, noted that the proposed language submitted was slightly different from that discussed by the NTETC Grain Analyzer Sector and provided a summary corresponding to this item prepared by Ms. Lee, Grain Analyzer Sector Technical Advisor. Ms. Butcher also pointed out that WWMA proposed alternate language that is consistent with printed tickets requirements in other codes. The SWMA agreed that the customer should be given the option of receiving a printed ticket from a transaction and that the proposed changes would clarify the responsibility of the device user. The SWMA preferred the option forwarded by WWMA since it mirrors existing language in other *NIST Handbook 44* codes. The SWMA forwarded the item to NCWM, recommending it as a Voting Item as revised by WWMA.

At the 2012 NCWM Interim Meeting, the S&T Committee received comments in support of the alternative language submitted by the WWMA. NIST, OWM reported that the proposed language submitted to the regional weights and measures associations was different from that agreed to by the Grain Analyzer Sector at its August 2011 meeting.

The Grain Analyzer Sector had specifically opposed deleting the phrase "calibration version identification." NIST, OWM also noted that not all grain moisture meters are Category 3 devices; consequently, calibration version identification information is a critical component on the printed receipt to reconstruct the basis for a sale and help officials to resolve complaints.

The committee agreed that the version proposed by WWMA and SWMA was preferable since it mirrors similar language in other *NIST Handbook 44* Codes. The committee also agreed that, given the Grain Analyzer Sector's opposition to deleting the reference to "calibration version identification," this phrase should be retained in the paragraph. The committee presented an amended version of the proposal. The committee recognized that the regional associations were not aware of the sector's position on the proposed deletion of the reference to the calibration version and that the submitter has not had an opportunity to review the significant changes from the original version. The 2012 S&T Committee designated this item as an Informational Item to allow additional opportunity for input.

At the Sector's August 2012 meeting one member suggested that the phrase "or as otherwise specified by the customer" be modified to read "or as agreed to by the customer". Customers are not going to proactively specify how elevator record keeping systems are put together, but they can agree that this information comes on a settlement sheet. A contract for the sale of grain at some future date with XYZ Grain contains a phrase that the seller agrees to XYZ Grain's various transaction policies. By signing the contract, the seller agrees to accept settlement sheet information via a web listing that can be accessed with a computer or possibly using a smart phone. The seller is not "specifying" how he wants to receive the "ticket" information, he is just "agreeing" to receive it in a different manner.

The wording proposed by the Sector in 2011, "A printed ticket shall be made available to the customer upon request at the time of transaction…" did not require the customer to do anything if he didn't want a ticket, but it did require him to ask for one if he wanted one. The wording in the Item under Consideration required the customer to say, "I don't want a ticket ...." if a ticket wasn't wanted. If he said nothing, he would be given a ticket (or offered one).

Other Sector members felt that the wording of the Item under Consideration allowed flexibility, and most were in favor of accepting the Item under Consideration. An attempt to obtain a consensus on the S&T Committee's proposal was unsuccessful due to one jurisdiction's belief that …"a ticket is given to the customer no matter what."

There was further discussion on whether the wording in the Item under Consideration, "….. at the time of the transaction or as otherwise specified by the customer" means that the customer gets a ticket at the time of transaction or at a later specified time. Some believed that "as otherwise specified by the customer" could mean "Never" or "in another form". Sector Chairman, Ms. Cassie Eigenmann, DICKEY-john, Corp., reminded the Sector that the reason Illinois Grain & Feed Association submitted the request for change was because they did not want to have to print a ticket at the time of transaction unless the customer requested one at the time of transaction.

It was pointed out that unless a ticket is printed by the GMM before the grain sample is "dumped" from the GMM it may not be possible for the GMM to print a ticket for that transaction. The information, however, could reside in the memory of the elevator's grain transaction system and could be printed in another form e.g., on a settlement sheet that is sent (or transmitted) to the seller later. Further discussion suggested that the S&T proposed wording could be interpreted to mean that elevators that captured GMM information in their grain transaction system at the time of transaction would not have to supply a GMM printed ticket at time of transaction unless requested by the customer at time of transaction. If the elevator is using a GMM that is equipped to record and that was put into service **before** January 1, 1998, the elevator would be required to give the customer a printed ticket at the time of transaction (need print only percent moisture content and grain selected).

Conclusion:
After further discussion a formal vote was taken to accept the Item Under Consideration as shown above. The vote was 9 in favor to 1 opposed. The opposing vote was based on the implied need to give every customer a printed ticket.

11. Update on Proficiency Testing

Source:
Dr. Hurburgh, Iowa State University

Purpose:
Develop an air-oven proficiency testing program to ensure state laboratory and manufacturers air-oven measurements are traceable to the official USDA, GIPSA air-oven measurements.

Item Under Consideration:
Create an ongoing air-oven proficiency testing program for states maintaining a grain moisture laboratory and GMM manufacturers.

Background / Discussion:
At the 2009 NTETC Grain Analyzer Sector Meeting Dr. Hurburgh, Iowa State University, urged the representatives from the American Oil Chemists Society (AOCS) to prepare a proposal so that the collaborative (air-oven) study could be conducted on an on-going basis rather than on an ad hoc basis. He cautioned that the proposal would have to include corn and wheat as well as soybeans.

At the 2011 NTETC Grain Analyzer Sector Meeting, Ms. Johnson, AOCS, proposed an air-oven/GMM proficiency testing series designed specifically to address the needs of GMM manufacturers and states maintaining a grain moisture laboratory. AOCS would administer the program, oversee distribution of samples, compile results, perform statistical analysis of results, and distribute a report to participants. AOCS does not collect the samples. This is subcontracted to suitable providers. AOCS does not have laboratories. Since GIPSA/ FGIS is a certified laboratory already participating in the AOCS Soybean Quality Traits program, GIPSA air-oven results could be reported for comparison.

At the sector's August 2012 meeting the sector learned that Ms. Christine Atkinson will be taking over the Proficiency Testing program for States and interested manufacturers formerly headed by Ms. Amy Johnson. Ms. Atkinson verified that participant's cost will remain $100 per year. The sector reiterated that the program should focus solely on the standard FGIS air-oven method. Instrument results will not be reported. Participants' air-oven results will be compared against GIPSA's standard FGIS air-oven results. In response to Ms. Atkinson's question about scheduling, the sector was in general agreement that samples should ship after harvest, preferably between mid-January and mid-February with participants' results due 30 days after the shipping date.

Conclusion:
In summary, the sector agreed upon the following Program Details:

- Samples – Soybeans 2, Corn 2, Hard Red Winter Wheat 2
- Cost to Participants - $100.00/year
- Schedule:
  - Samples (6) ship between January 15 and February 15.
  - Samples must be tested within 5 business days of receipt with results due 30 days after the shipping date.
- Reports to be posted on www.SoybeanQualityTraits.org by 1 May.
- Only the GIPSA oven results will be identified. Individual manufacturer's and State participant's oven results will be assigned an identifier known only to the manufacturer or State participant. Instrument results will not be reported.
- Detailed Participant Instructions will be provided to each participant.

12. NCWM Publication 14, NTEP Administrative Policy Changes

Source:
NTEP

Background / Discussion:
NCWM is working on revisions to *Publication 14, Administrative Policy*, to put it in a more logical order and more understandable form. The purpose is not to change the intent of the publication, but to realign and clarify sections as necessary. Sectors, committees and the NTEP laboratories are asked to review the revised section, NTEP Administrative Policy and provide feedback. An electronic copy of the document was distributed by NCWM to all who registered to attend the NTETC Grain Analyzer Sector meeting in August.

Conclusion:
No comments were offered at the August 2012 Sector meeting.
[***Editor's Note:*** On September 14, 2012, Mr. Don Onwiler, NTEP Executive Director, sent an email message to GA Sector meeting attendees alerting them that the *Administrative Policy document* distributed for the sector's meeting was not the most up-to-date version. The most recent copy is now posted to the GA Sector "meeting documents" page on the NCWM web site. It can be accessed at: http://www.ncwm.net/content/grain-analyzer-docs. Mr. Onwiler welcomes comments for the next two months.]

13. Next Sector Meeting

Mr. Jim Truex, NTEP Administrator, suggested that the sector consider using some form of web conferencing if a meeting of only 4 or 5 hours would be required. At that time, it was difficult to determine what the outcome would be for the issues the sector was forwarding to the S&T Committee. Should it be necessary to hold a physical meeting, the sector agreed to the following tentative location and dates:

Dates:	Wednesday, August 21 and Thursday, August 22, 2012
Location:	Chase Suites by Woodfin at KCI in Kansas City, MO. (if available)

14. Review of Form 15s

Background/Discussion:
At the end of the first day of the sector's August 2012 meeting the Co-Technical Advisors agreed to complete the Form 15s that would be required to move Agenda Items 4, 5, and 10 forward. The following morning 3 completed Form 15s were presented for the sector's review and approval:

1. Amend Table S.2.5. of §5.56.(a) in NIST Handbook 44 (see GA Agenda Item 4.)
2. Modify Definition of Remote Configuration (see GA Agenda Item 5.)
3. S&T Committee Item 356-1 Printed Ticket User Requirements (See GA Agenda Item 10.)

Conclusion:
The sector accepted Form15s "1" and "2" by consensus and "3" by a vote of 9 in favor to 1 opposed. As before, the opposing vote was based on the implied need to give every customer a printed ticket.

15. Update on the New Meter Technology

Background/Discussion:
The sector invited Dr. David Funk, Deputy Director & Chief Scientist, GIPSA/FGIS Technology and Science Division, to update the sector on the new meter technology. Following is a summary of his presentation:

History of Official Moisture Meter Approvals

- 1937 – Tag-Heppenstall
- 1960 – Motomco Model 919
- 1998 – DICKEY-john GAC 2100
- April 11, 2012 – First UGMA-Compatible moisture meters approved
  – DICKEY-john GAC 2500UGMA
  – Perten AM-5200-A

What is GIPSA's Unified Grain Moisture Algorithm (UGMA)?

- Very accurate dielectric-type moisture method
- Higher measurement frequency (about 150 MHz)
- Based on a defined physical parameter–Dielectric Constant
- Excellent density correction (Landau-Lifshitz, Looyenga Density Correction with LLL Exponent = 3)
- Three "unifying parameters" per grain group (Slope, Offset, and Translation Unifying Parameters)
- A single calibration "curve" for all grain types (a 5th-Order Polynomial)
- Precise, wide-range temperature correction
- Calibrated to GIPSA's standard AIR Oven method
- "Open"– Available to any manufacturer

Why change to UGMA?

- Improved accuracy for all grain types
- Improved accuracy of UGMA
- Improved year-to year calibration stability
- Drastically improved accuracy on high and low test weight corn
- Wider sample temperature ranges (allows measuring frozen grain)
- "Green" grain effects reduced (moisture "rebound" significantly reduced)
- Easier calibration development

GIPSA's basic definition of equivalency

- Same Technology
- Very close agreement among types as well as units of a type
- Same calibrations and standardization processes

UGMA – Compatibility Criteria

- NTEP Certification
- Documented & stable production processes
- Measurement frequency – 148.5 to 150.5 MHz
- Standardize Test cell design
- Standardized loading method
- Standardize measurements
  - Sample dielectric constant
  - Sample mass
  - Sample temperature
- Tight tolerances specified for individual subsystems as well as for moisture results
- Must use specified mathematics
- Units' agreement with FGIS Master system must meet tolerances in FGIS Regulations
  - +/- 0.05% M for Headquarters Standard units
  - +/- 0.15% M for other Official units
  (where "M" is the mean difference on medium-moisture HRWW)
- All UGMA-Compatible models must be able to use the same check testing process.
- A simple check testing process must ensure performance on all grains over full moisture ranges.
- Instruments must provide for efficient means of entering calibrations.
- Instruments must provide standardized output data stream for printing or networking.

Anticipated Moisture Changes with Transition to UGMA

- GAC2100 and new UGMA-based meters are all calibrated to agree with GIPSA's air oven method as closely as possible.
- Do not expect significant average differences between GAC2100 and new UGMA-based meters – **except:**
- Low test weight corn moisture values will generally **increase:**
  - GAC2100 reads lower than UGMA by 0.2% per pound per bushel below 57 lb/bu.
- High test weight corn moisture values will generally **decrease:**
  - GAC2100 reads higher than UGMA by 0.2% per pound per bushel above 57 lb/bu.

Implications on field-testing UGMA meters

- Better to test with another UGMA meter
- Alternatively, test with one sample of grain
- Test weight will make a difference in the moisture result of UGMA meters (May need to verify that UGMA meter is measuring mass correctly.)

Implications for the next 5 years

- There may be profound changes. Do we need NTEP phase 2?
- Reduction in the number of grain samples that are being collected but will not need to collect as many samples for the official meters which are UGMA meters now.

More information can be found at the GIPSA web page on UGMA moisture meter implementation:
http://www.gipsa.usda.gov/fgis/equipment.html

National Type Evaluation Technical Committee (NTETC) Grain Analyzer Sector Meeting Summary

August 21-22, 2013 / Kansas City, Missouri

INTRODUCTION

The charge of the NTETC Grain Analyzer Sector is important in providing appropriate type evaluation criteria based on specifications, tolerances and technical requirements of *NIST Handbook 44* Sections 1.10. General Code, 5.56. Grain Moisture Meters and 5.57. Near-Infrared Grain Analyzers. The sector's recommendations are presented to the National Type Evaluation Program (NTEP) Committee each January for approval and inclusion in *NCWM Publication 14 Technical Policy, Checklists, and Test Procedures* for national type evaluation.

The sector is also called upon occasionally for technical expertise in addressing difficult *NIST Handbook 44* issues on the agenda of National Conference on Weights and Measures (NCWM) Specifications and Tolerances (S&T) Committee. Sector membership includes industry, NTEP laboratory representatives, technical advisors, and the NTEP Administrator. Meetings are held annually, or as needed and are open to all NCWM members and other registered parties.

Suggested revisions are shown in **bold face print** by ~~**striking out**~~ information to be deleted and **underlining** information to be added. Requirements that are proposed to be nonretroactive are printed in ***bold faced italics***.

Table A
Table of Contents

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
BIML	International Bureau of Legal Metrology	NTETC	National Type Evaluation Technical Committee
CD	Committee Draft	OCP	Ongoing Calibration Program
CIML	International Committee of Legal Metrology	OIML	International Organization of Legal Metrology
CIPM	International Committee of Weights and Measures	OWM	Office of Weights and Measures
D	Document	R	Recommendation
EMRP	European Metrology Research Program	S&T	Specifications and Tolerances
FGIS	Federal Grain Inspection Service	SC	Subcommittee
GA	Grain Analyzer	SD	Secure Digital
GIPSA	Grain Inspection, Packers and Stockyards Administration	TC	Technical Committee
GMM	Grain Moisture Meter	TW	Test Weight
MRA	Mutual Recognition Agreement	UGMA	Unified Grain Moisture Algorithm
NCWM	National Conference on Weights and Measures	USB	Universal Serial Bus
NIR	Near Infrared Grain Analyzer	USDA	United States Department of Agriculture
NIST	National Institute of Standards and Technology	USNWG	United States National Working Group
NTEP	National Type Evaluation Program		

Details of All Items
(In order by Reference Key)

1. Report on the 2013 NCWM Interim and Annual Meetings

The 2013 NCWM Interim Meeting was held January 27-30, 2013 in Charleston, South Carolina. At that meeting, no recommended amendments to Publication 14 for grain analyzers were provided to the NTEP committee. Several of the recommended changes to Publication 14 that were discussed at the 2012 Sector meeting were pending voting at the 2013 annual meeting and will be reviewed later in agenda item 4 as proposed changes to the 2013 edition of Publication 14. See the table of ammendments and changes to Publication 14 below.

The 2013 NCWM Annual Meeting was held July 14-18, 2013 in Louisville, Kentucky. There were two Grain Analyzer Sector Voting Items on the agenda. **Item 356-1, Table S.2.5. Categories of Device and Methods of Sealing** and **Item 356-2, UR.3.4. Printed Tickets.** See Grain Analyzer Agenda Item 4, and Agenda Item 5 below, for details. There was also one Grain Analyzer Sector Developing item on the S&T agenda, **Item 360-7, Appendix D – Definitions: Remote Configuration Capability.** See Grain Analyzer Agenda Item 6, below, for details.

Mr. Jim Truex, NTEP Administrator, reported that 37 States were represented at the NCWM 2013 annual meeting. Jim also provided an overview of the **structure** of NCWM Inc, Handbook 44, and NCWM Publication 14. At the Annual Meeting, **Items 356-1, Table S.2.5. Categories of Device and Methods of Sealing and Item 356-2, UR.3.4. Printed Tickets** were adopted. **Item 360-7, Appendix D – Definitions: Remote Configuration Capability** remains a developing item for additional input from the Sectors.

Amendments/Changes to the Grain Moisture Meters and Near Infrared Grain Analyzer Chapters in the 2013 Edition of NCWM Publication 14			
Section Number	**Amendment/Change**	**Page (2013 Edition)**	**Source: 2013 Grain Analyzer Sector Meeting Summary**
Appendix C Table S.2.5 Categories of Device and Methods of Sealing	Amend Category 3 to remove the word "remotely" from the second paragraph. Add a paragraph to Category 3a and 3b	GMM-37	Agenda Item 4.a.
GMM Checklist Code Reference: S.2.5. Provisions for Sealing - Category 3 devices	Amend paragraph 4.6.36 and 4.6.37 to reflect the changes that were made in Appendix C, Table S.2.5	GMM-21	Agenda Item 4.b.
NIR Checklist Code Reference S.2.6. Provisions for Sealing	Amend paragraph 4.9.16. to delete remotely and add "OR" following the sentance in 4.9.16.1	NIR-15	Agenda Item 4.c.

2. Report on NTEP Evaluations and Ongoing Calibration Program (OCP) (Phase II) Testing

Ms. Cathleen Brenner, Grain Inspection, Packers and Stockyards Administration (GIPSA), the NTEP Participating Laboratory for grain analyzers brought the sector up to date on NTEP Evaluation (Phase I) activity. She also reported on the collection and analysis of Grain Moisture Meter OCP (Phase II) data on the 2012 crop. Ms. Brenner will identify, for the 2013 harvest, the models enrolled in Phase II.

Ms. Brenner reported that there are three models enrolled in Phase I and one of those models is near completion and will be joining models enrolled in the Phase II program for the 2013 harvest. The second model is enrolled for moisture and the third model for extending the temperature ranges.

Ms. Brenner also reported on the collection and analysis of Grain Moisture Meter OCP (Phase II) data on the 2012 crop. For the 2013 harvest there are 7 models enrolled in Phase II. The manufacturers will be charged on the basis of 6 models because, using GAC2500-UGMA data, DICKEY-john can automatically back calculate calibrations to the GAC2500 without having to run samples on the GAC2500*. Phase II data collection for the 2013 harvest began in early August.

The 7 meters:

1. Bruins Instruments - OmegAnalyzerG
2. DICKEY-john Corp. - GAC2000 (NTEP Version), GAC2100a and GAC2100b
3. DICKEY-john Corp. - GAC2500 (*See note above. Will not run samples on this model.)
4. DICKEY-john Corp. - GAC2500-UGMA
5. Foss North America - Infratec 1241
6. Perten Instruments Inc. - AM5200 and AM5200-A (The AM5200-A is UGMA Certified.)

7. The Steinlite Corporation - SL95

The 2013 Phase II enrollment cost to each manufacturer, based on 6 device types, is $8,750.

3. Review of OCP (Phase II) Performance Data

At the sector's August 2005 meeting it was 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, Ms. Brenner, GIPSA, the NTEP Participating Laboratory for Grain analyzers will present data showing the performance of NTEP meters compared to the air oven. This data is based on the last three crop years (2010–2012) using calibrations updated for use during the 2013 harvest season. The 2010-2012 Grain Moisture Meter (GMM) Phase II comparison graphs are available for view or can be downloaded for printing at the following web address:

http://www.ncwm.net/resources/dyn/files/1081743z9820e9b2/_fn/GMMBiases13.pdf

Ms. Brenner reported that on May 1, 2013, the USDA GIPSA official moisture meter for all fifteen NTEP grains switched to the Unified Grain Moisture Algorithm (UGMA) technology. The "Official Meter" designation in the above camparison charts is the UGMA master sytem which has three years worth of data. The UGMA models, Perten AM 5200-A and Dickey-john GAC 2500 Unified Grain Moisture Algorithm (UGMA) meters do not have three years data. A randomized assignment of codes was used for the individual manufacturers based on the grain groupings with data for the individual manufacturers, so the code identified as "Meter 1"on the charts represents a the same manufacturer on each chart; "Meter A" is a different manufacturer on each chart; etc.

The overall performance of the meters looked good for most grains with the exception of Long Grain Rice, which had the most variation between the official meter and other meters in the program.

4. Amend Table S.2.5. of §5.56.(a) in NIST Handbook 44 - Update

Source:
NTETC Grain Analyzer Sector

Purpose:
Delete "remotely" from the second paragraph of Category 3 requirements that begins, "When accessed remotely …" to make it clear that the requirements of Category 3 apply whether accessed manually using the keyboard or accessed by remote means, and add the modified second paragraph of Category 3 requirements to Categories 3a and 3b to make it clear that these requirements apply to all the subcategories of Category 3. At the 2013 Annual meeting, S&T item 356-1, amendments to Table S.2.5. of §5.56.(a) in NIST Handbook 44 as noted in the item under consideration below, were adopted.

Item Under Consideration:

Table S.2.5. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods of Sealing***
Category 1: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999). If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.*
Category 2: *Remote configuration capability, but access is controlled by physical hardware.* *A device shall clearly indicate that it is in the remote configuration mode and shall not be capable of operating in the measure mode while enabled for remote configuration.*	*The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999). If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.*
Category 3: *Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password).* *When accessed* ~~***remotely***~~ *for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measuring mode.*	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants). A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)*
Category 3a: *No remote capability, but operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc.) in normal operation.* ***When accessed for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measuring mode.***	*Same as Category 3*
Category 3b: *No remote capability, but access to metrological parameters is controlled through a software switch (e.g., password).* ***When accessed for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measuring mode.***	*Same as Category 3*

[*Nonretroactive as of January 1, 1999* ***and January 1, 201X***]
(Amended 1998 **and 201X**)

Note: Zero-setting and test point adjustments are considered to affect metrological characteristics and must be sealed.

(Added 1993) (Amended 1995 and 1997)

Background / Discussion:
All of the GMMs in Categories 3, 3a, and 3c of Table S.2.5. use an electronic method of sealing, and most of them also offer access to the configuration mode thorough a keyboard entered password. In this mode, sealable parameters can also be changed locally through the keyboard. Category 3 of Table S.2.5. currently includes the following requirement:

> When accessed remotely for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measuring mode.

At its 2011 Grain Analyzer Sector Meeting the sector agreed by consensus that the following changes to Table S.2.5. of §5.56.(a) of *NIST Handbook 44* should be forwarded to the S&T Committee for consideration:

- Add a note to Table S.2.5. to recognize the expanded scope of "remote capability".
- Delete "remotely" from the second paragraph of Category 3 requirements that begins, "When accessed remotely …" to make it clear that the requirements of Category 3 apply whether accessed manually using the keyboard or accessed by remote means.
- Add the modified second paragraph of Category 3 requirements to Categories 3a and 3b to make it clear that these requirements apply to all the subcategories of Category 3.

At the suggestion of National Institute of Standards Technology (NIST), Office of Weights and Measures (OWM), the Table S.2.5. changes approved by the sector in 2011 have been separated into two independent items: one dealing with the changes to Category 3 and its subcategories (as shown in Item Under Consideration) and one dealing with the modification of the definition of remote configuration capability appearing in Appendix D of *NIST Handbook 44* to recognize the expanded scope of "remote capability". This independence insures that one item will not hold up the other from consideration.

At the 2013 Annual meeting, S&T item 356-1, amendments to Table S.2.5. of §5.56.(a) in NIST Handbook 44 as noted in the item under consideration above, were adopted. With the adoption of the amendments to Table S.2.5 the following related changes will be made to both the GMM Chapter and the Near Infrared (NIR) Grain Analyzer Chapter of *NCWM Publication 14*. These changes are shown in Items 4(a), 4(b), and 4(c) following:

4.a. Proposed Changes to Table S.2.5. in Appendix C of the GMM Chapter of Publication 14

Table S.2.5. Categories of Device and Methods of Sealing

Categories of Device		Method of Sealing
Category 1:	No remote configuration capability	Seal by physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999.) If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.
Category 2:	Remote configuration capability, but access is controlled by physical hardware. Device shall clearly indicate that it is in the remote configuration mode and shall not be capable of operating in the measure mode while enabled for remote configuration.	The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters; one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999.) If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.

Category 3:	Remote configuration capability, access may be unlimited or controlled through a software switch (e.g. password.) When accessed ~~**remotely**~~ for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measure mode.	An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants.) A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to twenty-five (25) times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)
Category 3a:	No remote capability, but operator is able to make changes that affect the metrological integrity of the device (e.g. slope, bias, etc.) in normal operation. **When accessed for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measure mode.**	Device shall clearly indicate that it is in the remote configuration mode and shall not be capable of operating in the measure mode while enabled for remote configuration.
Category 3b:	No remote capability, but access to metrological parameters is controlled through a software switch (e.g. password.) **When accessed for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measure mode.**	Remote configuration capability, access may be unlimited or controlled through a software switch (e.g. password.)

Non-retroactive as of January 1, 1999. Amended 1998 ***and 201X***

4.b. Proposed Changes to the Checklist of the GMM chapter of Publication 14

For Category 3 Devices

4.6.36. If a measurement is in process when the device is accessed ~~**remotely**~~ for the purpose of modifying sealable parameters, the measurement is either: ☐ Yes ☐ No ☐ N/A

- Terminated Before Results can be Displayed or Printed. **OR**
- Completed Before Entering the Configuration Mode

4.6.37. When accessed ~~**remotely**~~ for the purpose of modifying sealable parameters, the device clearly indicates that it is in the configuration mode and is not capable of operating in the measure mode. ☐ Yes ☐ No ☐ N/A

4.6.37.1 Describe the method used to seal the device or access the audit trail information:

_____

_____

4.c. Proposed Changes to the Checklist of the NIR Grain Analyzer Chapter of Publication 14

Near Infrared (NIR) Grain Analyzers use an electronic method of sealing similar to those of GMMs, and most of them also offer access to the configuration mode thorough a keyboard entered password. In this mode, sealable parameters can be changed locally through the keyboard. At the 2011 NTETC Graina Analyzer Sector Meeting the sector agreed that contingent upon acceptance of Item Under Consideration the NIR Check List of *NCWM Publication 14* should be modified to delete "remotely" from §4 Design of NIR Analyzers, ¶ 4.9.16 as shown below.

4.9.16. If a measurement is in process when the device is accessed ~~**remotely**~~ for the purpose of modifying sealable parameters, the measurement is either:

4.9.16.1 Terminated Before Results can be Displayed or Printed. **OR** ☐ Yes ☐ No ☐ N/A

4.9.16.2 Completed before entering the configuration mode ☐ Yes ☐ No ☐ N/A

4.9.16.3 Describe the method used to seal the device or access the audit trail information:

_____

_____

Conclusion:
This item was included on the Grain Analyzer Sector's 2013 Agenda as an update on the amendments to Table S.2.5. Categories of Device and Methods of Sealing in NIST Handbook 44, Grain Moisture Meter Code 5.56.(a) that were adopted at the July 2013 NCWM annual meeting. The sector was in agreement with the changes that were adopted at the July 2013 NCWM Annual Meeting and by consensus agreed to the subsequent changes to Publication 14.

5. Item 356-1 Printed Ticket User Requirements – Update

Source:
Grain and Feed Association of Illinois (2012)

Purpose:
Change the mandatory printing of tickets from grain moisture meters to an "on demand at the time of transaction" printing and remove the requirement of printing the calibration version identification. Note that the S&T Committee did not agree with proposed removal of the requirement to print the calibration version identification; this position is reflected in the version of the proposal currently under consideration by the committee. This item was adopted at the 2013 NCWM Annual meeting.

Item Under Consideration:
Amend *NIST Handbook 44*, Grain Moisture Meter Code 5.56.(a) as follows:

UR.3.4. Printed Tickets.

(b) The customer shall be given a printed ticket **at the time of the transaction or as otherwise specified by the customer.** The printed ticket shall include ~~**showing**~~ the date, grain type, grain moisture results, and test weight per bushel, and calibration version identification. The ticket **information** shall be generated by the grain moisture meter system.

(Amended 1993, 1995, ~~**and**~~ 2003, **and 2013**)

Background:
According to the submitter, the user requirement to provide a printed ticket for every single load is unrealistic in the country elevator industry. Traffic patterns at country elevators do not lend themselves to providing a printed ticket to all customers and customers really don't want them. As the speed and capacity increases in the industry,

outbound scales are being located at a distance from the inbound scale and the scale house where the moisture tester is located to alleviate traffic bottlenecks. When the outbound scale is located away from where the ticket is printed, the truck driver must circle back around to pick up the ticket, thus, causing logistical problems. In addition, since meters are sealed, inspected and required to have the correct calibration, there is no need for the calibration version identification to be printed on the ticket. Also, most customers are not going to know if it is the correct calibration version identification or not. There have been problems getting the information from the grain moisture meter to the grain accounting system – especially the calibration version identification. Some grain accounting systems have to be "hard coded" for calibration version identification which must be changed whenever the calibration changes. The change will be at an added cost for the industry.

When a consumer pays at a gas pump, they have the option of a receipt on demand at the time of transaction or not receiving a receipt. There would be a cost savings to moisture meter users as they would save on paper and filing space, and in the situation where the calibration version identification is "hard coded," there will be a cost savings of the expense to have the grain accounting software provider make those changes.

Since moisture meters are capable of printing the ticket, some would argue that they should just go ahead and print them and provide them to the customer. In addition, the requirement does not say when the ticket shall be given to the customer; thus, the printed tickets could be saved for weeks, months, or even years in case the customer had a concern at some point. Printing the calibration version identification ensures the correct calibration is being used.

The submitter proposed amendments to paragraph UR.3.4. Printed Tickets as follows:

UR.3.4. Printed Tickets.

(b) The customer shall be given a printed ticket on **demand at the time of the transaction** showing the date, grain type, grain moisture results, **and** test weight per bushel~~**, and calibration version identification**~~. The ticket **information** shall be generated by the grain moisture meter system.

(Amended 1993, 1995, ~~**and**~~ 2003, **and 20XX**)

At the 2011 Central Weights and Measures Association (CWMA) Interim Meeting some jurisdictions opposed the proposal citing that it is a fundamental element of a point of sale transaction that there is either a witness to the transaction or that a receipt is made available. Others supported the item and recognized that many customers refuse to take the printed tickets. The CWMA believes that the calibration version identification is not necessary on the ticket since most jurisdictions are already verifying the calibrations version when the device is inspected. This proposal is not eliminating the opportunity for the seller to obtain a printed ticket. The CWMA forwarded the item to NCWM, recommending it as a Voting Item.

At the 2011 Western Weights and Measures Association (WWMA) Annual Meeting the committee heard no comments on this item. The WWMA amended the proposal to make the language consistent with other codes such as 3.32. LPG and Anhydrous Ammonia Liquid-Measuring Devices Code paragraph UR.2.6. Ticket Printer: Customer Tickets. The WWMA forwarded the modified version below to NCWM, recommending it as a Voting Item.

UR.3.4. Printed Tickets.

(b) The customer shall be given a printed ticket ~~showing~~ at the time of the transaction or as otherwise specified by the customer. The printed ticket shall include the date, grain type, grain moisture results, and test weight per bushel, ~~and calibration version identification~~. The ticket information shall be generated by the grain moisture meter system.

(Amended 1993, 1995, ~~**and**~~ 2003, **and 20XX**)

At the 2011 Northeastern Weights and Measures Association (NEWMA) Interim Meeting there were no comments. Deferring to the expertise of the NTETC Grain Analyzer Sector, NEWMA forwarded the item to NCWM, recommending it as a Developing Item.

At the 2011 Southern Weights and Measures Association (SWMA) Annual Meeting, Ms. Butcher, NIST Technical Advisor, noted that the proposed language submitted was slightly different from that discussed by the NTETC Grain Analyzer Sector and provided a summary corresponding to this item prepared by Ms. Lee, Grain Analyzer Sector Technical Advisor. Ms. Butcher also pointed out that WWMA proposed alternate language that is consistent with printed tickets requirements in other codes. The SWMA agreed that the customer should be given the option of receiving a printed ticket from a transaction and that the proposed changes would clarify the responsibility of the device user. The SWMA preferred the option forwarded by WWMA since it mirrors existing language in other *NIST Handbook 44* codes. The SWMA forwarded the item to NCWM, recommending it as a Voting Item as revised by WWMA.

At the 2012 NCWM Interim Meeting, the S&T Committee received comments in support of the alternative language submitted by the WWMA. NIST, OWM reported that the proposed language submitted to the regional weights and measures associations was different from that agreed to by the Grain Analyzer Sector at its August 2011 meeting. The Grain Analyzer Sector had specifically opposed deleting the phrase "calibration version identification." NIST, OWM also noted that not all grain moisture meters are Category 3 devices; consequently, calibration version identification information is a critical component on the printed receipt to reconstruct the basis for a sale and help officials to resolve complaints.

The committee agreed that the version proposed by WWMA and SWMA was preferable since it mirrors similar language in other *NIST Handbook 44* Codes. The committee also agreed that, given the Grain Analyzer Sector's opposition to deleting the reference to "calibration version identification," this phrase should be retained in the paragraph. The committee presented an amended version of the proposal. The committee recognized that the regional associations were not aware of the sector's position on the proposed deletion of the reference to the calibration version and that the submitter has not had an opportunity to review the significant changes from the original version. The 2012 S&T Committee designated this item as an Informational Item to allow additional opportunity for input.

At the Sector's August 2012 meeting one member suggested that the phrase "or as otherwise specified by the customer" be modified to read "or as agreed to by the customer". Customers are not going to proactively specify how elevator record keeping systems are put together, but they can agree that this information comes on a settlement sheet. A contract for the sale of grain at some future date with XYZ Grain contains a phrase that the seller agrees to XYZ Grain's various transaction policies. By signing the contract, the seller agrees to accept settlement sheet information via a web listing that can be accessed with a computer or possibly using a smart phone. The seller is not "specifying" how he wants to receive the "ticket" information, he is just "agreeing" to receive it in a different manner.

The wording proposed by the Sector in 2011, "A printed ticket shall be made available to the customer upon request at the time of transaction…" did not require the customer to do anything if he didn't want a ticket, but it did require him to ask for one if he wanted one. The wording in the Item under Consideration required the customer to say, "I don't want a ticket ...." if a ticket wasn't wanted. If he said nothing, he would be given a ticket (or offered one).

Other Sector members felt that the wording of the Item under Consideration allowed flexibility, and most were in favor of accepting the Item under Consideration. An attempt to obtain a consensus on the S&T Committee's proposal was unsuccessful due to one jurisdiction's belief that …"a ticket is given to the customer no matter what."

There was further discussion on whether the wording in the Item under Consideration, "….. at the time of the transaction or as otherwise specified by the customer" means that the customer gets a ticket at the time of transaction or at a later specified time. Some believed that "as otherwise specified by the customer" could mean "Never" or "in another form". Sector Chairman, Ms. Cassie Eigenmann, DICKEY-john, Corp., reminded the Sector that the reason Illinois Grain & Feed Association submitted the request for change was because they did not want to have to print a ticket at the time of transaction unless the customer requested one at the time of transaction.

It was pointed out that unless a ticket is printed by the GMM before the grain sample is "dumped" from the GMM it may not be possible for the GMM to print a ticket for that transaction. The information, however, could reside in the memory of the elevator's grain transaction system and could be printed in another form e.g., on a settlement sheet that is sent (or transmitted) to the seller later. Further discussion suggested that the S&T proposed wording could be interpreted to mean that elevators that captured GMM information in their grain transaction system at the time of transaction would not have to supply a GMM printed ticket at time of transaction unless requested by the customer at time of transaction. If the elevator is using a GMM that is equipped to record and that was put into service **before** January 1, 1998, the elevator would be required to give the customer a printed ticket at the time of transaction (need print only percent moisture content and grain selected).

At the 2012 Grain Analyzer Sector meeting, the sector agreed in a vote of 9 in favor and 1 opposed to the item under consideration.

WWMA received no comments on this item at its 2012Annual Meeting. The WWMA believed the intent in the amended proposed language is similar to other codes in HB 44 and sufficiently gives options of how printed tickets are provided to the customer. WWMA supported the item and recommended that it be a Voting Item.

NEWMA supported this item as a "Voting" item at both its 2012 Interim Meeting and 2013 Annual Meeting.

The SWMA received no comments at its 2012 Annual Meeting. The Committee recognized that the NCWM S&T Committee designated this as an Information Item to allow additional time for the weights and measures community, including the original submitter to review the changes made to the proposal during the 2012 NCWM Interim Meeting. The Committee believes that adequate time has elapsed to allow for comment. The Committee noted that the NTEP Grain Sectors have also reviewed the proposal, as modified, and have expressed no opposition. SWMA recommended that the item be a Voting Item.

During its Open Hearings at the 2013 NCWM Interim Meeting, the Committee heard comments from Ms. Juana Williams (NIST OWM) who noted that OWM believes the suggested changes to UR.3.4. Printed Tickets are appropriate and notes that the language is similar to other codes in NIST Handbook 44. OWM agrees with the Grain Analyzer Sector's decision to retain the requirement for recording the "calibration version identification." OWM notes that while "Category 3" devices would require the printing of the calibration version identification information, not all grain moisture meters are "Category 3" devices. Having this information printed on receipts provides customers and officials with the means to verify that correct calibration settings are being used for a given transaction. The Committee received no other comments on this item. Hearing no opposition to the proposed changes, the Committee agreed to recommend the proposal for a vote.

On the 2013 NCWM Online Position Forum, one Government representative opposed the proposal, with no additional comments. During Open Hearings at the 2013 NCWM Annual Meeting, the Committee heard no comments in opposition to this item. NIST OWM reiterated its comments from the 2013 Interim Meeting. The item under consideration was adopted at the 2013 NCWM Annual Meeting.

Conclusion:
This item was included on the Grain Analyzer Sector's 2013 Agenda as an update on the amendments to UR.3.4. Printed Tickets in NIST Handbook 44, Grain Moisture Meter Code 5.56.(a) that were adopted at the July 2013 NCWM annual meeting. The sector was in agreement with the changes that were adopted at the July 2013 NCWM Annual Meeting.

6. Modify the Definition of Remote Configuration Capability Appearing in Appendix D of NIST Handbook 44 to Recognize the Expanded Scope of "Remote Configuration Capability" (S&T Developing item 360-7)

Source:
NTETC Grain Analyzer Sector

Purpose:
Table S.2.5. *Categories of Device and Methods of Sealing* that appears in §5.56.(a) of *NIST Handbook 44* lists acceptable methods of sealing for various categories of GMMs. When the sector first recommended adding the table to *NIST Handbook 44* at their September 1996 meeting, the concept of making a change to a GMM from a remote site involved information " …sent by to the device by modem (or computer)." In 2011 this concept has expanded to include the ability of the measuring device to accept new or revised sealable parameters from a memory chip (e.g., an SD Memory Card that may or may not itself be necessary to the operation of the device), external computer, network, or other device plugged into a mating port (e.g., Universal Serial Bus (USB) port) on the measuring device or connected wirelessly to the measuring device. The changes proposed in Item Under Consideration expand the scope of "remote configuration capability" to cover instances where the "other device" may be necessary to the operation of the weighing or measuring device or which may be considered a permanent part of that device.

Item Under Consideration:

> **remote configuration capability. –** The ability to adjust a weighing or measuring device or change its sealable parameters from or through some other device that ~~**is not**~~ **may or may not** itself **be** necessary to the operation of the weighing or measuring device or ~~**is not**~~ **may or may not be** a permanent part of that device.[2.20, 2.21, 2.24, 3.30, 3.37, 5.56(a)]
>
> (Added 1993, **Amended 20XX**)

Background / Discussion:
Two common types of removable data storage devices are the USB flash drive and the Secure Digital (SD) memory card. A USB flash drive is a data storage device that includes flash memory with an integrated USB interface. USB flash drives are typically removable and rewritable, and physically much smaller than a floppy disk. A SD card is a non-volatile memory card format originally designed for use in portable devices. The SD standard is maintained by the SD Card Association.

Removable digital storage devices can be used in GMMs as either "data transfer" devices which are not necessary to the operation of the GMM or as "data storage devices" which are necessary to the operation of the GMM.

A USB flash drive is most likely to be used as a "data transfer" device. In a typical "data transfer" application, the USB flash drive is first connected to a computer with access to the web. The computer visits the GMM manufacturer's web site and downloads the latest grain calibrations that are then stored in the USB flash drive. The USB flash drive is removed from the computer and plugged into a USB port on the GMM. The GMM is put into "remote configuration" mode to copy the new grain calibration data into the GMM's internal memory. When the GMM has been returned to normal operating (measuring) mode the USB flash drive can be removed from the GMM.

Although an SD memory card could also be used as a "data transfer device" it is more likely to be used as a "data storage device". In a typical "data storage device" application, the SD memory card stores the grain calibrations used on the GMM. The SD memory card must be plugged into an SD memory card connector on a GMM circuit card for the GMM to operate in measuring mode. To install new grain calibrations the GMM must be turned "off" or put into a mode in which the SD memory card can be safely removed. The SD memory card can either be replaced with an SD memory card that has been programmed with the new grain calibrations or the original SD memory card can be re-programmed with the new grain calibrations in much the same way as that described in the preceding paragraph to copy new grain calibrations into a USB flash drive. In either case, the SD memory card containing the new calibrations must be installed in the GMM for the GMM to operate in measuring mode. In that regard, the SD memory card) can be considered a "permanent part" of the GMM in that the GMM cannot operate without it.

Note: In the above example "SD memory card" could be any removable flash memory card such as the Secure Digital Standard-Capacity, the Secure Digital High-Capacity, the Secure Digital eXtended-Capacity, and the Secure Digital Input/Output, which combines input/output functions with data storage. These come in three form factors: the original size, the "mini" size, and the "micro" size. "Memory Stick" is a removable flash memory card format,

launched by Sony in 1998, and is also used in general to describe the whole family of Memory Sticks. In addition to the original Memory Stick, this family includes the Memory Stick PRO, the Memory Stick Duo, the Memory Stick PRO Duo, the Memory Stick Micro, and the Memory Stick PRO-HG.

At its 2012 meeting the Grain analyzer Sector agreed by consensus to accept the Item Under Consideration and recommended forwarding this item to the S&T Committee for consideration.

2012 WWMA Annual Meeting: Ms. Juana Williams (NIST OWM) supported the intent. She talked about this item in conjunction with Item 356-1, S.2.5. Categories of Device and Methods of Sealing. This is a complex item affecting multiple other devices; therefore the proposal requires further consideration. The language in the proposal to amend the definition of remote configuration capability is confusing. The Committee believes the current definition already allows the use of remote configuration devices and allows the flexibility desired. The ramifications of changing the definition could affect other devices in HB 44. WWMA did not forward this item to NCWM.

2012 SWMA Annual Meeting: There were no comments. After reviewing the proposal and considering the potential impact on other device types, the Committee recommended this as a Developing Item. The Committee asks that the Sector continue to obtain input on the definition and the impact the changes would have on other device types. SWMA forwarded the item to NCWM, recommending it as a Developing Item and assigning its development to the Grain Analyzer Sector.

During its Open Hearings at the 2013 NCWM Interim Meeting, the Committee heard comments from Ms. Juana Williams (NIST OWM). OWM suggests the Committee consider this item as a Developing item to allow other Sectors to discuss how a change to the definition may affect other device types of similar design and to consider changes if needed. OWM recognizes that the current definition for "remote configuration capability" may <u>not</u> address those grain moisture meters (GMMs) which can only be operated with a removable data storage device, containing, among other things, the grain calibrations intended for use with the GMM, inserted in the device (as was described by the Grain Analyzer Sector). As such, OWM notes that current sealing requirements were developed at a time when such technology likely didn't exist, nor could be envisioned, and are based on the current definition of remote configuration capability. Because the current definition was never intended to apply to this "next generation" technology, OWM suggests that those charged with further development of this item may wish to revisit the five philosophies of sealing and consider whether a new paragraph, completely separate from current sealing requirements, might be appropriate and a better option, than the one currently proposed. The five philosophies of sealing are included in the 1992 Report of the 77th National Conference on Weights and Measures (Report of the Specifications and Tolerances Committee). Another option, preferred over the changes currently proposed, would be to add a separate statement to the current definition of "remote configuration capability" to address removable storage devices. For example, the following sentence might be considered as an addition to the current definition for "remote configuration capability:"

> **<u>Devices which are programmed using removable media (such as SD cards, flash drives, etc.) that may or may not be required to remain with the device during normal operation are also considered to be remotely configured devices.</u>**

The Committee also heard comments from Dmitri Karimov (LC), speaking on behalf of the MMA, who made two points: (1) Flow computers may already have these capabilities, thus it may be more appropriate to consider adding requirements to the General Code so that the requirements will be uniformly applied to all device types; and (2) the Committee should look ahead and consider other capabilities that may or already have emerged such as wireless communication and configuration.

The Committee acknowledged the comments indicating that the current definition of "remote configuration capability" was developed at a time when certain technologies, such as blue tooth, SD storage devices, flash drives, etc., didn't exist. The Committee recognized that it may be difficult to modify the existing definition and associated requirements to be flexible enough to address emerging and future technologies without having a significant (and possibly detrimental impact) on existing devices. Consequently, rather than modifying the current definition, the Committee concluded that a better approach might be to develop an entirely separate set of security requirements that would apply to emerging technologies. The Committee believes that additional work is needed to develop

proposed definition(s) and associated requirements and decided to designate the item as Developmental. The Committee requests other Sectors review the Grain Sector's proposed modification to the definition as well as OWM's suggestions and provide input.

At their 2013 Annual Meetings, both NEWMA and CWMA supported this as a "Developing" item. NEWMA heard from NIST who encouraged members to consider this work as it applies to all device types.

On the 2013 NCWM Online Position Forum, one Government representative indicated a neutral position on this item with no additional comments.

At the 2013 NCWM Annual Meeting Open Hearings, the Committee heard comments from Juana Williams (NIST OWM) who reiterated OWM's comments from the 2013 Interim Meeting, suggesting that it may be appropriate to develop separate requirements to address new and future technologies which can be remotely configured with removable media. OWM plans to develop draft language and ask for input from the various Sectors at their upcoming meetings. Ms. Williams also noted the suggestion made at the 2013 NCWM Interim Meeting by Dmitri Karimov, LC, speaking on behalf of the MMA, that a provision might be added to the General Code to address this type of equipment.

Julie Quinn (MN) agreed with OWM's comments and indicated support for possibly including requirements in the General Code to address newer and emerging technologies. Dmitri Karimov (LC), speaking on behalf of MMA, concurred with this suggestion.

The sector is asked to review and discuss the proposed language, and propose any additional language for changes to the definition of remote configuration capability.

Conclusion:
At the time of the August 2013 Grain Analyzer Sector Meeting, OWM had not drafted a definition for remote configuration capability to address devices which are programed using removable media such as SD cards or flash drives. During the August 2013 grain analyzer sector meeting, the Sector discussed other ways devices can be remotely confirgured that should also be considered when drafting a definition for remote configuration capability to address these devices.

Mr. Hurburgh mentioned that we also need to consider devices that use cloud computing to remotely confirgure a device and suggested that we consider the various ways a device can be remotely confirgured.

The sector agreed that OWM should develop a proposal for a definition for remote configuration capability that addresses devices that use removable media such as SD cards, flash drives or other methods not covered by the existing definition.

7. Status of Interagency Agreement and Impact of UGMA (new GIPSA designated) Meter on Another 5-year Agreement

Source:
Cathy Brenner, USDA, GIPSA

Background/Discussion: The current Interagency Agreement is the fourth 5-year agreement of the on-going calibration program. The agreement was signed in March 2010 and runs through analysis of the 2014 crop and issuance of the 2015 Certificates of Conformance. Thus, we have just started the fourth year of the current agreement. It should be noted that annual calibration activities occur in two government fiscal years and are better defined by a starting date of July 1. The current 5-year agreement 2010-2014 is included in the table below:

Proposed NTEP On-going Calibration Program Fee Schedule For Year 2010 to 2014							
(1) Total Meters (including official meter)	(2) Meters In NTEP Pool	(3) Cost Per Pool Meter	(4) Total Program Cost	Funding Contribution From Participants			
				(5) NIST	(6) GIPSA	(7) Mfg's (total funding from mfg's)	(8) Cost Per Meter Type
2	1	22,500	22,500	7,500	7,500	7,500	3,750
3	2	22,500	45,000	15,000	15,000	15,000	5,000
4	3	22,500	67,500	22,500	22,500	22,500	5,625
5	4	22,500	90,000	30,000	30,000	30,000	6,000
6	5	22,500	112,500	30,000	30,000	52,500	8,750
7	6	22,500	135,000	30,000	30,000	75,000	10,715
8	7	22,500	157,500	30,000	30,000	97,500	12,185
9	8	22,500	180,000	30,000	30,000	120,000	13,335

Explanation of columns in the Fee Schedule table:

Column	Explanation (or formula for calculating)
(1) Total Meters	The number of meter types (including the Official GIPSA meter) that will share in the NTEP calibration costs.
(2) Total Meters in NTEP Pool	The number of meter types other than the Official meter that will share in the NTEP calibration costs.
(3) Cost per Pool Meter	The cost associated with each pool meter in the program.
(4) Total Program Cost	A per meter type cost of $22,500 times the number of NTEP "pool" meters.
(5) NIST Contribution	One-third the total program cost up to a maximum of $30,000.
(6) GIPSA Contribution	One-third the total program cost up to a maximum of $30,000.
(7) Manufacturers Contributions (total funding from manufacturers)	Total Program Cost minus NIST Contribution minus GIPSA Contribution.
(8) Cost per Meter Type	Manufacturers' Contributions divided by Total Meters (including the Official meter).

The GIPSA Technology and Science Division is currently seeking, and expects to obtain, Agency support for another Interagency Agreement. Challenges include a continuing government-wide emphasis on fee supported programs. We would like to complete GIPSA discussion this fall and draft a proposal for NIST consideration next spring.

Program costs are difficult to project. GIPSA recently evaluated its fee structure for evaluation testing and is in the process of evaluating fee structures for the commodity program (currently used for reference lab fees). The fee structure has a built in annual fee increase and there is discussion of building in annual fee increases for the commodity program as well. Listed below is the evaluation testing fee structure as published in the Federal Register, http://www.gipsa.usda.gov/Federal%20Register/fr13/04-15-2013a.pdf , for May 2013 through Fiscal Year 2017.

Effective Date	**Hourly Rate**
May 1, 2013	$87.40
October 1, 2013	$89.20
October 1, 2014	$91.00
October 1, 2015	$92.90
October 1, 2016	$94.80

On May 1, 2013, GIPSA completed the transition from the Dickey-john GAC2100 to the GIPSA UGMA master system using the Dickey-john GAC2500-UGMA and the Perten AM5200-A as the official moisture meters. GIPSA is in the early stages of determining how the program to maintain the official inspection system moisture calibrations may change due to the implementation of the UGMA technology for official moisture determinations. The NTEP

Phase II, On-going Calibration Program, is built on top of the official moisture calibration program. TSD believes that the on-going calibration program has been very successful in meeting standardization goals and is working to keep fee increases at a reasonable level as it is extremely unlikely that either NIST or GIPSA will be able to increase their support beyond the current maximum of $30,000 per year.

In order to provide the standardization services to the commercial system, GIPSA TSD is currently discussing options for improving the process and reducing the burden on all parties. GIPSA is seeking input from the sector on limiting the number of samples tested to a maximum of 10 samples per 2-percent moisture interval for all grains.

At the August 2013 Grain Analyzer Sector meeting, the sector discussed limiting the samples tested per 2-percent moisture interval in the ongoing calibration program to a minimum to keep any fee increase to a minimum for this testing. It was noted that fewer sample are needed to calibrate the new UGMA meters It was also noted that GIPSAs fees are increasing and with no changes to the program the manufacturers fees will increase. During the discussion one alternate proposal was to base the cost on 1/3 shared cost of the program where GIPSA and NIST cover 1/3 the cost of the program each and manufacturers split 1/3 the cost. It was noted during the meeting that due to budget issues GIPSA and NIST will likely not be able to fund more that the 30,000 per year.

Conclusion:
Ms. Brenner agreed to review the statistics to determine how the sample size of up to 30 samples per 2-percent moisture interval per grain type was established and to investigate the impact of reducing the sample size to 10 sample per 2-percent moisture interval per grain type. The sector agreed by consensus to reduce the number of samples used in the ongoing calibration program for each 2-percent moisture range per grain type as long as the integrity of the program is not affected.

8. Near Infrared Corn NTEP Support

Source:
Cathy Brenner, USDA GIPSA `

Purpose:
When the NIR Corn constituent ranges listed in Publication 14 were created, there was a market for high oil corn. That market has changed and GIPSA is not receiving these types of samples which are needed to maintain the sample set criteria currently listed in Publication 14. In 2012, Iowa State University received some high oil corn samples from a seed company. Iowa State informed the NTEP laboratory that organic breeders are increasing oil in some specialty hybrids. The NTEP lab is working with Iowa State to obtain additional samples to try and rebuild its sample library for two complete sets of NIR Corn Accuracy.

Item Under Consideration:
The question for the sector is whether or not NCWM Publication 14 should be changed to exclude corn or change the oil constituent range in NCWM Publiation 14 from the 3 – 9 range at 0% M.B to a commodity corn oil constituent range of 3 – 5 range at 0% M.B. It should also be noted that Publication 14 includes constituent ranges and tolerances for corn starch. The NTEP laboratory has not evaluated any NIR instruments for corn starch due to the difficulties in obtaining the samples that meet the requirements for the accuracy set.

Proposed changes to NCWM Publication 14, Near Infrared:

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 (%)	Low Moisture Range	High Moisture Range

		at Moisture Basis (M.B.) Shown		
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.		
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~~ **Or** Corn	Protein	8 – 12 at 0% M.B.	11% – 13%	14% – 16%
	~~Oil~~ **Or** Oil	~~3 – 9 at 0% M.B.~~ **Or** 3 – 5 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

Background / Discussion:
The challenge is that Iowa State may not have sufficient samples that are large enough to provide the NTEP laboratory with appropriate amounts of the samples to allow for testing. When testing, the laboratory will consume approximately 150 grams from each sample. Iowa State has also worked with several NIR manufacturers to develop corn calibrations for their instruments and may not have a large number of samples that have not been included in any of these calibrations. Dr. Charles Hurburgh also indicated that the newer high oil hybrids may not be well predicted on the current GIPSA calibration that is used to screen samples for the accuracy set selection.

The Grain Analyzer Sector is asked to consider the proposed change and discuss the proposed changes during the sector meeting.

At the August 2013 Sector meeting Ms. Brenner restated her concerns with getting an appropriate sample size to perform the official test for high oil corn and her proposal to reduce the constituent range for corn as shown above. It was noted during the discussion that there is a limited market for high oil corn because of the current market for other oils. It was also noted that business conducted for high oil corn is done on a contractual basis.

Conclusion:
The sector agreed by consensus to leave the current ranges as listed in Publication 14 and the type of corn used within the stated range will be supported by statistics.

9. Test Weight per Bushel Acceptance and Maintenance Tolerance

Source:
Mr. Jeffrey D. Adkisson, Grain and Feed Association of Illinois

Purpose:
Due to problems cited in the grain and feed industry, review and make any needed changes to the test weight per bushel tolerances in *NIST Handbook 44* Section 5.56(a).

Item Under Consideration:
During the discussion of this item at the 2012 sector meeting it was noted that because the system is rapidly changing over to the new UGMA technology which is going to result in the improvement in TW readings, TW should resolve itself as older instruments are retired. It was also mentioned that test weight data is needed to review the current system to make any needed changes to test weight per bushel and that sample selection when testing meters for test weight, should be reviewed. It was receommended that TW per bushel comparison charts be developed for review. Cathy Brenner developed these charts and the Sector is asked to review these charts for discussion during the meeting. The charts are available for review or can be downloaded for printing at the following web address:

http://www.ncwm.net/resources/dyn/files/1081742zef27d924/_fn/TW+2013+Sector+Meeting.pdf

Background / Discussion:
This is a carryover from the sector's 2011 meeting. Mr. Adkisson, Grain and Feed Association of Illinois, cited problems his industry is having regarding Test Weight (TW) per bushel. GMMs that have failed TW during field inspection are sent to the manufacturer for repair. When the meters are returned, the reports indicate that no problems have been found. There are also situations where a meter has failed TW. When the state inspector subsequently tested the elevator's quart kettle it matched the meter, but it didn't match the state inspector's sample. This is particularly frustrating for the country elevators in Illinois that are using the GMM TW only as a screening tool.

At the Sector's August 2011 meeting a task group was formed to investigate the whole TW system with the goal of defining procedures that would improve TW both for the user and for the inspection system. Past data obtained by the Sector had indicated that the existing tolerances were reasonable. It was felt that increasing TW tolerances would only cover up the problems. What was needed was an investigation of the whole system of calibrating meters, then translating that calibration into the field, and then keeping it that way.

Dr. Charles R. Hurburgh, Jr., Iowa State University, agreed to head the task group. Other TW Task Group members included:

- Mr. Jeffery Adkisson – Grain and Feed Association of Illinois
- Ms. Diane Lee – NIST, OWM
- Ms. Cassie Eigenmann – DICKEY-john Corporation
- Mr. Ivan Hankins – Iowa Department of Agriculture/Weights and Measures
- Mr. Tim Kaeding – Perten Instruments, Inc.
- Mr. Karl Cunningham – Illinois Department of Agriculture

Further action on the issue of tolerances was postponed until the TW Task Group was able to recommend appropriate action.

In Early 2012 the TW Task Group developed the following list of Action Items:

- Survey the grain industry as to the frequency of discounting each of the major grains (wheat, corn, and soybeans) for test weight, and within those discounted the frequency of use of the meter test weight versus the cup-bucket test weight.
- Survey the industry for comparative data between meters and an Official GIPSA agency on the same samples.
- Develop a draft procedure for sample selection and pre-qualification

Dr. Hurburgh reported that discounting for low TW was not an issue in either 2010 or 2011. TWs for corn were so high that discounting was not an issue. Within Iowa most grain elevators were using the TW reported by their GMM. Only a few were using the standard quart kettle method. This is likely to change in the 2012 harvest as low TWs are likely to be more common. Also, there may not be as much TW increase in drying as would normally be expected. TW may come up again as a discount factor.

Same sample TW data has not been collected comparing grain elevator GMMs with an Official GIPSA agency. Dr. Hurburgh explained that this information should be relatively easy to obtain, because in almost every case when a train is officially graded the samples are run at the grain elevator first. Since last year's sector meeting, the rapid acceptance of the new UGMA GMMs as Official Meters for corn, soybeans, sunflowers, and grain sorghum (with the remaining grains scheduled to switch to UGMA GMMs for Official Inspection on May1, 2013), has altered some of the issues. The new technology not only provides a better moisture measurement, but a better TW measurement as well.

The remaining action item that the task group believed was necessary was a procedure for pre-qualifying TW samples as being good predictors for the TW function as well as moisture function. Most States pre-screen moisture samples to get the outliers out of the system. That pre-qualification would have to be expanded if TW is to be actively used to reject meters on the basis of TW.

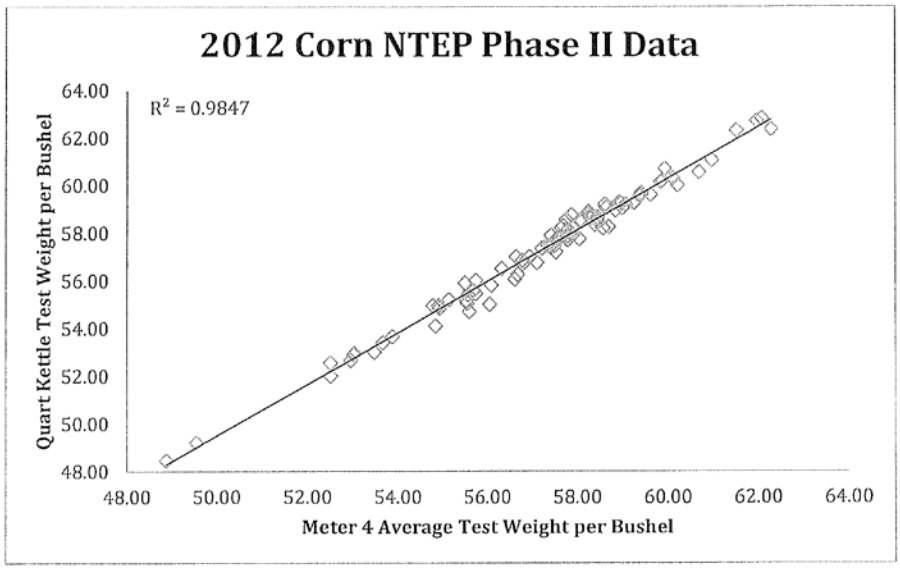
Dr. Hurburgh recommended that the sector not adjust TW tolerances at this time, because the system is rapidly changing over to the new technology which is going to result in the improvement in TW readings. The problem should resolve itself as older instruments are retired.

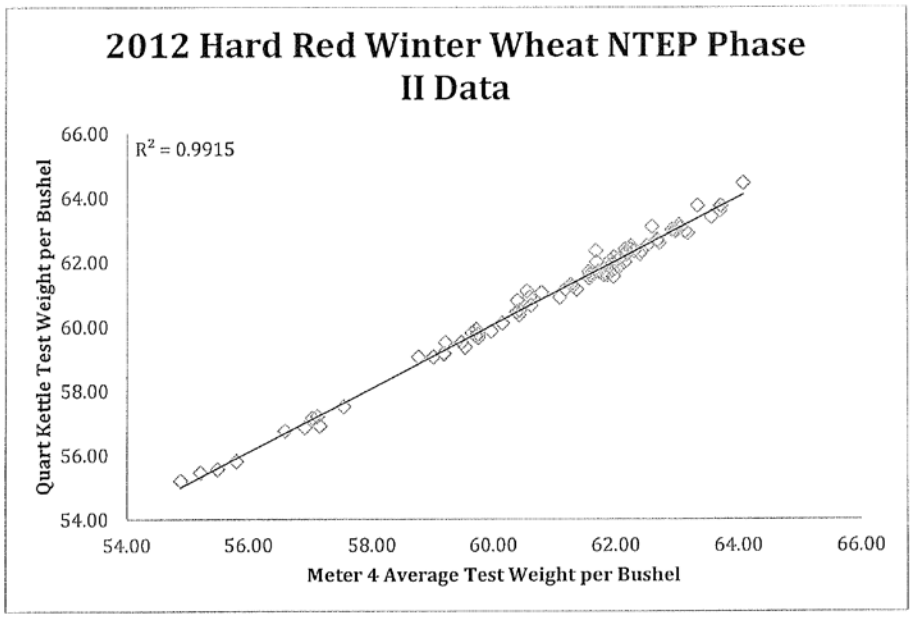
Mr. Karl Cunningham, Illinois Dept of Agriculture, informed the Sector that Illinois's TW rejection rate has gone down in the last two years. He has no problem with TW on the meters in his laboratory and doesn't think the present tolerances are a problem. Many of the field problems may be due to rough handling of the meters during shipping. Mr. Cunningham advises elevators who have to have their devices worked on to take them to the manufacturer's service department themselves if at all possible.

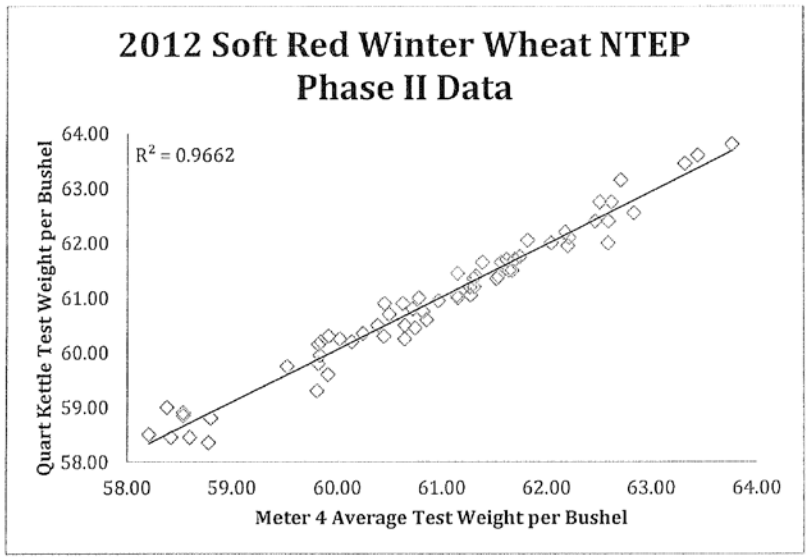
Mr. Tim Kaeding, Perten Instruments, suggested that there might be value in expanding the Phase II OCP grain moisture comparison charts to include TW. Dr. Hurburgh recommended that a TW comparison chart showing the spread of TW measurements for individual meters against the corresponding official quart kettle TW measurements would address the tolerance issue, whereas a bias plot would not. He suggested plotting meter TWs on the x-axis and quart kettle results on the y-axis. A best-fit line could be drawn for each meter.

The sector agreed that TW comparison charts should be prepared for the 3 grains which are most likely to be subject to discounts on the basis of TW: Corn and two wheat classes. The wheat classes selected were: Hard Red Winter and Soft Red Winter. Manufacturer approval is required for NTEP Phase II TW performance data to be released for publication even if individual instruments are not identified. The two meter manufacturers present indicated that they would approve the release of this data. Permission would have to be obtained from the other manufacturers. The sector agreed to postpone further action on changing TW tolerances until more information was available.

At the August 2013 Sector Meeting Ms. Brenner reviewed test weight per bushel data for Corn, Hard Red Winter Wheat and Soft Red Winter Wheat (See charts below). The data showed that NTEP meters aligned closely with the official quart kettle test weight per bushel measurements. States noted that they have seen a significant improvement in test weight per bushel measurements and lower complaints have been received concerning test weight. Karl Hansan stated that he is collecting data on the moisture changes in grain samples over time when using the samples in the field. This data can be used to improve the field inspection of the test weight per bushel measurements on grain analyzers. Ms. Lee, provided a draft copy of a weights and measures newsletter article entitled "Determining Reference Test Weight per Bushel Value of Grains." Following the August Sector Meeting the article was published in the Weights and Measures Newsletter and can be accessed at: http://www.nist.gov/pml/wmd/pubs/upload/WMConnections.pdf This article will help to ensure that States are following proper procedures when assigning reference test weight per bushel values to grains used to test instruments that provide test weight per bushel measurements.


2012 Corn NTEP Phase II Data
R^2 = 0.9847
Quart Kettle Test Weight per Bushel
64.00
62.00
60.00
58.00
56.00
54.00
52.00
50.00
48.00
48.00
50.00
52.00
54.00
56.00
58.00
60.00
62.00
64.00
Meter 4 Average Test Weight per Bushel


2012 Hard Red Winter Wheat NTEP Phase II Data
R^2 = 0.9915
Quart Kettle Test Weight per Bushel
66.00
64.00
62.00
60.00
58.00
56.00
54.00
54.00
56.00
58.00
60.00
62.00
64.00
66.00
Meter 4 Average Test Weight per Bushel



Conclusion:
The sector agreed to continue to monitor the issue of test weight per bushel and Mr. Hansan agreed to share the field data on the changes in grain samples used in field testing.

10. Report on International Organization of Legal Metrology (OIML) TC 17/SC 1 R 59 *Moisture Meters for Cereal Grains and Oilseeds* and proposed changes to the NTEP humidity test for grain moisture meters and near infrared grain analyzers

Source:
Cathy Brenner, USDA, GIPSA

Purpose:
Harmonize OIML and NTEP test procedures to align the U.S. humidity test procedures with the OIML D11 Damp Heat test procedure.

Item Under Consideration:
Replace the current Humidity test in Publication 14 for both moisture and protein with the International OIML D11 Damp heat test as shown below. If the following changes are approved, then the detailed procedure in Appendix A for Grain Moisture Meters will need to be revised by the NTEP laboratory.

For Grain Moisture Meters –

~~**Humidity**~~
~~Each instrument (power on) will be placed in an environmental chamber at 22 °C and a relative humidity of 20% for 16 hours. A single HRW sample (12% 14% moisture content) will then be analyzed 10 times. The relative humidity will be raised to 90% (22 °C) and, after the instrument has equilibrated at this humidity for at least 16 hours, the HRW sample will again be analyzed 10 times. A maximum bias shift of (0.20% of grain moisture content is allowed between the average of 10 readings made at 20% relative humidity and those made at 90% relative humidity.~~

Damp Heat
Each instrument (power on) will be placed in an environmental chamber at 22 °C and 30% relative humidity for 16 hours. Three HRW wheat samples, one selected from each of the 2% moisture intervals, will be placed

in the environmental chamber two hours prior to testing. Each sample will be analyzed five times and removed from the chamber. The environmental chamber will be set to the maximum ambient temperature specified by the manufacturer or 45 °C whichever is less and a relative humidity of 50% but not to exceed the absolute humidity of 20g/m^3 for 16 hours. The samples will be placed in the environmental chamber two hours prior to testing. Each sample will be analyzed five times. A maximum bias shift of 0.18% of grain moisture content per sample is allowed between the average readings at the lower temperature and those made at the higher temperature.

For Near Infrared Grain Analyzers –

~~**Humidity**~~
~~Each instrument (power on) will be placed in an environmental chamber at 22 °C and a relative humidity of 20% for 16 hours. A single HRW sample will then be analyzed 10 times. The relative humidity will be raised to 90% (22 °C.) After the instrument has equilibrated at this humidity for at least 16 hours, the HRW sample will again be analyzed 10 times.~~

~~A maximum bias shift of ± 0.20 is allowed between the average of 10 readings made at 20% relative humidity and those made at 90% relative humidity.~~

Damp Heat
Each instrument (power on) will be placed in an environmental chamber at 22 °C and 30% relative humidity for 16 hours. Three HRW wheat samples, one selected to represent the low (10%-12%), medium (12%-14%), and high (14%-16%) protein levels, will be placed in the environmental chamber two hours prior to testing. Each sample will be analyzed five times and removed from the chamber. The environmental chamber will be set to the maximum ambient temperature specified by the manufacturer or 45 °C whichever is less and a relative humidity of 50% but not to exceed the absolute humidity of 20g/m^3 for 16 hours. The samples will be placed in the environmental chamber two hours prior to testing. Each sample will be analyzed five times. A maximum bias shift of 0.18% of grain moisture content per sample is allowed between the average readings at the lower temperature and those made at the higher temperature.

Background / Discussion:
This item was included on the sector's agenda to provide a summary of the activities of OIML TC17/SC1 for the grain analyzer sector and to those Sector members that participate on the United States National Working Group (USNWG) on grain moisture meters. In addition the sector is asked to review a proposal to change the Humidity test in NCWM Publication 14 to align with the OIML D11 and IEC damp heat test procedure.

OIML TC17/SC1 was tasked to revise OIML R 59 *Moisture Meters for Cereal Grains and Oilseeds* to reflect new technologies and acual grain analysis. The Co-Secretariats (China and the United States) are working closely with an International Project Group to revise OIML Recommendation R 59 *Moisture Meters for Cereal Grains and Oilseeds*. The U.S. completed a six committee draft (6CD) of OIML R 59, which was circulated to the international project group and the U.S. National Working Group (USNWG) on grain moisture measuring devices for review and comment on March 6, 2013. The U.S. Co-secretariat requested that the comments to the 6CD be submitted by June 6, 2013. The U.S. Secretariat collated the U.S. and international comments to the 6CD and these comments were reviewed at the TC17/SC1 meeting hosted by NIST/OWM July 23-24, 2013.

At the TC17/SC1 July 23-24, 2013 meeting, comments to the 6 CD were reviewed and the major discussion was harmonization of test procedures between OIML TC17/SC1 R59 *Moisture Meters for Cereal Grains and Oilseeds* and OIML TC17/SC8 Recommendation on *Protein Measuring Instruments for Cereal Grain and Oil Seeds.*

At the July 2013 meeting it was discussed that the international damp heat test (OIML D11 and IEC) is significantly different from the NTEP Humidity test. The international test is more robust and more accurately reflects the environmental conditions an instrument is likely to encounter in field use. The damp heat test is conducted at a maximum temperature of either the manufacturer specified upper ambient temperature or 30 °C and a maximum

relative humidity of 85%. The damp heat test is designed to evaluate the device under the environmental (temperature and relative humidity) conditions it will encounter during operation.

At the December 1991 organizational meeting, the NIR Wheat Protein Analyzer sector reviewed the USDA Federal Grain Inspection Service's (FGIS) Design Criteria and Operational Performance Specifications (DCOPS) for Grain Constituent Measuring Instruments using Near Infrared Spectroscopy dated January 1989. The NTETC NIR sector recommended that the environmental tests, including Humidity, listed in the DCOPS be adopted and that tolerances for some test may need to be re-evaluated. The Humidity test was designed to evaluate the affect of humidity on the instrument while holding the temperature constant.

At the March 1992 NTETC grain moisture meter sector meeting, the FGIS Moisture Handbook, NCWM Handbook 44, and OIML International Recommendation R59 "Moisture Meters for Cereal Grains and Oilseeds" were reviewed. The subcommittee discussed that humidity might have considerable affect on the performance of thermogravimetric devices and resistance meters. It was suggested that humidity tests could be adapted from the OIML R59 Damp heat, stead state test.

The moisture subcommittee met in August 1992 and recommended the Humidity test that is currently in Publication 14 which agrees with the NIR test. At the October 1992 NTETC grain moisture meter sector meeting, the sector approved the recommendations made by the subcommittee for the humidity test.

Since 1994, no device has failed the humidity test for either moisture or protein.

The proposed damp heat test for the OIML Protein document specifies the test as shown below. At the July 2013 meeting, it was agreed to review the number of replicates used for the test. The number of replicates per sample being considered is five.

C.5.4 Damp heat

EUT	Two sample instruments of the submitted type, set-up according to clause C.2.1.
Spare unit	A sample instrument of the submitted type, set-up according to clause C.2.1 and maintained at reference conditions for the duration of the test.
Grain samples	One set from a single grain type comprised of three samples that represent the legally relevant *P*MB range (i.e. one sample for each low, mid and high *P*MB). Allowable grains are specified by the national responsible body. Wheat is the preferred grain type. Except during analysis, each sample is kept in its enclosure during the test. The enclosed samples are only introduced to the damp heat 2 hours prior to testing. Samples used in a climatic test shall not be reused in other tests.
Standards	IEC 60068-2-78 [16], IEC 60068-3-4 [17]
Test method and procedure (in brief)	Test Cab: Damp heat, steady state The test consists of exposure to the specified maximum temperature and the specified constant relative humidity for the specified time. The change of temperature shall not exceed 1 °C/min during heating up and cooling down. The absolute humidity of the test atmosphere shall not exceed 20 g/m^3. When testing is performed at temperatures lower than 35 °C, the relative humidity shall not exceed 50%. Six *P*MB measurements on every sample are taken using each unit, at every test condition: i) EUT and grain samples at reference temperature ii) EUT after damp heat exposure, grain samples at maximum temperature and RH iii) EUT and grain samples after recovery at reference conditions
Sample monitoring	To ensure that heating, exposure to moisture and recovery do not change the *P*MB of grain samples significantly, the grain samples are monitored by a spare unit.
Test severity	Exposure duration (after EUT stabilisation): 2 days; Maximum RH: 85% Maximum temperature: TH or 30 ºC TH is the maximum temperature in the operating range specified by the national responsible body.
Suggested steps	1) The EUT is powered on and stabilised at reference temperature. 2) In a separate chamber, the spare unit is powered on and equilibrated at reference temperature

	with the grain samples. 3) Sample 1 is analysed once on instrument 1, then once on instrument 2, then once on the spare unit. Further *PMB* measurements are taken across the three units in the same manner, until six *P*MB measurements are recorded for each instrument. 4) Step 3 is repeated for the other two grain samples. 5) The EUT is subjected to the maximum temperature and humidity and stabilised. The exposure duration is observed. Two hours prior to the end of the exposure duration, the enclosed grain samples are introduced to damp heat conditions. 6) All the hot grain samples are analysed in turn on both units of the EUT, alternating between the two instruments, until three *P*MB measurements per grain samples are recorded for each instrument. 7) The samples are retained at the location of the EUT for as long as necessary to equilibrate at the maximum temperature. Each sample is analysed three times on both units of the EUT again. 8) After ensuring that six *P*MB measurements on each hot sample are recorded for each instrument, the EUT and grain samples are recovered to reference temperature. 9) Steps 3 – 4 are repeated.
Test result	Values for the error shift on every grain sample are calculated at each test condition for each unit (of the EUT). Error shift (damp heat) = (Mean *P*MB condition ii – Mean *P*MB condition i) Error shift (recovery) = (Mean *P*MB condition iii – Mean *P*MB condition i) – Correction* *Application of a correction is required if a significant change in the sample *PMB* during heating and/or recovery is indicated by the sample stability test.
Grain sample stability test and correction	The *P*MB variation on a grain sample *calculated from measurements on the spare unit*, shall be within the limit in Table 4 column 9 for no correction to apply. Sample *P*MB variation (recovery) = Mean *P*MB (condition iii) – Mean *P*MB (condition i) Any sample *PMB* variation that exceeds the limit, shall be applied as a correction, e.g.: Sample *P*MB variation (recovery) = Correction for error shift (recovery)
Acceptance requirements	All values for the error shift (i.e. with any necessary correction) shall be within the limit in clause 4.5 Table 4 column 9. All operational functions shall operate as designed.

During the August 2013 Grain Analyzer Sector meeting the Sector reviewed the proposal to replace the NTEP Publication 14 GMM and NIR Humidity test procedure with the OIML D11 Damp Heat test procedure. It was noted that the proposed changes to the humidity test in Publication 14 were based on OIML D11 requirements Damp heat test, Severity level 1. During discussion of this item, It was mentioned that the temperature and humidity levels as specified in OIML D11 may pose unsafe operating conditions to laboratory staff and also that grain moisture meters are not designed to operate in these extreme conditions. A question was asked if another severity level in D11 would more closely match the testing that is currently in Publication 14 and that has been used for many years in the U.S. Ms. Lee, reviewed OIML D11 requirements following the meeting and found that both severity level 1 and 2 exceed the temperature and humidity levels specified in Publication 14

Conclusion:
The Sector agreed by consensus that the OIML D11, Damp heat test, is much too severe for grain moisture meters and that publication 14 should not be changed to meet the requirements of OIML D11.

11. Report on OIML TC 17/SC 8 Protein Measuring Instruments for Cereal Grain and Oil Seeds

Background / Discussion:
This item was included on the sector's agenda to provide a summary of the activities of OIML TC 17/SC 8 to the grain analyzer sector and to those Sector members that participate on the United States National Working Group (USNWG) on grain protein measuring instruments. OIML TC17/SC8 was formed to study the issues and to develop a Recommendation on *Protein Measuring Instruments for Cereal Grain and Oil Seeds.* Australia is the Secretariat for this subcommittee. The third committee draft (3CD) for this Recommendation was circulated to the US national Working group for comments on July 3, 2012 for review and comment and comments were requested by September

8, 2012. The U.S. Comments to 3CD were forwarded to the secretariat and the secretariat developed the 4CD based on these comments.

The 4CD was circulated to the USNWG on grain protein measuring instruments on April 9, 2013 and comments to the 4CD of TC 17/SC 8 were requested by June 13, 2013. The U.S. comments to the 4CD were forwarded to the secretariat. The U.S. was requested to vote on the 4CD and a vote of no was provided due to a number of differences in the test procedures of the OIML Recommendation for *Protein Measuring Instruments for Cereal Grain and Oil Seeds* and the OIML Recommendation 59 *Moisture Meters for Cereal Grain and Oilseeds*.

A meeting was hosted by NIST, OWM, July 24-25, 2013 to discuss the comments to the 4CD for the Recommendation on *Protein Measuring Instruments for Cereal Grain and Oil Seeds*. Discussions on 4CD dealt mostly with harmonization of testing with the 6CD of the OIML Recommendation R59 *Moisture Meters for Cereal Grain and Oilseeds*, software requirements, and influence quantities and test sample temperature.

At the August 2013 Grain Analyzer Sector meeting the the Sector reinterated their concerns with the OIML D11 damp heat test.

Conclusion:
The Sector agreed that the damp heat test in OIML Recommendation on Protein Measuring Instruments for Cereal Grain and Oil Seeds, 4CD should be replaced with the humidity test as written in OIML R59 CD6.

12. Software Sector Items

(a) Identification of Certified Software

Source:
NTETC Software Sector

Purpose:
Review and provide comment to the Software Sector reports and conculsion on software issues.

Background:
This item originated as an attempt to answer the question "How does the field inspector know that the software running in the device is the same software evaluated and approved by the lab?" In previous meetings it was shown that the international community has addressed this issue (both WELMEC and OIML).

From WELMEC 7.2:

> **Required Documentation:**
> The documentation shall list the software identifications and describe how the software identification is created, how it is inextricably linked to the software itself, how it may be accessed for viewing and how it is structured in order to differentiate between version changes with and without requiring a type approval**.**

From OIML D-31:

> The executable file "**tt100_12.exe**" is protected against modification by a checksum. The value of checksum as determined by algorithm **XYZ** is **1A2B3C**.

Previous discussions have included a listing of some additional examples of possible valid methods (not limiting):

- CRC (cyclical redundancy check)
- Checksum
- Inextricably Linked version no.

- Encryption
- Digital Signature

Is there some method to give the weights and measures inspector information that something has changed?
Yes, the Category III Audit Trail or other means of sealing.

How can the weights and measures inspector identify an NTEP Certified version?
They can't, without adding additional requirements like what is described here, in conjunction with including the identifier on the CC).

The sector believes that we should work towards language that would include a requirement similar to the International Organization of Legal Metrology (OIML) requirement in *NIST Handbook 44*. It is also the opinion of the sector that a specific method should not be defined; rather the manufacturer should utilize a method and demonstrate the selected identification mechanism is suitable for the purpose. It is not clear from the discussion where such proposed language might belong.

NTEP strongly recommends that metrological software be separated from non-metrological software for ease of identification and evaluation.

From OIML:

> Separation of software parts - All software modules (programmes, subroutines, objects etc.) that perform metrologically significant functions or that contain metrologically significant data domains form the metrologically significant software part of a measuring instrument (device or sub-assembly). The conformity requirement applies to all parts and parts shall be marked according to Section G-S-X.X.
>
> If the separation of the software is not possible or needed, then the software is metrologically significant as a whole.

(Segregation of parameters is currently allowed - see table of sealable parameters)

Initial draft proposed language: (G-S.1.1?)

NIST Handbook 44 (This has been written into G-S.1.d.3): Identification of Certified Software:

> **Software-based electronic devices shall be designed such that the metrologically significant software is clearly identified by the version or revision number.** ~~**The identification**~~**, and this identification** ~~**of the software**~~ **shall be** ~~**inextricably**~~ **directly and inseparably linked to the software itself. The version or revision number may consist of more than one part, but at least one part shall be dedicated to the metrologically significant software.**

From NCWM Publication 14:

Identification of Certified Software:

> Note: Manufacturers may choose to separate metrologically significant software from non-metrologically significant software. Separation would allow the revision of the non-metrological portion without the need for further evaluation. In addition, non-metrologically significant software may be updated on devices without breaking a seal, if so designed. Separation of software requires that all software modules (programs, subroutines, objects etc.) that perform metrologically significant functions or that contain metrologically significant data ~~**domains**~~ form the metrologically significant software part of a measuring instrument (device or sub-assembly). If the separation of the software is not possible or needed, then the software is metrologically significant as a whole. ~~**The conformity requirement applies to all parts and parts shall be marked according to Section G-S-X.X.**~~

> The manufacturer must describe and possibly demonstrate how the version or revision identifier is directly and inseparably linked to the metrologically significant software. Where the version revision identifier is comprised of more than one part, the manufacturer shall describe which portion represents the metrological significant software and which does not.

From OIML D-31:

> Legally relevant software of a measuring instrument / electronic device / sub-assembly shall be clearly identified with the software version or another token. The identification may consist of more than one part but at least one part shall be dedicated to the legal purpose.
>
> The identification shall be inextricably linked to the software itself and shall be presented or printed on command or displayed during operation or at start up for a measuring instrument that can be turned off and on again. If a sub-assembly/an electronic device has neither display nor printer, the identification shall be sent via a communication interface in order to be displayed/printed on another sub-assembly/electronic device.

The first sentence of the first paragraph above is already addressed in *NIST Handbook 44's* marking requirements.

In 2010, the sector recommended the following change to *NIST Handbook 44*, General Code: G-S.1(d) to add a new subsection (3):

> *(d) the current software version or revision identifier for* ***~~not built for purpose~~*** ***software-based electronic*** *devices;*
> *[Nonretroactive as of January 1, 2004]*
> (Added 2003) **(Amended 20XX)**
>
> *(1) The version or revision identifier shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision.*
> *[Nonretroactive as of January 1, 2007]*
> *(Added 2006)*
>
> *(2) Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number." Abbreviations for the word "Revision" shall, as a minimum, begin with the letter "R" and may be followed by the word "Number." The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).*
> *[Nonretroactive as of January 1, 2007]*
> (Added 2006)
>
> **(3) The version or revision identifier shall be directly and inseparably linked to the software itself. The version or revision identifier may consist of more than one part, but at least one part shall be dedicated to the metrologically significant software.**
> ***[Nonretroactive as of January 1, 201X]***
> **(Added 20XX)**

Also the sector recommended the following information be added to *NCWM Publication 14* as explanation/examples:

- Unique identifier must be displayable/printable on command or during operation, etc.
- At a minimum, a version/revision indication (1.02.09, rev 3.0 a, etc). Could also consist of / contain checksum, etc (crc32, for example)

There was some additional discussion on this item regarding where this new requirement was best located. It was suggested that the first sentence of G-S.1.d.(3) could be added as a clause to the base paragraph G-S.1(d) text, e.g. "*the current software version or revision identifier for* ***~~not built for purpose~~*** ***software-based*** *devices, which shall be directly and inseparably linked to the software itself;"* .

It also was suggested that the second sentence in G-S.1.d. (3) might be more suitable for *NCWM Publication 14*, as it describes more ”how” than ”what” the requirement entails.

In addition, the sector considered the following information to be added to *NCWM Publication 14* as explanation/examples:

- The current software identifier must be displayable/printable on command during operation (or made evident by other means deemed acceptable by G-S.1.)
- At a minimum, the software identifier must include a version/revision indication (1.02.09, rev 3.0 a, etc). It could also consist of / contain checksum, etc (crc32, for example).
- The version or revision identifier may consist of more than one part, but at least one part shall be dedicated to the metrologically significant software.

Other questions that are still outstanding:

- If we allow hard-marking of the software identifier (the sector has wavered on this in the past), does the above wording then imply that some mechanical means is required (i.e. physical seal) to ”inseparably link” the identifier to the software?
- If a device is capable of doing so, does it still have to be able to display, print or communicate the identifier somehow, even if it is hard-marked?

At the 2012 NTETC Software Sector Meeting, there was some discussion as to where the terminology regarding inextricably linking the software version or revision to the software itself belonged. At the moment, it is not incorporated in the proposed text for G-S.1. *NCWM Publication 14* may be a better option for the time being. This would be another item that would benefit from further explanation in a supplementary document.

Several sector members were of the opinion that attempting to make this change at the same time as the earlier changes might be a difficult sell. Mr. Truex, NTEP Administrator, reiterated the necessity of baby steps.

In 2012, the sector thus recommended adding the following to *NCWM Publication 14* and forward to NTETC Weighing, Measuring, Grain Analyzer sectors for feedback:

Identification of Certified Software:

> Note: Manufacturers may choose to separate metrologically significant software from non-metrologically significant software. Separation would allow the revision of the non-metrological portion without the need for further evaluation. In addition, non-metrologically significant software may be updated on devices without breaking a seal, if so designed. Separation of software requires that all software modules (programs, subroutines, objects etc.) that perform metrologically significant functions or that contain metrologically significant data domains form the metrologically significant software part of a measuring instrument (device or sub-assembly). If the separation of the software is not possible or needed, then the software is metrologically significant as a whole. The conformity requirement applies to all parts and parts shall be marked according to Section G-S-X.X.
>
> The manufacturer must describe and possibly demonstrate how the version or revision identifier is directly and inseparably linked to the metrologically significant software. Where the version revision identifier is comprised of more than one part, the manufacturer shall describe which portion represents the metrological significant software and which does not.

Discussion:

The Measuring Sector reviewed this item and had no feedback other than a statement that they support the continuing / ongoing efforts of this sector. The Weighing Sector summary mentioned that no one opted to provide comment. They agreed to take no further action on this item, pending further action from the Software Sector. This was specifically in reference to the accepted symbols.

For the time being, Jim Truex recommended that we not attempt to provide a definition for “software-based device”.

We discussed the possibility of combining this change with the first agenda item, which had been attempted in previous years. Alternatively, if the HB44 changes from agenda item 1 are made, this agenda item could be addressed in Pub. 14.

Conclusion:
After further discussion, the wording in G-S.1.d under agenda item 1 was changed. Agenda item 2 will remain; however, it will address potential changes to Pub. 14 and contain no suggested modifications to Handbook 44. (See changes and conclusion under agenda item 1 for further details.)

The Sector chair volunteered to review the existing slide presentation detailing the purpose of these changes, to ensure that it accurately reflects this information.

(b) Software Protection/Security

Source:
NTETC Software Sector

Background:
The sector agreed that *NIST Handbook 44* already has audit trail and physical seal, but these may need to be enhanced.

From the WELMEC Document:

> **Protection against accidental or unintentional changes**
> Metrologically significant software and measurement data shall be protected against accidental or unintentional changes.
>
> **Specifying Notes:**
> Possible reasons for accidental changes and faults are: unpredictable physical influences, effects caused by user functions and residual defects of the software even though state of the art of development techniques have been applied.
>
> This requirement includes consideration of:
>
> a) Physical influences: Stored measurement data shall be protected against corruption or deletion when a fault occurs or, alternatively, the fault shall be detectable.
>
> b) User functions: Confirmation shall be demanded before deleting or changing data.
>
> c) Software defects: Appropriate measures shall be taken to protect data from unintentional changes that could occur through incorrect program design or programming errors, e.g. plausibility checks.
>
> **Required Documentation:**
> The documentation should show the measures that have been taken to protect the software and data against unintentional changes.
>
> **Example of an Acceptable Solution:**
> - The accidental modification of software and measurement data may be checked by calculating a checksum over the relevant parts, comparing it with the nominal value and stopping if anything has been modified.
> - Measurement data are not deleted without prior authorization, e.g. a dialogue statement or window asking for confirmation of deletion.
> - For fault detection see also Extension I.

The sector continued to develop a proposed checklist for *NCWM Publication 14*. The numbering will still need to be added. This is based roughly on R 76 – 2 checklist and discussions beginning as early as the October 2007

NTETC Software Sector Meeting. The information requested by this checklist is currently voluntary, however, it is recommended that applicants comply with these requests or provide specific information as to why they may not be able to comply. Based on this information, the checklist may be amended to better fit with NTEP's need for information and the applicant's ability to comply.

The California, Maryland and Ohio laboratories agreed to use this check list on one of the next devices they have in the lab and report back to the sector on what the problems may be. In February 2011, the North Carolina laboratory was also given a copy of the check list to try.

1. Devices with ~~Embedded~~ Software ~~TYPE P (aka built-for-purpose)~~

1.3. Declaration of the manufacturer that the software is used in a fixed hardware and software environment. **AND** ☐ Yes ☐ No ☐ N/A

1.4. Cannot be modified or uploaded by any means after securing/verification. ☐ Yes ☐ No ☐ N/A

Note: It is acceptable to break the "seal" and load new software, audit trail is also a sufficient seal.

1.5. The software documentation contains:

- 1.5.3. Description of all functions, designating those that are considered metrologically significant. ☐ Yes ☐ No ☐ N/A
- 1.5.4. Description of the securing means (evidence of an intervention). ☐ Yes ☐ No ☐ N/A
- 1.5.5. Software Identification, including version / revision ☐ Yes ☐ No ☐ N/A
- 1.5.6. Description how to check the actual software identification. ☐ Yes ☐ No ☐ N/A

1.6. The software identification is:

- 1.6.7. Clearly assigned to the metrologically significant software and functions. ☐ Yes ☐ No ☐ N/A
- 1.6.1. Description how to check the actual software identification. ☐ Yes ☐ No ☐ N/A
- 1.6.2. Provided by the device as documented. ☐ Yes ☐ No ☐ N/A
- 1.6.3. Directly linked to the software itself. ☐ Yes ☐ No ☐ N/A

2. ~~Personal Computers, Instruments with PC Components, and Other Instruments, Devices, Modules, and Elements with Programmable or~~ Loadable Metrologically Significant Software ~~TYPE U (aka not built-for-purpose)~~

2.1. The metrologically significant software is:

- 2.1.4. Documented with all relevant (see below for list of documents) information. ☐ Yes ☐ No ☐ N/A
- 2.1.5. Protected against accidental or intentional changes. ☐ Yes ☐ No ☐ N/A

2.2. Evidence of intervention (such as, changes, uploads, circumvention) is available until the next verification / inspection (e.g., physical seal, Checksum, Cyclical Redundancy Check (CRC), audit trail, etc. means of security). ☐ Yes ☐ No ☐ N/A

3. Software with ~~Closed Shell (~~no access to the operating system and/or programs possible for the user~~)~~

3.1. Check whether there is a complete set of commands (e.g., function keys or commands via external interfaces) supplied and accompanied by short descriptions. ☐ Yes ☐ No ☐ N/A

3.2. Check whether the manufacturer has submitted a written declaration of the completeness of the set of commands. ☐ Yes ☐ No ☐ N/A

4. Operating System and / or Program(s) Accessible for the User

4.1.	Check whether a checksum or equivalent signature is generated over the machine code of the metrologically significant software (program module(s) subject to legal control Weights and Measures jurisdiction and type-specific parameters).	☐ Yes ☐ No ☐ N/A
4.2.	Check whether the metrologically significant software will detect and act upon any unauthorized alteration of the metrologically significant software using simple software tools (e.g., text editor).	☐ Yes ☐ No ☐ N/A

5. Software Interface(s)

5.1. Verify the manufacturer has documented:

5.1.6.	The program modules of the metrologically significant software are defined and separated.	☐ Yes ☐ No ☐ N/A
5.1.7.	The protective software interface itself is part of the metrologically significant software.	☐ Yes ☐ No ☐ N/A
5.1.8.	The functions of the metrologically significant software that can be accessed via the protective software interface.	☐ Yes ☐ No ☐ N/A
5.1.9.	The parameters that may be exchanged via the protective software interface are defined.	☐ Yes ☐ No ☐ N/A
5.1.10.	The description of the functions and parameters are conclusive and complete.	☐ Yes ☐ No ☐ N/A
5.1.11.	There are software interface instructions for the third party (external) application programmer.	☐ Yes ☐ No ☐ N/A

The Maryland laboratory had particular questions regarding 3.1 and 5.1. The information for 3.1 could be acquired from an operator's manual, a training video, or in-person training. The items in 5.1 were confusing to the evaluators. The terminology is familiar to software developers, but not necessarily others. It was indicated that manufacturers were typically quick to return the filled out questionnaire, but he didn't know how his laboratory was supposed to verify that it was true. Generally, the laboratories wouldn't be expected to verify things to that level. For example, if the manufacturer states that a checksum is used to ensure integrity, the laboratories wouldn't be expected to evaluate the algorithm used.

The intent was to see whether the manufacturer had at least considered these issues, not for evaluators to become software engineers. Perhaps a glossary or descriptive paragraphs might be added to assist the evaluators for if the manufacturer has questions for the evaluators.

OIML makes use of supplementary documents to explain the checklist they use. Below are links:
http://www.oiml.org/publications/D/D031-e08.pdf
http://www.welmec.org/latest/guides/72.html
http://www.welmec.org/fileadmin/user_files/publications/2-3.pdf

WELMEC document 2.3 is the original source for our checklist, but it's been significantly revised and simplified. Mr. Payne, Maryland Department of Agriculture, is going to review the other documents and come up with some suggestions for the checklist. Mr. Roach, California Division of Measurement Standards, is going to begin using the checklist. The international viewpoint is that any device running an operating system is considered to be Type U. Mr. Roach mentioned that they're having lots of problems with "skimmers" stealing PIN's. Is there some way they can detect this?

Mr. Lewis, Rice Lake Weighing Systems, Inc., mentioned that he liked Measurement Canada's website. When answering similar questions, different pages would appear, based on answers to those questions: http://www.ic.gc.ca/eic/site/mc-mc.nsf/eng/lm00573.html

At the 2011 NTETC Software Sector Meeting, the laboratories were polled to obtain any feedback on the use of the checklist. Maryland attempted to use this checklist a few times. They had some difficulty obtaining answers from the manufacturers because the individual(s) interacting with the Maryland evaluator didn't always have the required information on hand. More experience in using the checklist will help determine what needs to be revised.

It was suggested that the checklist could be sent to manufacturers for their feedback as well, with the stipulation that it a completely voluntary exercise and purely informational at this point. The laboratories will coordinate with willing manufacturers to obtain feedback.

Work is ongoing on this item with the intent that it eventually will be incorporated as a checklist in *NCWM Publication 14*; again the laboratories are requested to try utilizing this checklist for any evaluations on software-based electronic devices.

The checklist has been reviewed with an eye to making its terminology clearer to laboratories. Some examples and clarifications have been added as shown in the discussion section of this item. The revised checklist will be distributed to the laboratories for additional review. Maryland and California laboratories agreed to use the checklist on a trial basis.

Discussion:
Over the past year, attempts to use the current checklist did not meet with many difficulties. The checklists were given to the manufacturers to fill out, and that seemed to work rather well. Minor modifications (in red above) were made to clarify certain confusing areas or eliminate redundancy.

Conclusion:
The next step will be to forward it to the four sectors; we can report that the labs have tried using it on a trial basis and we're ready to recommend it for Pub. 14 with the modification suggested here, such as the removal of the Type P / Type U wording.

(c) Software Maintenance and Reconfiguration

Source:
NTETC Software Sector

Background:
After the software is completed, what do the manufacturers use to secure their software? The following items were reviewed by the sector. *Note that agenda Item 3 also contains information on Verified and Traced updates and Software Log.*

1. Verify that the update process is documented (OK)
2. For traced updates, installed Software is authenticated and checked for integrity

   Technical means shall be employed to guarantee the authenticity of the loaded software (i.e. that it originates from the owner of the type approval certificate). This can be accomplished (e.g. by cryptographic means like signing). The signature is checked during loading. If the loaded software fails this test, the instrument shall discard it and either use the previous version of the software **or become inoperative**.

   Technical means shall be employed to guarantee the integrity of the loaded software i.e. that it has not been inadmissibly changed before loading. This can be accomplished e.g. by adding a checksum or hash code of the loaded software and verifying it during the loading procedure. If the loaded software fails this test, the instrument shall discard it and either use the previous version of the software **or become inoperative**.

Examples are not limiting or exclusive.

3. Verify that the sealing requirements are met

The sector asked, What sealing requirements are we talking about?

This item is **only** addressing the **software update**, it can be either verified or traced. It is possible that there are two different security means, one for protecting software updates (software log) and one for protecting the other metrological parameters (Category I II or III method of sealing). Some examples provided by the sector members include but are not limited to:

- Physical Seal, software log
- Category III method of sealing can contain both means of security

4. Verify that if the upgrade process fails, the device is inoperable or the original software is restored

The question before the group is, Can this be made mandatory?

The manufacturer shall ensure by appropriate technical means (e.g. an audit trail) that traced updates of metrologically significant software are adequately traceable within the instrument for subsequent verification and surveillance or inspection. This requirement enables inspection authorities, which are responsible for the metrological surveillance of legally controlled instruments, to back-trace traced updates of metrologically significant software over an adequate period of time (that depends on national legislation). The statement in italics will need to be reworded to comply with US weights and measures requirements.

The sector **agreed** that the two definitions below for Verified update and Traced update were acceptable.

Verified Update
A verified update is the process of installing new software where the security is broken and the device must be re-verified. Checking for authenticity and integrity is the responsibility of the owner/user.

Traced Update
A traced update is the process of installing new software where the software is automatically checked for authenticity and integrity, and the update is recorded in a software update log or audit trail.

Note: It's possible that the Philosophy of Sealing section of NCWM Publication 14 may already address the above IF the definitions of Verified and Traced Updates (and the statement below) were to be added. The contrary argument was that it may be better to be explicit).

Use of a Category 3 audit trail is required for a Traced Update. A log entry representing a traced software update shall include the software identification of the newly installed version.

The sector recommended consolidating the definitions with the above statement thus:

Verified Update
A verified update is the process of installing new software where the security is broken and the device must be re-verified. Checking for authenticity and integrity is the responsibility of the owner/user.

Traced Update
A traced update is the process of installing new software where the software is automatically checked for authenticity and integrity, and the update is recorded in a ~~**software update log or**~~ Category 3 audit trail. The audit trail entry shall include the software identification of the newly installed version.

In 2012, the sector recommended that as a first step, the following be added to *NCWM Publication 14*:

The updating of metrologically significant software, including software that checks the authenticity and integrity of the updates, shall be considered a sealable event.

Mr. Truex, NTEP Administrator, indicated his opinion that the above sentence is unnecessary since it's self-evident. It was agreed by the group however to ask the other sectors for feedback on the value of this addition.

Though the sector is currently considering only the single sentence be incorporated into *NCWM Publication 14* for the time being, ultimately, the sector may wish to advance the remaining language of the original item submission.

Discussion:
The Sector had no information indicating that the other sectors had yet been approached for feedback on the value of the addition of the proposed sentence.

Conclusion:
This sector would like the other sectors to evaluate this for inclusion in Pub. 14.
We'd also like to include some description indicating that an existing audit trail should be protected during a software update, though that may already be a requirement. This does appear to be addressed in the Requirements for Metrological Audit Trails Appendices in Pub. 14.

At the August 2013 Grain Analyzer Sector meeting, Mr. Truex provided a review of the Software Sector's proposals for changes to Publication 14 Identification of Certified Software, Software Protection/Security, and Software Maintenance and Reconfiguration. Manufactuers had a number of question to include "What is the baseline for which software is considered metrologically significant?" After some discussion the manufacturers requested that they be given additional time to review the proposed changes and to allow their software designers an opportunity to look at the proposed changes to software. Ms. Brenner sent an e-mail on August 29, 2013 to all NTEP grain analyzer manufacturers requesting that comments be submitted to Ms. Lee by October 15, 2013.

Conclusion:
Grain Analyzer Manufacturers provided the following comments to the Software Sector's proposal for changes to Publication 14:

Grain Analyzer Manufacturer's Comments to Software Sector's Proposed Changes to Publication 14			
Manufacturer	**GA Sector Item**	**Comment**	**Proposed change**
Dickey-john	12a	We currently don't separate the metrologically significant code or identify it's version in the application. We can do this, but it will require a significant code change and validation. Question 1: Does the metrological significant code need to be actually separate from the application or is a label in the application identifying the version of the prediction module used acceptable. This will result in less changes to the code. Question 2: What if we had added a test on the prediction module that inserted key values into the engine, that we would document in the metrological specific tests, that would give a specific answer? For example, if the prediction module is the same then the same inputs with the same calibration file will yield the same results from version to version; log those results and include in the metrological report.	Object to 12.a – The document insists that we separate the legally relevant code and make separate binaries. We could simply add a label that is bound to the prediction module code. Adding this label could tie the prediction module to the version, and will allow us to separately maintain revision control of that code. However, the code itself will not be a separate binary.

FOSS	General	Since FOSS distributes instruments worldwide, having NTEP and OIML requirements the same would be beneficial. I know efforts are being made to have the 2 as similar as possible. A concern is the potential that software code that is adopted would invalidate the currently approved instruments. A preferred outcome would be that once software code is adopted, only instruments seeking approval (not currently approved) would be required to meet the code.	

In addition manufacturers that attended the August 2013 Grain Analyzer Meeting, expressed an interest in attending the next 2014 Software Sector meeting to provide additional input.

13. Update on Proficiency Testing

Source:
Dr. Hurburgh, Iowa State University

Purpose:
Develop an air-oven proficiency testing program to ensure state laboratory and manufacturers air-oven measurements are traceable to the official USDA, GIPSA air-oven measurements.

Item Under Consideration:
Update on progress of the ongoing air-oven proficiency testing program for states maintaining a grain moisture laboratory and GMM manufacturers.

Background / Discussion:
At the 2009 NTETC Grain Analyzer Sector Meeting Dr. Hurburgh, Iowa State University, urged the representatives from the American Oil Chemists Society (AOCS) to prepare a proposal so that the collaborative (air-oven) study could be conducted on an on-going basis rather than on an ad hoc basis. He cautioned that the proposal would have to include corn and wheat as well as soybeans.

At the 2011 NTETC Grain Analyzer Sector Meeting, Ms. Johnson, AOCS, proposed an air-oven/GMM proficiency testing series designed specifically to address the needs of GMM manufacturers and states maintaining a grain moisture laboratory. AOCS would administer the program, oversee distribution of samples, compile results, perform statistical analysis of results, and distribute a report to participants. AOCS does not collect the samples. This is subcontracted to suitable providers. AOCS does not have laboratories. Since GIPSA/ FGIS is a certified laboratory already participating in the AOCS Soybean Quality Traits program, GIPSA air-oven results could be reported for comparison.

At the sector's August 2012 meeting the sector learned that Ms. Christine Atkinson will be taking over the Proficiency Testing program for States and interested manufacturers formerly headed by Ms. Amy Johnson. Ms. Atkinson verified that participant's cost will remain $100 per year. The sector reiterated that the program should focus solely on the standard FGIS air-oven method. Instrument results will not be reported. Participants' air-oven results will be compared against GIPSA's standard FGIS air-oven results. In response to Ms. Atkinson's question about scheduling, the sector was in general agreement that samples should ship after harvest, preferably between mid-January and mid-February with participants' results due 30 days after the shipping date.

The sector agreed upon the following Program Details:

Samples – Soybeans 2, Corn 2, Hard Red Winter Wheat 2

- Cost to Participants - $100.00/year

- Schedule:
  - Samples (6) ship between January 15 and February 15.
  - Samples must be tested within 5 business days of receipt with results due 30 days after the shipping date.
- Reports to be posted on www.SoybeanQualityTraits.org by 1 May.
- Only the GIPSA oven results will be identified. Individual manufacturer's and State participant's oven results will be assigned an identifier known only to the manufacturer or State participant. Instrument results will not be reported.
- Detailed Participant Instructions will be provided to each participant.

An update on any progress of proficiency testing will be discussed at the Sector meeting.

At the August 2013 Grain Analyzer Sector meeting no report was provided on AOAC's efforts to conduct proficiency testing for grain moisture. Karl Cunningham, IL and Kenvin Hansan, MO agreed to work together to conduct a grain moisture proficiency test.

Conclusion:
Karl Cunningham, IL, agreed to provide the samples for proficiency testing and Kevin Hansan, MO, agreed to analyze the data in accordance with the procedures used to conduct proficiency testing in the State laboratory program. Kevn also agered to collect data on test weight per bushel which may be useful in field test procedures for evaluating test weight per bushel on instruments. See agenda item 9 for the discussion on test weight per bushel.

14. The Feasibility of a Phase II program for Near Infrared Grain Analyzers

Source:
Dr. Hurburgh, Iowa State University

Background/Discussion:
The GIPSA Grain Inspection Advisory Committee recommends that GIPSA initiate research to determine the feasibility of extending the theory of "equivalency" to multiple-constituent instruments in order to utilize standardized technology while maintaining accuracy and consistency in measurement of wheat protein.

Ms. Eigenmann provided an update on the Grain Inspection Advisory Committee's Resolutions. The Sector discuss the feasibility of an ongoing calibration program also referred to as a Phase II program for Near Infrared Grain Analyzers (NIR) instruments that measure wheat program. The Phase II program for grain moisture is a program that monitors the moisture calibrations on grain moisture meters annually. As changes to the calibrations occur due to grains, climate, etc., data collected in this program allows for changes to moisture calibratons annually and ensure equivalency among the different moisture meter models. The Advisory committee is recommending that this program be extended to include NIR instruments that measure wheat protein. It was noted that there could be multiple NIR instruments for wheat protein introduced into the market and that it may be advisable to have the Phase II program extended to NIR instruments that measure wheat protein. It was also mentioned that currently there are few States that are checking wheat protein on multi-constituient instruments.

GIPSA currently has an annual review program for the official protein system but would have to consider the cost associated with extending the program for other NIR wheat protein analyzers It was noted during the discussion that GIPSA currently has hourly rate fees set that could be applied to a phase II program for wheat program.

Unlike moisture where there may be changes to the calibrations annually, there will not be year to year changes for wheat protein. As such, consideration may be given to conducting the program less than annually, and considering reviewing wheat protein calibrations every 3, 4, or 5 years, as appropriate. In addition it was noted that there also has to be a mechanism to get manufacturers calibration data for calibration review.

Conclusion:
The sector will continue to discuss the feasibility of a phase II program for wheat protein giving consideration to the following issues:

- How the program will be funded,
- How often the calibrations for wheat protein will be updated, which will likely affect the cost,
- How many devices are currently being used in commercial transactions, and
- If being used commercially in a State, what is needed by States to begin testing these devices.

15. Next Sector Meeting

The next meeting is tentatively planned for Wednesday, August 20 and Thursday, August 21, 2014, at the Chase Suites by Woodfin at KCI in Kansas City, MO. Sector members are asked to hold these days open pending confirmation of availability of facility, determination of agenda items, exact meeting times, and meeting duration. Final meeting details will be announced by early June 2014.

If you would like to submit an agenda item for the 2014 meeting, please contact any of the following persons by June 1, 2014:

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

16. Update on the New Meter Technology

Background/Discussion:
During the August 2013 Grain Analyzer Sector meeting, Dr. David Funk, Deputy Director and Chief Scientist, GIPSA-FGIS, Technology and Science Division, updated the Sector on the new Unified Grain Moisture Algorithm (UGMA) meter technology.

Since the August 2012 Grain Analyzer Sector, the implementation of the new UGMA moisture meters for official inspection of corn, soybeans, sorghum, and sunflowers occurred on September 10, 2012, at which time the Perten AM 5200-A and the Dickey-john GAC 2500-UGMA replaced the Dickey-john GAC 2100 as the approved moisture meter models for those grains. The conversion to the use of UGMA-Compatible moisture meters was completed on May 1, 2013, with all officially-inspected grains and commodities switched to the UGMA-Compatible moisture meters. As of May 1, 2013, the GAC 2100 is no longer approved for official inspection of any grain or commodity under FGIS jurisdiction.

There was further discussion of test weight and the UGMA meters and the variation in different test methods. It was noted that the ISO and U.S. methods for test weight differ in the kettle size and fill method which contributes to variations in the results of the two methods. Also, both methods are user dependent.

Dr. Funk mentioned that tests were being performed reviewing the Official UGMA meter test weight per bushel measurement results to determine if these measurements could be used for Official test weight per bushel measurements. It was noted that results may be available from this testing in September 2013. The use of UGMA meters to determine official test weight per bushel results would expedite the official test weight measurement and might provide for greater uniformity.

Additional information on UGMA moisture meter implementation can be found on the GIPSA web page: http://www.gipsa.usda.gov/fgis/equipment.html.

Grain Analyzer Sector Summary

August 20-21, 2014 / Kansas City, Missouri

INTRODUCTION

The charge of the NTETC Grain Analyzer Sector is important in providing appropriate type evaluation criteria based on specifications, tolerances and technical requirements of *NIST Handbook 44* Sections 1.10. General Code, 5.56. Grain Moisture Meters and 5.57. Near-Infrared Grain Analyzers. The sector's recommendations are presented to the National Type Evaluation Program (NTEP) Committee each January for approval and inclusion in *NCWM Publication 14 Technical Policy, Checklists, and Test Procedures* for national type evaluation.

The sector is also called upon occasionally for technical expertise in addressing difficult *NIST Handbook 44* issues on the agenda of National Conference on Weights and Measures (NCWM) Specifications and Tolerances (S&T) Committee. Sector membership includes industry, NTEP laboratory representatives, technical advisors, and the NTEP Administrator. Meetings are held annually, or as needed and are open to all NCWM members and other registered parties.

Suggested revisions are shown in **bold face print** by ~~**striking out**~~ information to be deleted and **underlining** information to be added. Requirements that are proposed to be nonretroactive are printed in ***bold faced italics***.

Table A
Table of Contents

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
BIML	International Bureau of Legal Metrology	NTETC	National Type Evaluation Technical

			Committee
CD	Committee Draft	OCP	Ongoing Calibration Program
CIML	International Committee of Legal Metrology	OIML	International Organization of Legal Metrology
CIPM	International Committee of Weights and Measures	OWM	Office of Weights and Measures
D	Document	R	Recommendation
EMRP	European Metrology Research Program	S&T	Specifications and Tolerances
FGIS	Federal Grain Inspection Service	SC	Subcommittee
GA	Grain Analyzer	SD	Secure Digital
GIPSA	Grain Inspection, Packers and Stockyards Administration	TC	Technical Committee
GMM	Grain Moisture Meter	TW	Test Weight
MRA	Mutual Recognition Agreement	UGMA	Unified Grain Moisture Algorithm
NCWM	National Conference on Weights and Measures	USB	Universal Serial Bus
NIR	Near Infrared Grain Analyzer	USDA	United States Department of Agriculture
NIST	National Institute of Standards and Technology	USNWG	United States National Working Group
NTEP	National Type Evaluation Program		

Details of All Items
(In order by Reference Key)

1. Selecting a new NTETC GA Chairperson

Cassie Eigenmann, the NTETC GA Chair notified the GA Sector on January 24, 2014 that she was retiring from her position as Analytical Laboratory Manager at the DICKEY-john Corporation effective February 4, 2014 and therefore would resign from her position as Chair of the NTETC GA Sector. In her January 24, 2014 e-mail notification, Ms. Eigenmann also informed the GA Sector that NCWM requested that she poll the Sector members for possible candidates to fill the NTETC GA Chair position. One nomination for Sector Chairperson was received for Karl Cunningham of Illinois Weights and Measures. Additional nominations may be made during the meeting.

Ms. Eigenmann held the position of NTETC GA Sector Chair for over 10 years. Her facilitation of the Sector discussions over the years has helped the Sector with numerous proposals and recommendations for changes to NCWM Publications 14 and NIST HB 44. We wish her well in her future endeavors.

In accordance with the NTEP Administrative policies there is no fixed term for the NTETC GA Chair position, the Sector Chair must be a member of NCWM, and the Sector Chair is appointed by the NTEP committee Chair.

A new GA Sector Chair will be selected at the August 2014 NTETC Sector Meeting.

Cassie Eigenmann attended the August 2014 NTETC meeting and performed the duties of the Sector Chairman. Ms. Eigenmann informed the Sector that after polling the Sector she received one nomination, Karl Cunningham of Illinois, for the position of the Grain Analyzer Sector Chair. A question was raised as to whether or not travel would be a concern for Mr. Cunningham. Mr. Cunningham responded that travel would not be a concern. Ms. Eigenmann asked if there were any additional nominations. No additional nominations were made and the sector voted unanimously for Karl Cunningham as the new Grain Analyzer Sector chairman.

2. Report on the 2013 NCWM Interim and Annual Meetings

The 2014 NCWM Interim Meeting was held January 19-22 in Albuquerque, New Mexico. At that meeting, no recommended amendments to Publication 14 for grain analyzers were provided to the NTEP committee.

The 2014 NCWM Annual Meeting was held July 13-17, 2014 in Detroit, Michigan. There were no Grain Analyzer Sector Voting Items on the agenda. There was one Grain Analyzer Sector Developing item on the S&T agenda, **Item 360-7, Appendix D – Definitions: Remote Configuration Capability.** See Grain Analyzer Agenda Item 5, below, for details.

Mr. Jim Truex, NTEP Administrator, provide an update on the Interim and Annual Meetings. He reported that there was good representation at the 2014 interim and annual meetings compared to other years and that the NTEP Committee accepted the Grain Analyzer Sector's recommended changes to NCWM Publication 14 as reported in the 2013 Grain Analyzer Sector Summary.

3. Report on NTEP Evaluations and Ongoing Calibration Program (OCP) (Phase II) Testing

Cathy Brenner and Mr. Rick Dempster, Grain Inspection, Packers and Stockyards Administration (GIPSA), the NTEP Participating Laboratory for grain analyzers, brought the sector up-to-date on NTEP Evaluation (Phase I) activity. They also reported on the collection and analysis of Grain Moisture Meter OCP (Phase II) data on the 2013 crop and identified the models enrolled in Phase II for the 2014 harvest. For the 2014 harvest 7 models are enrolled in Phase II this year. The manufacturers will be charged on the basis of 6 models because, by using GAC2500-UGMA data, DICKEY-john can automatically back calculate calibrations to the GAC2500 without having to run samples on the GAC2500*.

The 7 models:

1. Bruins Instruments - OmegAnalyzerG
2. DICKEY-john Corp. - GAC2000 (NTEP Version), GAC2100a and GAC2100b2100
3. DICKEY-john Corp. - GAC2500 (*See note above. Will not run samples on this model.)
4. DICKEY-john Corp. - GAC2500-UGMA
5. Foss North America - Infratec 1241
6. Perten Instruments Inc. - 9500, AM5200 and AM5200-A (The AM5200-A is UGMA Certified.)
7. The Steinlite Corporation - SL95

4. Review of OCP (Phase II) Performance Data

At the sector's August 2005 meeting it was 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, Ms. Brenner, GIPSA, the NTEP Participating Laboratory for Grain analyzers presented data showing the performance of NTEP meters compared to the air oven. This data is based on the last three crop years (2011–2013) using calibrations updated for use during the 2014 harvest season. The 2011-2013 Grain Moisture Meter (GMM) Phase II comparison graphs are available for view or can be downloaded for printing at the following web address:

http://www.ncwm.net/resources/dyn/files/1235447z287194bf/_fn/GMMBiases14.pdf

At the August 2014 Grain Analyzer Sector meeting, the NTEP laboratory reported the following information concerning the 15 NTEP grains for the 2013 crop year:

- The grains collected were from late harvested grains.
- Due to the government shut down, sample maintenance was performed during the current year.

5. Modify the Definition of Remote Configuration Capability Appearing in Appendix D of NIST Handbook 44 to Recognize the Expanded Scope of "Remote Configuration Capability" (S&T Developing item 360-7)

Source:
NTETC Grain Analyzer Sector

Purpose:
Table S.2.5. *Categories of Device and Methods of Sealing* that appears in §5.56.(a) of *NIST Handbook 44* lists acceptable methods of sealing for various categories of GMMs. When the sector first recommended adding the table to *NIST Handbook 44* at their September 1996 meeting, the concept of making a change to a GMM from a remote site involved information " …sent by to the device by modem (or computer)." In 2011 this concept has expanded to include the ability of the measuring device to accept new or revised sealable parameters from a memory chip (e.g., an SD Memory Card that may or may not itself be necessary to the operation of the device), external computer, network, or other device plugged into a mating port (e.g., Universal Serial Bus (USB) port) on the measuring device or connected wirelessly to the measuring device. The changes proposed in Item under Consideration expand the scope of "remote configuration capability" to cover instances where the "other device" may be necessary to the operation of the weighing or measuring device or which may be considered a permanent part of that device.

Item under Consideration:

> **remote configuration capability. –** The ability to adjust a weighing or measuring device or change its sealable parameters from or through some other device that ~~**is not**~~ **may or may not** itself **be** necessary to the operation of the weighing or measuring device or ~~**is not**~~ **may or may not be** a permanent part of that device.[2.20, 2.21, 2.24, 3.30, 3.37, 5.56(a)]
>
> (Added 1993, **Amended 20XX**)

Background / Discussion:
Two common types of removable data storage devices are the USB flash drive and the Secure Digital (SD) memory card. A USB flash drive is a data storage device that includes flash memory with an integrated USB interface. USB flash drives are typically removable and rewritable, and physically much smaller than a floppy disk. A SD card is a non-volatile memory card format originally designed for use in portable devices. The SD standard is maintained by the SD Card Association.

Removable digital storage devices can be used in GMMs as either "data transfer" devices which are not necessary to the operation of the GMM or as "data storage devices" which are necessary to the operation of the GMM.

A USB flash drive is most likely to be used as a "data transfer" device. In a typical "data transfer" application, the USB flash drive is first connected to a computer with access to the web. The computer visits the GMM manufacturer's web site and downloads the latest grain calibrations that are then stored in the USB flash drive. The USB flash drive is removed from the computer and plugged into a USB port on the GMM. The GMM is put into "remote configuration" mode to copy the new grain calibration data into the GMM's internal memory. When the GMM has been returned to normal operating (measuring) mode the USB flash drive can be removed from the GMM.

Although an SD memory card could also be used as a "data transfer device" it is more likely to be used as a "data storage device". In a typical "data storage device" application, the SD memory card stores the grain calibrations used on the GMM. The SD memory card must be plugged into an SD memory card connector on a GMM circuit card for the GMM to operate in measuring mode. To install new grain calibrations the GMM must be turned "off" or put into a mode in which the SD memory card can be safely removed. The SD memory card can either be replaced with an SD memory card that has been programmed with the new grain calibrations or the original SD memory card can be re-programmed with the new grain calibrations in much the same way as that described in the

preceding paragraph to copy new grain calibrations into a USB flash drive. In either case, the SD memory card containing the new calibrations must be installed in the GMM for the GMM to operate in measuring mode. In that regard, the SD memory card can be considered a "permanent part" of the GMM in that the GMM cannot operate without it.

Note: In the above example "SD memory card" could be any removable flash memory card such as the Secure Digital Standard-Capacity, the Secure Digital High-Capacity, the Secure Digital Extended-Capacity, and the Secure Digital Input/Output, which combines input/output functions with data storage. These come in three form factors: the original size, the "mini" size, and the "micro" size. "Memory Stick" is a removable flash memory card format, launched by Sony in 1998, and is also used in general to describe the whole family of Memory Sticks. In addition to the original Memory Stick, this family includes the Memory Stick PRO, the Memory Stick Duo, the Memory Stick PRO Duo, the Memory Stick Micro, and the Memory Stick PRO-HG.

At its 2012 meeting the Grain analyzer Sector agreed by consensus to accept the Item under Consideration and recommended forwarding this item to the S&T Committee for consideration.

2012 WWMA Annual Meeting: Ms. Juana Williams (NIST OWM) supported the intent. She talked about this item in conjunction with Item 356-1, S.2.5. Categories of Device and Methods of Sealing. This is a complex item affecting multiple other devices; therefore the proposal requires further consideration. The language in the proposal to amend the definition of remote configuration capability is confusing. The Committee believes the current definition already allows the use of remote configuration devices and allows the flexibility desired. The ramifications of changing the definition could affect other devices in HB 44. WWMA did not forward this item to NCWM.

2012 SWMA Annual Meeting: There were no comments. After reviewing the proposal and considering the potential impact on other device types, the Committee recommended this as a Developing Item. The Committee asks that the Sector continue to obtain input on the definition and the impact the changes would have on other device types. SWMA forwarded the item to NCWM, recommending it as a Developing Item and assigning its development to the Grain Analyzer Sector.

During its Open Hearings at the 2013 NCWM Interim Meeting, the Committee heard comments from Ms. Juana Williams (NIST OWM). OWM suggests the Committee consider this item as a Developing item to allow other Sectors to discuss how a change to the definition may affect other device types of similar design and to consider changes if needed. OWM recognizes that the current definition for "remote configuration capability" may <u>not</u> address those grain moisture meters (GMMs) which can only be operated with a removable data storage device, containing, among other things, the grain calibrations intended for use with the GMM, inserted in the device (as was described by the Grain Analyzer Sector). As such, OWM notes that current sealing requirements were developed at a time when such technology likely didn't exist, nor could be envisioned, and are based on the current definition of remote configuration capability. Because the current definition was never intended to apply to this "next generation" technology, OWM suggests that those charged with further development of this item may wish to revisit the five philosophies of sealing and consider whether a new paragraph, completely separate from current sealing requirements, might be appropriate and a better option, than the one currently proposed. The five philosophies of sealing are included in the 1992 Report of the 77th National Conference on Weights and Measures (Report of the Specifications and Tolerances Committee). Another option, preferred over the changes currently proposed, would be to add a separate statement to the current definition of "remote configuration capability" to address removable storage devices. For example, the following sentence might be considered as an addition to the current definition for "remote configuration capability:"

> **<u>Devices which are programmed using removable media (such as SD cards, flash drives, etc.) that may or may not be required to remain with the device during normal operation are also considered to be remotely configured devices.</u>**

The Committee also heard comments from Dmitri Karimov (LC), speaking on behalf of the MMA, who made two points: (1) Flow computers may already have these capabilities, thus it may be more appropriate to consider adding requirements to the General Code so that the requirements will be uniformly applied to all device types; and (2) the

Committee should look ahead and consider other capabilities that may or already have emerged such as wireless communication and configuration.

The Committee acknowledged the comments indicating that the current definition of "remote configuration capability" was developed at a time when certain technologies, such as blue tooth, SD storage devices, flash drives, etc., didn't exist. The Committee recognized that it may be difficult to modify the existing definition and associated requirements to be flexible enough to address emerging and future technologies without having a significant (and possibly detrimental impact) on existing devices. Consequently, rather than modifying the current definition, the Committee concluded that a better approach might be to develop an entirely separate set of security requirements that would apply to emerging technologies. The Committee believes that additional work is needed to develop proposed definition(s) and associated requirements and decided to designate the item as Developmental. The Committee requests other Sectors review the Grain Sector's proposed modification to the definition as well as OWM's suggestions and provide input.

At their 2013 Annual Meetings, both NEWMA and CWMA supported this as a "Developing" item. NEWMA heard from NIST who encouraged members to consider this work as it applies to all device types.

On the 2013 NCWM Online Position Forum, one Government representative indicated a neutral position on this item with no additional comments.

At the 2013 NCWM Annual Meeting Open Hearings, the Committee heard comments from Juana Williams (NIST OWM) who reiterated OWM's comments from the 2013 Interim Meeting, suggesting that it may be appropriate to develop separate requirements to address new and future technologies which can be remotely configured with removable media. OWM plans to develop draft language and ask for input from the various Sectors at their upcoming meetings. Ms. Williams also noted the suggestion made at the 2013 NCWM Interim Meeting by Dmitri Karimov, LC, speaking on behalf of the MMA, that a provision might be added to the General Code to address this type of equipment.

Julie Quinn (MN) agreed with OWM's comments and indicated support for possibly including requirements in the General Code to address newer and emerging technologies. Dmitri Karimov (LC), speaking on behalf of MMA, concurred with this suggestion.

At the August 2013 Grain Analyzer Sector Meeting, OWM had not drafted a definition for remote configuration capability to address devices which are programed using removable media such as SD cards or flash drives. During the August 2013 grain analyzer sector meeting, the Sector discussed other ways devices can be remotely configured that should also be considered when drafting a definition for remote configuration capability to address these devices.

Mr. Hurburgh mentioned that we also need to consider devices that use cloud computing to remotely configure a device and suggested that we consider the various ways a device can be remotely configured.

The sector agreed that OWM should develop a proposal for a definition for remote configuration capability that addresses devices that use removable media such as SD cards, flash drives or other methods not covered by the existing definition.

At the 2013 Weighing Sector meeting, OWM requested members of the Sector help identify the various types of removable storage media (e.g., USB flash drives, SD memory cards, etc.) currently in use with weighing equipment and to describe the functionality of that media. The information provided would likely be used by OWM to develop some draft proposals to amend NIST Handbook 44 to adequately address the security of the metrological significant parameters of devices using such media.

The following feedback was provided by members of the Sector to OWM:

- I am not in favor of changing standards for advances in technology.

- Both SD cards and USB Flash drives can be used for data transfer and data storage. It would be difficult to address all devices by changing the General Code.
- There are other technologies besides SD and Flash digital storage devices that must be considered, e.g. Eprom and EEE, etc.,
- Several members commented that they felt it would likely be necessary to separate requirements in the various codes of NIST Handbook 44.
- It is not reasonable to expect manufacturers to share the technologies used in a public forum such as this meeting and it might be better to speak individually with representatives of the different manufacturers.

At the end of the discussion, a few weighing sector members offered to provide technical expertise to assist OWM in answering any questions that might arise during future development of proposed requirements to address this issue.

At the 2013 Measuring Sector Meeting, the Sector did not support the language "may or may not be necessary" because this phrase changes the category of what is considered "remote configuration capability." The Sector agreed that, if the card (or other removable device) needs to be a part of the measuring device for normal operation, then the card is effectively part of the device; in that case, the measuring device is a Category 1. If the card is only used for configuration or calibration and is not necessary for the operation of the measuring device, the measuring device is a Category 2. The Sector discussed whether or not additional guidance might be needed on what is covered by each sealing category; however, concluded that the definitions are adequate as currently written.

At the August 2014 Grain Analyzer sector meeting, the sector considered the responses from NIST OWM, SWMA, WWMA, Measuring Sector and Weighing Sector concerning devices that use SD cards, flash drives or other methods for configuration.

Conclusion:
The Grain Analyzer Sector agreed that the current proposed language may be confusing and agreed to withdraw their proposal for changes to the definition of remote configuration.

6. Status of Interagency Agreement

Source:
Cathy Brenner, USDA, GIPSA
G. Diane Lee, NIST, OWM

Background/Discussion: The current Interagency Agreement is the fourth 5-year agreement of the on-going calibration program. The agreement was signed in March 2010 and runs through analysis of the 2014 crop and issuance of the 2015 Certificates of Conformance. Thus, we have just started the fifth year of the current agreement. It should be noted that annual calibration activities occur in two government fiscal years and are better defined by a starting date of July 1.

GIPSA noted that in order to provide the standardization services to the commercial system, GIPSA TSD discussed options for improving the process and reducing the burden on all parties. At the August 2013 Grain Analyzer Sector meeting, GIPSA sought input from the sector on limiting the number of samples tested to a maximum of 10 samples per 2-percent moisture interval for all grains. It was noted that fewer sample are needed to calibrate the new UGMA meters. It was also noted that GIPSAs fees are increasing and with no changes to the program the manufacturers' fees will increase. During the discussion one alternate proposal was to base the cost on 1/3 shared cost of the program where GIPSA and NIST cover 1/3 the cost of the program each and manufacturers split 1/3 the cost. It was noted during the meeting that due to budget issues GIPSA and NIST will likely not be able to fund more than the 30,000 per year.

Ms. Brenner agreed to review the statistics to determine how the sample size of up to 30 samples per 2-percent moisture interval per grain type was established and to investigate the impact of reducing the sample size to 10

samples per 2-percent moisture interval per grain type. The sector agreed by consensus to reduce the number of samples used in the ongoing calibration program for each 2-percent moisture range per grain type as long as the integrity of the program is not affected.

A fifth 5-year Interagency Agreement has been drafted based upon GIPSA's base cost per NTEP only meters above the cost to maintain the official moisture meters. The agreement is currently being forwarded for appropriate signatures at NIST and then to GIPSA. The interagency agreement includes tables of the base cost per NTEP only meter and descriptions for funding calculations and fee tables for each year of the agreement. The fee tables are based on the reduced number of samples per 2-percent moisture interval.

At the 2014 Grain Analyzer Sector Meeting Ms. Cathy Brenner reported that she found no statistical impact in reducing the sample size in the ongoing calibration program from up to 30 samples to 10 samples per 2-percent interval. During the review of the ongoing calibration fee tables, Mr. Andy Gell, Foss North America pointed out that the cost per meter in the ongoing calibration program would be decreased due to the reduction in the number of samples per 2% moisture interval. Mr. Gell then noted that the tables showed an increase in the cost per meter. After further review by the sector an error was found in calculating the cost per meter. Corrections were made to the fee tables and the corrections to the tables are shown below:

Table 1 Description of Program Fee Schedule Acronyms and Funding Source Calculations

Key and/or Funding Source	Description
O	Number of GIPSA official meters
N	Number of NTEP only meters (non-GIPSA official meters)
BC	FY Base Cost per NTEP only Meters in the ongoing calibration program
TP	Total NTEP Program Cost = N x BC
TM	(O + N) Total Meters including Official Meters
NIST	National Institute of Standards and Technology Contribution = TP /3 up to and not more than 30,000
GIPSA	Grain Inspection Packers and Stockyards Administration contribution = TP /3 up to and not more than 30,000
MCMT	Manufacturers Cost per Meter Type = TP-NIST contribution - GIPSA contribution

Table 2 Ongoing Calibration Program Base Cost per NTEP only meter per Fiscal Year

Fiscal Year (FY)	NTEP On-going Calibration Program Base Cost per NTEP only meter (above GIPSA costs to maintain the official moisture meters) (BC)
2015	$17,678
2016	$18,064
2017	$18,453
2018	$18,513
2019	$18,576

~~**NTEP On-going Calibration Program Fee Schedule For Year 2015**~~							
~~(1) Total Meters (including official meter) (TM)~~ ~~= O+N~~	~~(2) Number of NTEP only meters (non-GIPSA official Meters)~~ ~~= N~~	~~(3) Base Cost per Pool Of NTEP Meters in ongoing Calibration Program~~ ~~= BC~~	~~(4) Total Program Cost (TP)~~ ~~= NxBC~~	~~Funding Contributions From Participants~~			
				~~(5) NIST~~ ~~= TP/3~~	~~(6) GIPSA~~ ~~=TP/3~~	~~(7) Total funding from all mfg's meter types~~ ~~= TMxMCMT~~	~~(8) Mfg's Cost Per Meter Type (MCMT)~~ ~~= TP-NIST-GIPSA~~
~~3~~	~~1~~	~~17,678~~	~~17,678~~	~~5,893~~	~~5,893~~	~~17,678~~	~~5,893~~
~~4~~	~~2~~	~~17,678~~	~~35,356~~	~~11,785~~	~~11,785~~	~~47,141~~	~~11,785~~
~~5~~	~~3~~	~~17,678~~	~~53,034~~	~~17,678~~	~~17,678~~	~~88,390~~	~~17,678~~
~~6~~	~~4~~	~~17,678~~	~~70,712~~	~~23,571~~	~~23,571~~	~~141,424~~	~~23,571~~
~~7~~	~~5~~	~~17,678~~	~~88,390~~	~~29,463~~	~~29,463~~	~~206,243~~	~~29,463~~
~~8~~	~~6~~	~~17,678~~	~~106,068~~	~~30,000~~	~~30,000~~	~~368,544~~	~~46,068~~
~~9~~	~~7~~	~~17,678~~	~~123,746~~	~~30,000~~	~~30,000~~	~~573,714~~	~~63,746~~
~~10~~	~~8~~	~~17,678~~	~~141,424~~	~~30,000~~	~~30,000~~	~~814,240~~	~~81,424~~

~~NTEP On-going Calibration Program Fee Schedule For Year 2016~~							
~~(1) Total Meters (including official meter) (TM)~~ ~~= O+N~~	~~(2) Number of NTEP only meters (non-GIPSA official Meters)~~ ~~= N~~	~~(3) Base Cost per NTEP only Meters in ongoing Calibration Program~~ ~~= BC~~	~~(4) Total Program Cost (TP)~~ ~~= NxBC~~	~~Funding Contributions From Participants~~			
				~~(5) NIST~~ ~~= TP/3~~	~~(6) GIPSA~~ ~~=TP/3~~	~~(7) Total funding from all mfg's meter types~~ ~~= TMxMCMT~~	~~(8) Mfg's Cost Per Meter Type (MCMT)~~ ~~= TP-NIST-GIPSA~~
~~3~~	~~1~~	~~18,064~~	~~18,064~~	~~6,021~~	~~6,021~~	~~18,064~~	~~6,021~~
~~4~~	~~2~~	~~18,064~~	~~36,128~~	~~12,043~~	~~12,043~~	~~48,171~~	~~12,043~~
~~5~~	~~3~~	~~18,064~~	~~54,192~~	~~18,064~~	~~18,064~~	~~90,320~~	~~18,064~~
~~6~~	~~4~~	~~18,064~~	~~72,256~~	~~24,085~~	~~24,085~~	~~144,512~~	~~24,085~~
~~7~~	~~5~~	~~18,064~~	~~90,320~~	~~30,000~~	~~30,000~~	~~212,240~~	~~30,320~~
~~8~~	~~6~~	~~18,064~~	~~108,384~~	~~30,000~~	~~30,000~~	~~387,072~~	~~48,384~~
~~9~~	~~7~~	~~18,064~~	~~126,448~~	~~30,000~~	~~30,000~~	~~598,032~~	~~66,448~~
~~10~~	~~8~~	~~18,064~~	~~144,512~~	~~30,000~~	~~30,000~~	~~845,120~~	~~84,512~~

~~NTEP On-going Calibration Program Fee Schedule For Year 2017~~							
~~(1) Total Meters (including official meter) (TM)~~ ~~= O+N~~	~~(2) Number of NTEP only meters (non-GIPSA official Meters)~~ ~~= N~~	~~(3) Base Cost per NTEP only Meters in ongoing Calibration Program~~ ~~= BC~~	~~(4) Total Program Cost (TP)~~ ~~= NxBC~~	~~Funding Contributions From Participants~~			
				~~(5) NIST~~ ~~= TP/3~~	~~(6) GIPSA~~ ~~=TP/3~~	~~(7) Total funding from all mfg's meter types~~ ~~= TMxMCMT~~	~~(8) Mfg's Cost Per Meter Type (MCMT)~~ ~~= TP-NIST-GIPSA~~
~~3~~	~~1~~	~~18,453~~	~~18,453~~	~~6,151~~	~~6,151~~	~~18,453~~	~~6,151~~
~~4~~	~~2~~	~~18,453~~	~~36,906~~	~~12,302~~	~~12,302~~	~~49,208~~	~~12,302~~
~~5~~	~~3~~	~~18,453~~	~~55,359~~	~~18,453~~	~~18,453~~	~~92,265~~	~~18,453~~
~~6~~	~~4~~	~~18,453~~	~~73,812~~	~~24,604~~	~~24,604~~	~~147,624~~	~~24,604~~
~~7~~	~~5~~	~~18,453~~	~~92,265~~	~~30,000~~	~~30,000~~	~~225,855~~	~~32,265~~
~~8~~	~~6~~	~~18,453~~	~~110,718~~	~~30,000~~	~~30,000~~	~~405,744~~	~~50,718~~
~~9~~	~~7~~	~~18,453~~	~~129,171~~	~~30,000~~	~~30,000~~	~~622,539~~	~~69,171~~
~~10~~	~~8~~	~~18,453~~	~~147,624~~	~~30,000~~	~~30,000~~	~~876,240~~	~~87,624~~

~~NTEP On-going Calibration Program Fee Schedule~~ ~~For Year 2018~~							
~~(1) Total Meters (including official meter) (TM)~~ ~~= O+N~~	~~(2) Number of NTEP only meters (non-GIPSA official Meters)~~ ~~= N~~	~~(3) Base Cost per NTEP only Meters in ongoing Calibration Program~~ ~~= BC~~	~~(4) Total Program Cost (TP)~~ ~~= NxBC~~	~~Funding Contributions From Participants~~			
				~~(5) NIST~~ ~~= TP/3~~	~~(6) GIPSA~~ ~~=TP/3~~	~~(7) Total funding from all mfg's meter types~~ ~~= TMxMCMT~~	~~(8) Mfg's Cost Per Meter Type (MCMT)~~ ~~= TP-NIST-GIPSA~~
~~3~~	~~1~~	~~18,513~~	~~18,513~~	~~6,171~~	~~6,171~~	~~18,513~~	~~6,171~~
~~4~~	~~2~~	~~18,513~~	~~37,026~~	~~12,342~~	~~12,342~~	~~49,368~~	~~12,342~~
~~5~~	~~3~~	~~18,513~~	~~55,539~~	~~18,513~~	~~18,513~~	~~92,565~~	~~18,513~~
~~6~~	~~4~~	~~18,513~~	~~74,052~~	~~24,684~~	~~24,684~~	~~148,104~~	~~24,684~~
~~7~~	~~5~~	~~18,513~~	~~92,565~~	~~30,000~~	~~30,000~~	~~227,955~~	~~32,565~~
~~8~~	~~6~~	~~18,513~~	~~111,078~~	~~30,000~~	~~30,000~~	~~408,624~~	~~51,078~~
~~9~~	~~7~~	~~18,513~~	~~129,591~~	~~30,000~~	~~30,000~~	~~626,319~~	~~69,591~~
~~10~~	~~8~~	~~18,513~~	~~148,104~~	~~30,000~~	~~30,000~~	~~881,040~~	~~88,104~~

~~NTEP On-going Calibration Program Fee Schedule~~ ~~For Year 2019~~							
~~(1) Total Meters (including official meter) (TM)~~ ~~= O+N~~	~~(2) Number of NTEP only meters (non-GIPSA official Meters)~~ ~~= N~~	~~(3) Base Cost Per NTEP only Meters in ongoing Calibration Program~~ ~~= BC~~	~~(4) Total Program Cost (TP)~~ ~~= NxBC~~	~~Funding Contributions From Participants~~			
				~~(5) NIST~~ ~~= TP/3~~	~~(6) GIPSA~~ ~~=TP/3~~	~~(7) Total funding from all mfg's meter types~~ ~~= TMxMCMT~~	~~(8) Mfg's Cost Per Meter Type (MCMT)~~ ~~= TP-NIST-GIPSA~~
~~3~~	~~1~~	~~18,576~~	~~18,576~~	~~6,192~~	~~6,192~~	~~18,576~~	~~6,192~~
~~4~~	~~2~~	~~18,576~~	~~37,152~~	~~12,384~~	~~12,384~~	~~49,536~~	~~12,384~~
~~5~~	~~3~~	~~18,576~~	~~55,728~~	~~18,576~~	~~18,576~~	~~92,880~~	~~18,576~~
~~6~~	~~4~~	~~18,576~~	~~74,304~~	~~24,768~~	~~24,768~~	~~148,608~~	~~24,768~~
~~7~~	~~5~~	~~18,576~~	~~92,880~~	~~30,000~~	~~30,000~~	~~230,160~~	~~32,880~~
~~8~~	~~6~~	~~18,576~~	~~111,456~~	~~30,000~~	~~30,000~~	~~411,648~~	~~51,456~~
~~9~~	~~7~~	~~18,576~~	~~130,032~~	~~30,000~~	~~30,000~~	~~630,288~~	~~70,032~~
~~10~~	~~8~~	~~18,576~~	~~148,608~~	~~30,000~~	~~30,000~~	~~886,080~~	~~88,608~~

NTEP On-going Calibration Program Fee Schedule For Year 2015							
(1) Total Meters (including official meter) (TM) = O+N	(2) Number of NTEP only meters (non-GIPSA official Meters) = N	(3) Base Cost per NTEP only Meters in ongoing Calibration Program = BC	(4) Total Program Cost (TP) = NxBC	Funding Contributions From Participants			
				(5) NIST = TP/3	(6) GIPSA =TP/3	(7) Total funding from all mfg's meter types =TP-NIST-GIPSA	(8) Mfg's Cost Per Meter Type (MCMT) =(TP-NIST-GIPSA)/TM
3	1	17,678	17,678	5,893	5,893	5,893	1,964
4	2	17,678	35,356	11,785	11,785	11,785	2,946
5	3	17,678	53,034	17,678	17,678	17,678	3,536
6	4	17,678	70,712	23,571	23,571	23,571	3,928
7	5	17,678	88,390	29,463	29,463	29,463	4,209
8	6	17,678	106,068	30,000	30,000	46,068	5,759
9	7	17,678	123,746	30,000	30,000	63,746	7,083
10	8	17,678	141,424	30,000	30,000	81,424	8,142

NTEP On-going Calibration Program Fee Schedule For Year 2016							
(1) Total Meters (including official meter) (TM) = O+N	(2) Number of NTEP only meters (non-GIPSA official Meters) = N	(3) Base Cost per NTEP only Meters in ongoing Calibration Program = BC	(4) Total Program Cost (TP) = NxBC	Funding Contributions From Participants			
				(5) NIST = TP/3	(6) GIPSA =TP/3	(7) Total funding from all mfg's meter types = TP-NIST-GIPSA	(8) Mfg's Cost Per Meter Type (MCMT) =(TP-NIST-GIPSA)/TM
3	1	18,064	18,064	6,021	6,021	6,021	2,007
4	2	18,064	36,128	12,043	12,043	12,043	3,011
5	3	18,064	54,192	18,064	18,064	18,064	3,613
6	4	18,064	72,256	24,085	24,085	24,085	4,014
7	5	18,064	90,320	30,000	30,000	30,320	4,331
8	6	18,064	108,384	30,000	30,000	48,384	6,048
9	7	18,064	126,448	30,000	30,000	66,448	7,383
10	8	18,064	144,512	30,000	30,000	84,512	8,451

NTEP On-going Calibration Program Fee Schedule
For Year 2017

(1) Total Meters (including official meter) (TM) = O+N	(2) Number of NTEP only meters (non-GIPSA official Meters) = N	(3) Base Cost per NTEP only Meters in ongoing Calibration Program = BC	(4) Total Program Cost (TP) = NxBC	Funding Contributions From Participants			
				(5) NIST = TP/3	(6) GIPSA =TP/3	(7) Total funding from all mfg's meter types = TP-NIST-GIPSA	(8) Mfg's Cost Per Meter Type (MCMT) =(TP-NIST-GIPSA)/TM
3	1	18,453	18,453	6,151	6,151	6,151	2,050
4	2	18,453	36,906	12,302	12,302	12,302	3,076
5	3	18,453	55,359	18,453	18,453	18,453	3,691
6	4	18,453	73,812	24,604	24,604	24,604	4,101
7	5	18,453	92,265	30,000	30,000	32,265	4,609
8	6	18,453	110,718	30,000	30,000	50,718	6,340
9	7	18,453	129,171	30,000	30,000	69,171	7,686
10	8	18,453	147,624	30,000	30,000	87,624	8,762

NTEP On-going Calibration Program Fee Schedule
For Year 2018

(1) Total Meters (including official meter) (TM) = O+N	(2) Number of NTEP only meters (non-GIPSA official Meters) = N	(3) Base Cost per NTEP only Meters in ongoing Calibration Program = BC	(4) Total Program Cost (TP) = NxBC	Funding Contributions From Participants			
				(5) NIST = TP/3	(6) GIPSA =TP/3	(7) Total funding from all mfg's meter types = TP-NIST-GIPSA	(8) Mfg's Cost Per Meter Type (MCMT) = (TP-NIST-GIPSA)/TM
3	1	18,513	18,513	6,171	6,171	6,171	2,057
4	2	18,513	37,026	12,342	12,342	12,342	3,086
5	3	18,513	55,539	18,513	18,513	18,513	3,703
6	4	18,513	74,052	24,684	24,684	24,684	4,114
7	5	18,513	92,565	30,000	30,000	32,565	4,652
8	6	18,513	111,078	30,000	30,000	51,078	6,385
9	7	18,513	129,591	30,000	30,000	69,591	7,732
10	8	18,513	148,104	30,000	30,000	88,104	8,810

NTEP On-going Calibration Program Fee Schedule For Year 2019							
(1) Total Meters (including official meter) (TM) = O+N	(2) Number of NTEP only meters (non-GIPSA official Meters) = N	(3) Base Cost Per NTEP only Meters in ongoing Calibration Program = BC	(4) Total Program Cost (TP) = NxBC	Funding Contributions From Participants			
				(5) NIST = TP/3	(6) GIPSA =TP/3	(7) Total funding from all mfg's meter types = TP-NIST-GIPSA	(8) Mfg's Cost Per Meter Type (MCMT) =(TP-NIST-GIPSA)/TM
3	1	18,576	18,576	6,192	6,192	6,192	2,064
4	2	18,576	37,152	12,384	12,384	12,384	3,096
5	3	18,576	55,728	18,576	18,576	18,576	3,715
6	4	18,576	74,304	24,768	24,768	24,768	4,128
7	5	18,576	92,880	30,000	30,000	32,880	4,697
8	6	18,576	111,456	30,000	30,000	51,456	6,432
9	7	18,576	130,032	30,000	30,000	70,032	7,781
10	8	18,576	148,608	30,000	30,000	88,608	8,861

7. Test Weight per Bushel Acceptance and Maintenance Tolerance

Source:
Mr. Jeffrey D. Adkisson, Grain and Feed Association of Illinois

Purpose:
Due to problems cited in the grain and feed industry, review and make any needed changes to the test weight per bushel tolerances in *NIST Handbook 44* Section 5.56(a).

Item under Consideration:
During the discussion of this item at the 2012 sector meeting it was noted that because the system is rapidly changing over to the new UGMA technology which is going to result in the improvement in TW readings, TW should resolve itself as older instruments are retired. It was also mentioned that test weight data is needed to review the current system to make any needed changes to test weight per bushel and that sample selection when testing meters for test weight, should be reviewed. It was recommended that TW per bushel comparison charts be developed for review. Cathy Brenner developed these charts and the charts are available for review or can be downloaded for printing at the following web address:

http://www.ncwm.net/resources/dyn/files/1081742zef27d924/_fn/TW+2013+Sector+Meeting.pdf

Background / Discussion:
This is a carryover from the sector's 2011 meeting. Mr. Adkisson, Grain and Feed Association of Illinois, cited problems his industry is having regarding Test Weight (TW) per bushel. GMMs that have failed TW during field

inspection are sent to the manufacturer for repair. When the meters are returned, the reports indicate that no problems have been found. There are also situations where a meter has failed TW. When the state inspector subsequently tested the elevator's quart kettle it matched the meter, but it didn't match the state inspector's sample. This is particularly frustrating for the country elevators in Illinois that are using the GMM TW only as a screening tool.

At the Sector's August 2011 meeting a task group was formed to investigate the whole TW system with the goal of defining procedures that would improve TW both for the user and for the inspection system. Past data obtained by the Sector had indicated that the existing tolerances were reasonable. It was felt that increasing TW tolerances would only cover up the problems. What was needed was an investigation of the whole system of calibrating meters, then translating that calibration into the field, and then keeping it that way.

Dr. Charles R. Hurburgh, Jr., Iowa State University, agreed to head the task group. Other TW Task Group members included:

- Mr. Jeffery Adkisson – Grain and Feed Association of Illinois
- Ms. Diane Lee – NIST, OWM
- Ms. Cassie Eigenmann – DICKEY-john Corporation
- Mr. Ivan Hankins – Iowa Department of Agriculture/Weights and Measures
- Mr. Tim Kaeding – Perten Instruments, Inc.
- Mr. Karl Cunningham – Illinois Department of Agriculture

Further action on the issue of tolerances was postponed until the TW Task Group was able to recommend appropriate action.

In Early 2012 the TW Task Group developed the following list of Action Items:

- Survey the grain industry as to the frequency of discounting each of the major grains (wheat, corn, and soybeans) for test weight, and within those discounted the frequency of use of the meter test weight versus the cup-bucket test weight.
- Survey the industry for comparative data between meters and an Official GIPSA agency on the same samples.
- Develop a draft procedure for sample selection and pre-qualification

Dr. Hurburgh reported that discounting for low TW was not an issue in either 2010 or 2011. TWs for corn were so high that discounting was not an issue. Within Iowa most grain elevators were using the TW reported by their GMM. Only a few were using the standard quart kettle method. This is likely to change in the 2012 harvest as low TWs are likely to be more common. Also, there may not be as much TW increase in drying as would normally be expected. TW may come up again as a discount factor.

Same sample TW data has not been collected comparing grain elevator GMMs with an Official GIPSA agency. Dr. Hurburgh explained that this information should be relatively easy to obtain, because in almost every case when a train is officially graded the samples are run at the grain elevator first. Since last year's sector meeting, the rapid acceptance of the new UGMA GMMs as Official Meters for corn, soybeans, sunflowers, and grain sorghum (with the remaining grains scheduled to switch to UGMA GMMs for Official Inspection on May1, 2013), has altered some of the issues. The new technology not only provides a better moisture measurement, but a better TW measurement as well.

The remaining action item that the task group believed was necessary was a procedure for pre-qualifying TW samples as being good predictors for the TW function as well as moisture function. Most States pre-screen moisture samples to get the outliers out of the system. That pre-qualification would have to be expanded if TW is to be actively used to reject meters on the basis of TW.

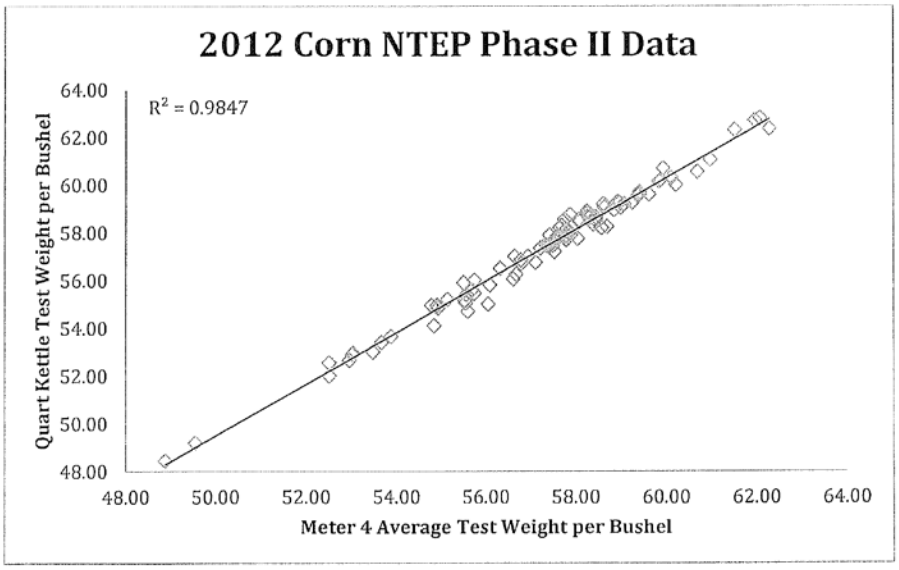
Dr. Hurburgh recommended that the sector not adjust TW tolerances at this time, because the system is rapidly changing over to the new technology which is going to result in the improvement in TW readings. The problem should resolve itself as older instruments are retired.

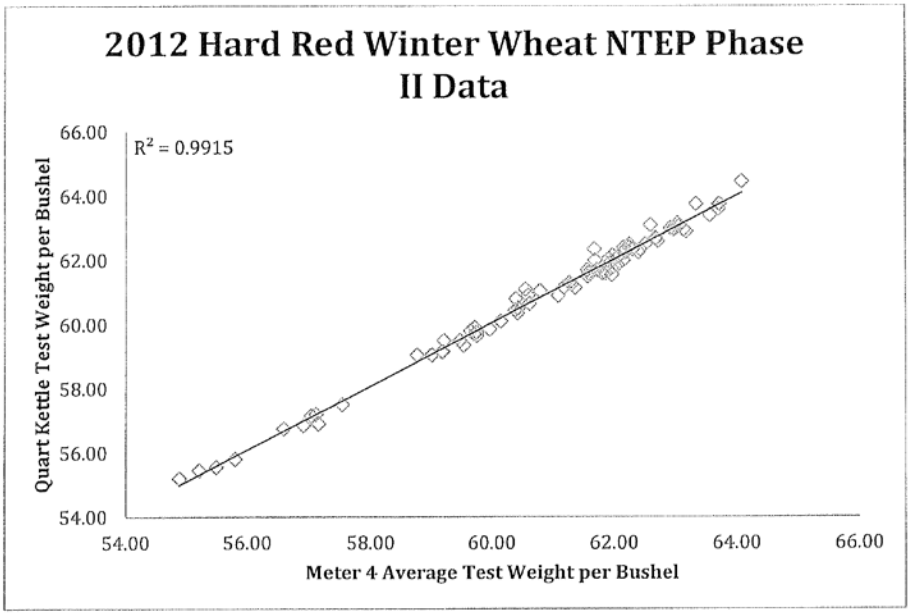
Mr. Karl Cunningham, Illinois Dept. of Agriculture, informed the Sector that Illinois's TW rejection rate has gone down in the last two years. He has no problem with TW on the meters in his laboratory and doesn't think the present tolerances are a problem. Many of the field problems may be due to rough handling of the meters during shipping. Mr. Cunningham advises elevators who have to have their devices worked on to take them to the manufacturer's service department themselves if at all possible.

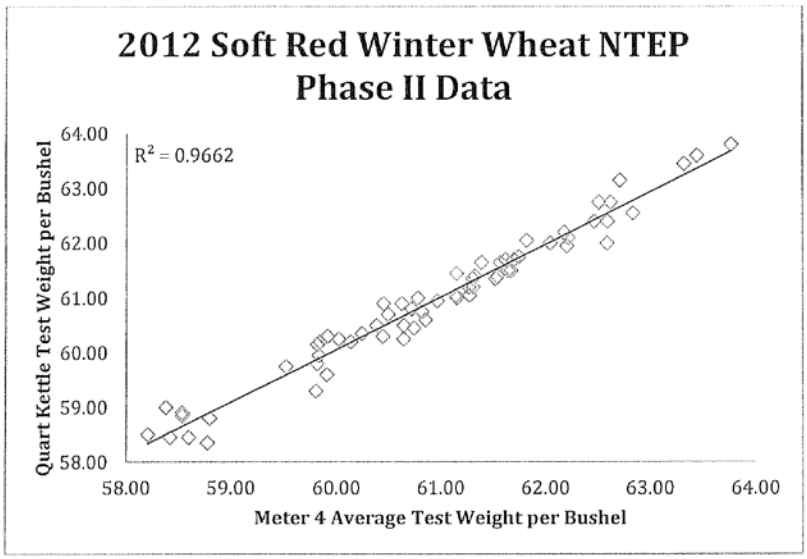
Mr. Tim Kaeding, Perten Instruments, suggested that there might be value in expanding the Phase II OCP grain moisture comparison charts to include TW. Dr. Hurburgh recommended that a TW comparison chart showing the spread of TW measurements for individual meters against the corresponding official quart kettle TW measurements would address the tolerance issue, whereas a bias plot would not. He suggested plotting meter TWs on the x-axis and quart kettle results on the y-axis. A best-fit line could be drawn for each meter.

The sector agreed that TW comparison charts should be prepared for the 3 grains which are most likely to be subject to discounts on the basis of TW: Corn and two wheat classes. The wheat classes selected were: Hard Red Winter and Soft Red Winter. Manufacturer approval is required for NTEP Phase II TW performance data to be released for publication even if individual instruments are not identified. The two meter manufacturers present indicated that they would approve the release of this data. Permission would have to be obtained from the other manufacturers. The sector agreed to postpone further action on changing TW tolerances until more information was available.

At the August 2013 Sector Meeting Ms. Brenner reviewed test weight per bushel data for Corn, Hard Red Winter Wheat and Soft Red Winter Wheat (See charts below). The data showed that NTEP meters aligned closely with the official quart kettle test weight per bushel measurements. States noted that they have seen a significant improvement in test weight per bushel measurements and lower complaints have been received concerning test weight. Karl Hansan stated that he is collecting data on the moisture changes in grain samples over time when using the samples in the field. This data can be used to improve the field inspection of the test weight per bushel measurements on grain analyzers. Ms. Lee provided a draft copy of a weights and measures newsletter article entitled "Determining Reference Test Weight per Bushel Value of Grains." Following the August Sector Meeting the article was published in the Weights and Measures Newsletter and can be accessed at: http://www.nist.gov/pml/wmd/pubs/upload/WMConnections.pdf. This article will help to ensure that States are following proper procedures when assigning reference test weight per bushel values to grains used to test instruments that provide test weight per bushel measurements.







At the August 2014 Grain Analyzer Sector meeting, Mr. Hanson noted that due to time constraints he was unable to collect data on test weight per bushel measurements of field grain samples. Mr. Jeffrey Adkisson, Grain and Feed Association of Illinois reported that the number of complaints concerning test weight has drop. He also noted that he was not sure if it was due to the growing season or if better test procedures are being used by State weights and measures officials. Manufacturers and others noted that they would like the weight per bushel charts to continue to determine how test weight is affect by crop issues.

8. Report on International Organization of Legal Metrology (OIML) TC 17/SC 1 R 59 *Moisture Meters for Cereal Grains and Oilseeds*

Background / Discussion:
This item is included on the sector's agenda to provide a summary of the activities of OIML TC17/SC1 for the grain analyzer sector and to those Sector members that participate on the United States National Working Group (USNWG) on grain moisture meters. In addition the sector is asked to review a proposal to change the Humidity test in NCWM Publication 14 to align with the OIML D11 and IEC damp heat test procedure.

OIML TC17/SC1 was tasked to revise OIML R 59 *Moisture Meters for Cereal Grains and Oilseeds* to reflect new technologies and actual grain analysis. The Co-Secretariats (China and the United States) are working closely with an International Project Group to revise OIML Recommendation R 59 *Moisture Meters for Cereal Grains and Oilseeds.* The U.S. completed a six committee draft (6th CD) of OIML R 59, which was circulated to the international project group and the U.S. National Working Group (USNWG) on grain moisture measuring devices for review and comment on March 6, 2013. The U.S. Co-secretariat requested that the comments to the 6th CD be submitted by June 6, 2013. The U.S. Secretariat collated the U.S. and international comments to the 6th CD and these comments were reviewed at the TC17/SC1 meeting hosted by NIST/OWM July 23-24, 2013.

At the TC17/SC1 July 23-24, 2013 meeting, comments to the 6th CD were reviewed and the major discussion was harmonization of test procedures between OIML TC17/SC1 R59 *Moisture Meters for Cereal Grains and Oilseeds* and OIML TC17/SC8 Recommendation on *Protein Measuring Instruments for Cereal Grain and Oil Seeds.*

At the July 2013 meeting it was discussed that the international damp heat test (OIML D11 and IEC) is significantly different from the NTEP Humidity test. The international test is more robust and more accurately reflects the environmental conditions an instrument is likely to encounter in field use. The damp heat test is conducted at a maximum temperature of either the manufacturer specified upper ambient temperature or 30 °C and a maximum relative humidity of 85%. The damp heat test is designed to evaluate the device under the environmental (temperature and relative humidity) conditions it will encounter during operation.

During the August 2013 Grain Analyzer Sector meeting the Sector reviewed the proposal to replace the NTEP Publication 14 GMM and NIR Humidity test procedure with the OIML D11 Damp Heat test procedure. It was noted that the proposed changes to the humidity test in Publication 14 were based on OIML D11 requirements Damp heat test, Severity level 1. During discussion of this item, it was mentioned that the temperature and humidity levels as specified in OIML D11 may pose unsafe operating conditions to laboratory staff and also that grain moisture meters are not designed to operate in these extreme conditions. A question was asked if another severity level in D11 would more closely match the testing that is currently in Publication 14 and that has been used for many years in the U.S. Ms. Lee, reviewed OIML D11 requirements following the meeting and found that both severity level 1 and 2 exceed the temperature and humidity levels specified in Publication 14. The Sector agreed by consensus that the OIML D11, Damp heat test, is much too severe for grain moisture meters and that publication 14 should not be changed to meet the requirements of OIML D11.

The U.S. will develop a 7th CD that will be distributed for voting based on comments to the 6th CD, the July 2013 TC17/SC1 meeting and the GA Sector feedback from the August 2013 meeting.

At the August 2014 Grain Analyzer Sector meeting, Ms. Diane Lee, NIST OWM, provided an update on the status of the 7th CD on *Moisture Meters for Cereal Grains and Oilseed.* Ms. Lee reported that the U.S. is nearing completion of the 7th CD on *Moisture Meters for Cereal Grains and Oilseed.* This document will be forwarded to the TC17/SC1 participating and observing countries for a vote and will also be forwarded to participants of the USNWG on Grain Moisture Measuring Devices for vote and comment.

9. Report on OIML TC 17/SC 8 *Protein Measuring Instruments for Cereal Grain and Oil Seeds*

Background / Discussion:
This item was included on the sector's agenda to provide a summary of the activities of OIML TC 17/SC 8 to the grain analyzer sector and to those Sector members that participate on the United States National Working Group (USNWG) on grain protein measuring instruments. OIML TC17/SC8 was formed to study the issues and to develop a Recommendation on *Protein Measuring Instruments for Cereal Grain and Oil Seeds.* Australia is the Secretariat for this subcommittee. The third committee draft (3rd CD) for this Recommendation was circulated to the US national Working group for comments on July 3, 2012 for review and comment and comments were requested by September 8, 2012. The U.S. Comments to the 3rd CD were forwarded to the secretariat and the secretariat developed the 4th CD based on these comments.

The 4th CD was circulated to the USNWG on grain protein measuring instruments on April 9, 2013 and comments to the 4th CD of TC 17/SC 8 were requested by June 13, 2013. The U.S. comments to the 4th CD were forwarded to the secretariat. The U.S. was requested to vote on the 4th CD and a vote of no was provided due to a number of differences in the test procedures of the OIML Recommendation for *Protein Measuring Instruments for Cereal Grain and Oil Seeds* and the OIML Recommendation 59 *Moisture Meters for Cereal Grain and Oilseeds*.

A meeting was hosted by NIST, OWM, July 24-25, 2013 to discuss the comments to the 4th CD for the Recommendation on *Protein Measuring Instruments for Cereal Grain and Oil Seeds*. Discussions on 4th CD dealt mostly with harmonization of testing with the 6th CD of the OIML Recommendation R59 *Moisture Meters for Cereal Grain and Oilseeds*, software requirements, and influence quantities and test sample temperature.

At the August 2013 Grain Analyzer Sector meeting, the Sector reiterated their concerns with the OIML D11 damp heat test and agreed that the damp heat test in OIML Recommendation on Protein Measuring Instruments for Cereal Grain and Oil Seeds, 4th CD should be replaced with the humidity test as written in OIML R59 CD6.

The TC17/SC8 Secretariat will distribute a 5th CD for voting.

At the August 2014 Grain Analyzer Sector meeting, Ms. Diane Lee, NIST OWM, provided an update on the status of the 5th CD on *Protein Measuring Instruments for Cereal Grain and Oil Seeds*. The 5th CD on *Protein Measuring Instruments for Cereal Grain and Oil Seeds* was sent via e-mail to the USNWG on Protein Measuring Device on August 26, 2014 for a vote and comments. The USNWG participants were requested to provide their vote and any comments to the 5th CD by October 14, 2014. Ms. Lee encouraged the Grain Analyzer Sector members that are also participating on the USNWG to provide a vote and any comment to the 5th CD on Protein *Measuring Instruments for Cereal Grain and Oil Seed.*

10. Software Sector Items

(a) Identification of Certified Software

Source:
NTETC Software Sector

Purpose:
Review and provide comment to the Software Sector reports and conclusion on software issues.

Background:

This item originated as an attempt to answer the question "How does the field inspector know that the software running in the device is the same software evaluated and approved by the lab?" In previous meetings it was shown that the international community has addressed this issue (both WELMEC and OIML).

From WELMEC 7.2:

> **Required Documentation:**
> The documentation shall list the software identifications and describe how the software identification is created, how it is inextricably linked to the software itself, how it may be accessed for viewing and how it is structured in order to differentiate between version changes with and without requiring a type approval**.**

From OIML D-31:

> The executable file "**tt100_12.exe**" is protected against modification by a checksum. The value of checksum as determined by algorithm **XYZ** is **1A2B3C**.

Previous discussions have included a listing of some additional examples of possible valid methods (not limiting):

- CRC (cyclical redundancy check)
- Checksum
- Inextricably Linked version no.
- Encryption
- Digital Signature

Is there some method to give the weights and measures inspector information that something has changed?
Yes, the Category III Audit Trail or other means of sealing.

How can the weights and measures inspector identify an NTEP Certified version?
They can't, without adding additional requirements like what is described here, in conjunction with including the identifier on the CC).

The sector believes that we should work towards language that would include a requirement similar to the International Organization of Legal Metrology (OIML) requirement in *NIST Handbook 44*. It is also the opinion of the sector that a specific method should not be defined; rather the manufacturer should utilize a method and demonstrate the selected identification mechanism is suitable for the purpose. It is not clear from the discussion where such proposed language might belong.

NTEP strongly recommends that metrological software be separated from non-metrological software for ease of identification and evaluation.

From OIML:

> Separation of software parts - All software modules (programmes, subroutines, objects etc.) that perform metrologically significant functions or that contain metrologically significant data domains form the metrologically significant software part of a measuring instrument (device or sub-assembly). The conformity requirement applies to all parts and parts shall be marked according to Section G-S-X.X.
>
> If the separation of the software is not possible or needed, then the software is metrologically significant as a whole.

(Segregation of parameters is currently allowed - see table of sealable parameters)

Initial draft proposed language: (G-S.1.1?)

NIST Handbook 44 (This has been written into G-S.1.d.3): Identification of Certified Software:

> **Software-based electronic devices shall be designed such that the metrologically significant software is clearly identified by the version or revision number~~.~~ ~~The identification~~, and this identification ~~of the software~~ shall be ~~inextricably~~ directly and inseparably linked to the software itself. The version or revision number may consist of more than one part, but at least one part shall be dedicated to the metrologically significant software.**

From NCWM Publication 14:

Identification of Certified Software:

> Note: Manufacturers may choose to separate metrologically significant software from non-metrologically significant software. Separation would allow the revision of the non-metrological portion without the need for further evaluation. In addition, non-metrologically significant software may be updated on devices without breaking a seal, if so designed. Separation of software requires that all software modules (programs, subroutines, objects etc.) that perform metrologically significant functions or that contain metrologically significant data ~~**domains**~~ form the metrologically significant software part of a measuring instrument (device or sub-assembly). If the separation of the software is not possible or needed, then the software is metrologically significant as a whole. ~~**The conformity requirement applies to all parts and parts shall be marked according to Section G-S.X.X.**~~
>
> The manufacturer must describe and possibly demonstrate how the version or revision identifier is directly and inseparably linked to the metrologically significant software. Where the version revision identifier is comprised of more than one part, the manufacturer shall describe which portion represents the metrological significant software and which does not.

From OIML D-31:

> Legally relevant software of a measuring instrument / electronic device / sub-assembly shall be clearly identified with the software version or another token. The identification may consist of more than one part but at least one part shall be dedicated to the legal purpose.
>
> The identification shall be inextricably linked to the software itself and shall be presented or printed on command or displayed during operation or at start up for a measuring instrument that can be turned off and on again. If a sub-assembly/an electronic device has neither display nor printer, the identification shall be sent via a communication interface in order to be displayed/printed on another sub-assembly/electronic device.

The first sentence of the first paragraph above is already addressed in *NIST Handbook 44's* marking requirements.

In 2010, the sector recommended the following change to *NIST Handbook 44*, General Code: G-S.1(d) to add a new subsection (3):

> *(d) the current software version or revision identifier for* ~~***not built for purpose***~~ ***software-based electronic devices;***
> *[Nonretroactive as of January 1, 2004]*
> (Added 2003) **(Amended 20XX)**
>
> *(1) The version or revision identifier shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision.*
> *[Nonretroactive as of January 1, 2007]*
> *(Added 2006)*

(2) Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number." Abbreviations for the word "Revision" shall, as a minimum, begin with the letter "R" and may be followed by the word "Number." The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).
[Nonretroactive as of January 1, 2007]
(Added 2006)

(3) The version or revision identifier shall be directly and inseparably linked to the software itself. The version or revision identifier may consist of more than one part, but at least one part shall be dedicated to the metrologically significant software.
[Nonretroactive as of January 1, 201X]
(Added 20XX)

Also the sector recommended the following information be added to *NCWM Publication 14* as explanation/examples:

- Unique identifier must be displayable/printable on command or during operation, etc.
- At a minimum, a version/revision indication (1.02.09, rev 3.0 a, etc.). Could also consist of / contain checksum, etc. (crc32, for example)

There was some additional discussion on this item regarding where this new requirement was best located. It was suggested that the first sentence of G-S.1.d.(3) could be added as a clause to the base paragraph G-S.1(d) text, e.g. "*the current software version or revision identifier for* ***~~not built for purpose~~ software-based*** *devices, which shall be directly and inseparably linked to the software itself;"* .

It also was suggested that the second sentence in G-S.1.d. (3) might be more suitable for *NCWM Publication 14*, as it describes more "how" than "what" the requirement entails.

In addition, the sector considered the following information to be added to *NCWM Publication 14* as explanation/examples:

- The current software identifier must be displayable/printable on command during operation (or made evident by other means deemed acceptable by G-S.1.)
- At a minimum, the software identifier must include a version/revision indication (1.02.09, rev 3.0 a, etc.). It could also consist of / contain checksum, etc. (crc32, for example).
- The version or revision identifier may consist of more than one part, but at least one part shall be dedicated to the metrologically significant software.

Other questions that are still outstanding:

- If we allow hard-marking of the software identifier (the sector has wavered on this in the past), does the above wording then imply that some mechanical means is required (i.e. physical seal) to "inseparably link" the identifier to the software?
- If a device is capable of doing so, does it still have to be able to display, print or communicate the identifier somehow, even if it is hard-marked?

At the 2012 NTETC Software Sector Meeting, there was some discussion as to where the terminology regarding inextricably linking the software version or revision to the software itself belonged. At the moment, it is not incorporated in the proposed text for G-S.1. *NCWM Publication 14* may be a better option for the time being. This would be another item that would benefit from further explanation in a supplementary document.

Several sector members were of the opinion that attempting to make this change at the same time as the earlier changes might be a difficult sell. Mr. Truex, NTEP Administrator, reiterated the necessity of baby steps.

In 2012, the sector thus recommended adding the following to *NCWM Publication 14* and forward to NTETC Weighing, Measuring, Grain Analyzer sectors for feedback:

Identification of Certified Software:

> Note: Manufacturers may choose to separate metrologically significant software from non-metrologically significant software. Separation would allow the revision of the non-metrological portion without the need for further evaluation. In addition, non-metrologically significant software may be updated on devices without breaking a seal, if so designed. Separation of software requires that all software modules (programs, subroutines, objects etc.) that perform metrologically significant functions or that contain metrologically significant data domains form the metrologically significant software part of a measuring instrument (device or sub-assembly). If the separation of the software is not possible or needed, then the software is metrologically significant as a whole. The conformity requirement applies to all parts and parts shall be marked according to Section G-S-X.X.
>
> The manufacturer must describe and possibly demonstrate how the version or revision identifier is directly and inseparably linked to the metrologically significant software. Where the version revision identifier is comprised of more than one part, the manufacturer shall describe which portion represents the metrological significant software and which does not.

Discussion:
The Measuring Sector reviewed this item and had no feedback other than a statement that they support the continuing / ongoing efforts of this sector. The Weighing Sector summary mentioned that no one opted to provide comment. They agreed to take no further action on this item, pending further action from the Software Sector. This was specifically in reference to the accepted symbols.
For the time being, Jim Truex recommended that we not attempt to provide a definition for "software-based device". We discussed the possibility of combining this change with the first agenda item, which had been attempted in previous years. Alternatively, if the HB44 changes from agenda item 1 are made, this agenda item could be addressed in Pub. 14.

Conclusion:
After further discussion, the wording in G-S.1.d under agenda item 1 was changed. Agenda item 2 will remain; however, it will address potential changes to Pub. 14 and contain no suggested modifications to Handbook 44. (See changes and conclusion under agenda item 1 for further details.)

The Sector chair volunteered to review the existing slide presentation detailing the purpose of these changes, to ensure that it accurately reflects this information.

(b) Software Protection/Security

Source:
NTETC Software Sector

Background:
The sector agreed that *NIST Handbook 44* already has audit trail and physical seal, but these may need to be enhanced.

From the WELMEC Document:

> **Protection against accidental or unintentional changes**
> Metrologically significant software and measurement data shall be protected against accidental or unintentional changes.
>
> **Specifying Notes:**

Possible reasons for accidental changes and faults are: unpredictable physical influences, effects caused by user functions and residual defects of the software even though state of the art of development techniques have been applied.

This requirement includes consideration of:

a) Physical influences: Stored measurement data shall be protected against corruption or deletion when a fault occurs or, alternatively, the fault shall be detectable.

b) User functions: Confirmation shall be demanded before deleting or changing data.

c) Software defects: Appropriate measures shall be taken to protect data from unintentional changes that could occur through incorrect program design or programming errors, e.g. plausibility checks.

Required Documentation:
The documentation should show the measures that have been taken to protect the software and data against unintentional changes.

Example of an Acceptable Solution:

- The accidental modification of software and measurement data may be checked by calculating a checksum over the relevant parts, comparing it with the nominal value and stopping if anything has been modified.
- Measurement data are not deleted without prior authorization, e.g. a dialogue statement or window asking for confirmation of deletion.
- For fault detection see also Extension I.

The sector continued to develop a proposed checklist for *NCWM Publication 14*. The numbering will still need to be added. This is based roughly on R 76 – 2 checklist and discussions beginning as early as the October 2007 NTETC Software Sector Meeting. The information requested by this checklist is currently voluntary, however, it is recommended that applicants comply with these requests or provide specific information as to why they may not be able to comply. Based on this information, the checklist may be amended to better fit with NTEP's need for information and the applicant's ability to comply.

The California, Maryland and Ohio laboratories agreed to use this check list on one of the next devices they have in the lab and report back to the sector on what the problems may be. In February 2011, the North Carolina laboratory was also given a copy of the check list to try.

1. Devices with ~~Embedded~~ Software ~~TYPE P (aka built-for-purpose)~~

1.3. Declaration of the manufacturer that the software is used in a fixed hardware and software environment. **AND** ☐ Yes ☐ No ☐ N/A

1.4. Cannot be modified or uploaded by any means after securing/verification. ☐ Yes ☐ No ☐ N/A

Note: It is acceptable to break the "seal" and load new software, audit trail is also a sufficient seal.

1.5. The software documentation contains:

1.5.3. Description of all functions, designating those that are considered metrologically significant. ☐ Yes ☐ No ☐ N/A

1.5.4. Description of the securing means (evidence of an intervention). ☐ Yes ☐ No ☐ N/A

1.5.5. Software Identification, including version / revision ☐ Yes ☐ No ☐ N/A

1.5.6. Description how to check the actual software identification. ☐ Yes ☐ No ☐ N/A

1.6. The software identification is:

1.6.7. Clearly assigned to the metrologically significant software and functions. ☐ Yes ☐ No ☐ N/A

1.6.1.	Description how to check the actual software identification.	☐ Yes ☐ No ☐ N/A
1.6.2.	Provided by the device as documented.	☐ Yes ☐ No ☐ N/A
1.6.3.	Directly linked to the software itself.	☐ Yes ☐ No ☐ N/A

2. ~~Personal Computers, Instruments with PC Components, and Other Instruments, Devices, Modules, and Elements with Programmable or~~ Loadable Metrologically Significant Software ~~TYPE U (aka not built-for-purpose)~~

2.1.	The metrologically significant software is:	
2.1.4.	Documented with all relevant (see below for list of documents) information.	☐ Yes ☐ No ☐ N/A
2.1.5.	Protected against accidental or intentional changes.	☐ Yes ☐ No ☐ N/A
2.2.	Evidence of intervention (such as, changes, uploads, circumvention) is available until the next verification / inspection (e.g., physical seal, Checksum, Cyclical Redundancy Check (CRC), audit trail, etc. means of security).	☐ Yes ☐ No ☐ N/A

3. Software with ~~Closed Shell (~~no access to the operating system and/or programs possible for the user~~)~~

3.1.	Check whether there is a complete set of commands (e.g., function keys or commands via external interfaces) supplied and accompanied by short descriptions.	☐ Yes ☐ No ☐ N/A
3.2.	Check whether the manufacturer has submitted a written declaration of the completeness of the set of commands.	☐ Yes ☐ No ☐ N/A

4. Operating System and / or Program(s) Accessible for the User

4.1.	Check whether a checksum or equivalent signature is generated over the machine code of the metrologically significant software (program module(s) subject to legal control Weights and Measures jurisdiction and type-specific parameters).	☐ Yes ☐ No ☐ N/A
4.2.	Check whether the metrologically significant software will detect and act upon any unauthorized alteration of the metrologically significant software using simple software tools (e.g., text editor).	☐ Yes ☐ No ☐ N/A

5. Software Interface(s)

5.1.	Verify the manufacturer has documented:	
5.1.6.	The program modules of the metrologically significant software are defined and separated.	☐ Yes ☐ No ☐ N/A
5.1.7.	The protective software interface itself is part of the metrologically significant software.	☐ Yes ☐ No ☐ N/A
5.1.8.	The functions of the metrologically significant software that can be accessed via the protective software interface.	☐ Yes ☐ No ☐ N/A
5.1.9.	The parameters that may be exchanged via the protective software interface are defined.	☐ Yes ☐ No ☐ N/A
5.1.10.	The description of the functions and parameters are conclusive	☐ Yes ☐ No ☐ N/A

and complete.

5.1.11. There are software interface instructions for the third party (external) application programmer. ☐ Yes ☐ No ☐ N/A

The Maryland laboratory had particular questions regarding 3.1 and 5.1. The information for 3.1 could be acquired from an operator's manual, a training video, or in-person training. The items in 5.1 were confusing to the evaluators. The terminology is familiar to software developers, but not necessarily others. It was indicated that manufacturers were typically quick to return the filled out questionnaire, but he didn't know how his laboratory was supposed to verify that it was true. Generally, the laboratories wouldn't be expected to verify things to that level. For example, if the manufacturer states that a checksum is used to ensure integrity, the laboratories wouldn't be expected to evaluate the algorithm used.

The intent was to see whether the manufacturer had at least considered these issues, not for evaluators to become software engineers. Perhaps a glossary or descriptive paragraphs might be added to assist the evaluators for if the manufacturer has questions for the evaluators.

OIML makes use of supplementary documents to explain the checklist they use. Below are links:
http://www.oiml.org/publications/D/D031-e08.pdf
http://www.welmec.org/latest/guides/72.html
http://www.welmec.org/fileadmin/user_files/publications/2-3.pdf

WELMEC document 2.3 is the original source for our checklist, but it's been significantly revised and simplified. Mr. Payne, Maryland Department of Agriculture, is going to review the other documents and come up with some suggestions for the checklist. Mr. Roach, California Division of Measurement Standards, is going to begin using the checklist. The international viewpoint is that any device running an operating system is considered to be Type U. Mr. Roach mentioned that they're having lots of problems with "skimmers" stealing PIN's. Is there some way they can detect this?

Mr. Lewis, Rice Lake Weighing Systems, Inc., mentioned that he liked Measurement Canada's website. When answering similar questions, different pages would appear, based on answers to those questions: http://www.ic.gc.ca/eic/site/mc-mc.nsf/eng/lm00573.html

At the 2011 NTETC Software Sector Meeting, the laboratories were polled to obtain any feedback on the use of the checklist. Maryland attempted to use this checklist a few times. They had some difficulty obtaining answers from the manufacturers because the individual(s) interacting with the Maryland evaluator didn't always have the required information on hand. More experience in using the checklist will help determine what needs to be revised.

It was suggested that the checklist could be sent to manufacturers for their feedback as well, with the stipulation that it a completely voluntary exercise and purely informational at this point. The laboratories will coordinate with willing manufacturers to obtain feedback.

Work is ongoing on this item with the intent that it eventually will be incorporated as a checklist in *NCWM Publication 14*; again the laboratories are requested to try utilizing this checklist for any evaluations on software-based electronic devices.

The checklist has been reviewed with an eye to making its terminology clearer to laboratories. Some examples and clarifications have been added as shown in the discussion section of this item. The revised checklist will be distributed to the laboratories for additional review. Maryland and California laboratories agreed to use the checklist on a trial basis.

Discussion:

Over the past year, attempts to use the current checklist did not meet with many difficulties. The checklists were given to the manufacturers to fill out, and that seemed to work rather well. Minor modifications (in red above) were made to clarify certain confusing areas or eliminate redundancy.

Conclusion:
The next step will be to forward it to the four sectors; we can report that the labs have tried using it on a trial basis and we're ready to recommend it for Pub. 14 with the modification suggested here, such as the removal of the Type P / Type U wording.

(c) Software Maintenance and Reconfiguration

Source:
NTETC Software Sector

Background:
After the software is completed, what do the manufacturers use to secure their software? The following items were reviewed by the sector. *Note that agenda Item 3 also contains information on Verified and Traced updates and Software Log.*

1. Verify that the update process is documented (OK)
2. For traced updates, installed Software is authenticated and checked for integrity

   Technical means shall be employed to guarantee the authenticity of the loaded software (i.e. that it originates from the owner of the type approval certificate). This can be accomplished (e.g. by cryptographic means like signing). The signature is checked during loading. If the loaded software fails this test, the instrument shall discard it and either use the previous version of the software **or become inoperative**.

   Technical means shall be employed to guarantee the integrity of the loaded software i.e. that it has not been inadmissibly changed before loading. This can be accomplished e.g. by adding a checksum or hash code of the loaded software and verifying it during the loading procedure. If the loaded software fails this test, the instrument shall discard it and either use the previous version of the software **or become inoperative**.

   Examples are not limiting or exclusive.

3. Verify that the sealing requirements are met

   The sector asked, what sealing requirements are we talking about?

   This item is **only** addressing the **software update**, it can be either verified or traced. It is possible that there are two different security means, one for protecting software updates (software log) and one for protecting the other metrological parameters (Category I II or III method of sealing). Some examples provided by the sector members include but are not limited to:

   - Physical Seal, software log
   - Category III method of sealing can contain both means of security

4. Verify that if the upgrade process fails, the device is inoperable or the original software is restored

   The question before the group is, Can this be made mandatory?

   The manufacturer shall ensure by appropriate technical means (e.g. an audit trail) that traced updates of metrologically significant software are adequately traceable within the instrument for subsequent verification

and surveillance or inspection. This requirement enables inspection authorities, which are responsible for the metrological surveillance of legally controlled instruments, to back-trace traced updates of metrologically significant software over an adequate period of time (that depends on national legislation). The statement in italics will need to be reworded to comply with US weights and measures requirements.

The sector **agreed** that the two definitions below for Verified update and Traced update were acceptable.

Verified Update
A verified update is the process of installing new software where the security is broken and the device must be re-verified. Checking for authenticity and integrity is the responsibility of the owner/user.

Traced Update
A traced update is the process of installing new software where the software is automatically checked for authenticity and integrity, and the update is recorded in a software update log or audit trail.

Note: It's possible that the Philosophy of Sealing section of NCWM Publication 14 may already address the above IF the definitions of Verified and Traced Updates (and the statement below) were to be added. The contrary argument was that it may be better to be explicit).

Use of a Category 3 audit trail is required for a Traced Update. A log entry representing a traced software update shall include the software identification of the newly installed version.

The sector recommended consolidating the definitions with the above statement thus:

Verified Update
A verified update is the process of installing new software where the security is broken and the device must be re-verified. Checking for authenticity and integrity is the responsibility of the owner/user.

Traced Update
A traced update is the process of installing new software where the software is automatically checked for authenticity and integrity, and the update is recorded in a ~~**software update log or**~~ Category 3 audit trail. The audit trail entry shall include the software identification of the newly installed version.

In 2012, the sector recommended that as a first step, the following be added to *NCWM Publication 14*:

The updating of metrologically significant software, including software that checks the authenticity and integrity of the updates, shall be considered a sealable event.

Mr. Truex, NTEP Administrator, indicated his opinion that the above sentence is unnecessary since it's self-evident. It was agreed by the group however to ask the other sectors for feedback on the value of this addition.

Though the sector is currently considering only the single sentence be incorporated into *NCWM Publication 14* for the time being, ultimately, the sector may wish to advance the remaining language of the original item submission.

Discussion:
The Sector had no information indicating that the other sectors had yet been approached for feedback on the value of the addition of the proposed sentence.

Conclusion:
This sector would like the other sectors to evaluate this for inclusion in Pub. 14.

We'd also like to include some description indicating that an existing audit trail should be protected during a software update, though that may already be a requirement. This does appear to be addressed in the Requirements for Metrological Audit Trails Appendices in Pub. 14.

At the August 2013 Grain Analyzer Sector meeting, Mr. Truex provided a review of the Software Sector's proposals for changes to Publication 14 Identification of Certified Software, Software Protection/Security, and Software Maintenance and Reconfiguration. Manufacturers had a number of questions to include "What is the baseline for which software is considered metrologically significant?" After some discussion the manufacturers requested that they be given additional time to review the proposed changes and to allow their software designers an opportunity to look at the proposed changes to software. Ms. Brenner sent an e-mail on August 29, 2013 to all NTEP grain analyzer manufacturers requesting that comments be submitted to Ms. Lee by October 15, 2013.

The Grain Analyzer Sector manufacturers provided the following comments to the Software Sector's proposal for changes to Publication 14:

Grain Analyzer Manufacturer's Comments to Software Sector's Proposed Changes to Publication 14			
Manufacturer	**GA Sector Item**	**Comment**	**Proposed change**
Dickey-john	12a	We currently don't separate the metrologically significant code or identify it's version in the application. We can do this, but it will require a significant code change and validation. Question 1: Does the metrological significant code need to be actually separate from the application or is a label in the application identifying the version of the prediction module used acceptable. This will result in less changes to the code. Question 2: What if we had added a test on the prediction module that inserted key values into the engine, that we would document in the metrological specific tests, that would give a specific answer? For example, if the prediction module is the same then the same inputs with the same calibration file will yield the same results from version to version; log those results and include in the metrological report.	Object to 12.a – The document insists that we separate the legally relevant code and make separate binaries. We could simply add a label that is bound to the prediction module code. Adding this label could tie the prediction module to the version, and will allow us to separately maintain revision control of that code. However, the code itself will not be a separate binary.
FOSS	General	Since FOSS distributes instruments worldwide, having NTEP and OIML requirements the same would be beneficial. I know efforts are being made to have the 2 as similar as possible. A concern is the potential that software code that is adopted would invalidate the currently approved instruments. A preferred outcome would be that once software code is adopted, only instruments seeking approval (not currently approved) would be required to meet the code.	

In addition, manufacturers that attended the August 2013 Grain Analyzer Meeting, expressed an interest in attending the next 2014 Software Sector meeting to provide additional input.

It was noted in the 2014 S&T annual report that Developing item 310-1 G-S.1. Identification was not considered at the 2013 GA sector meeting, the sector considered this item at previous sector meetings, but it was noted that the software sector was still developing this item and that the sector would provide additional feedback following further development. At the 2013 GA Sector meeting the sector was asked to provide comments to proposed changes to Publication 14.

At the 2014 GA Sector Meeting, Jim Truex will provide an update on the Software Sector activities and the status of Developing Item 310-1 G-S.1. Identification. GA sector member are requested to provide any additional feedback concerning the software sector's proposed changes to publication 14.

At the August 2014 Grain Analyzer sector meeting manufacturers discussed the Software Sectors proposal for changes to Publication 14 for identification of certified software, Software Protection/Security, and Software Maintenance and Reconfiguration. One manufacturer noted the difficulty in separating metrological and non-metrological software. It was noted that if the software is not separated then all software would be considered metrological. The Grain Analyzer sector had additional questions and made additional comments to the proposed changes to publication 14 for identification of certified software, software protection/security, and software maintenance and reconfiguration:

- If the software is not separated, would a manufacturer be required to resubmit the device to NTEP each year for reevaluation?
- Will the requirements for software affect devices that are currently designed and manufactured?
- There are issues with software changes if devices that are already manufactured are required to meet the software requirements.
- It is difficult to redesign devices.

The grain analyzer sector was informed that the Software Sector meeting would be held August 27-28, 2014. Manufacturers expressed that they needed the requirements so that these requirements can be considered in future device designs.

11. Update on Proficiency Testing

Source:
Dr. Hurburgh, Iowa State University

Purpose:
Develop an air-oven proficiency testing program to ensure state laboratory and manufacturer's air-oven measurements are traceable to the official USDA, GIPSA air-oven measurements.

Item under Consideration:
Update on progress of the ongoing air-oven proficiency testing program for states maintaining a grain moisture laboratory and GMM manufacturers.

Background / Discussion:
At the 2009 NTETC Grain Analyzer Sector Meeting Dr. Hurburgh, Iowa State University, urged the representatives from the American Oil Chemists Society (AOCS) to prepare a proposal so that the collaborative (air-oven) study could be conducted on an on-going basis rather than on an ad hoc basis. He cautioned that the proposal would have to include corn and wheat as well as soybeans.

At the 2011 NTETC Grain Analyzer Sector Meeting, Ms. Johnson, AOCS, proposed an air-oven/GMM proficiency testing series designed specifically to address the needs of GMM manufacturers and states maintaining a grain moisture laboratory. AOCS would administer the program, oversee distribution of samples, compile results,

perform statistical analysis of results, and distribute a report to participants. AOCS does not collect the samples. This is subcontracted to suitable providers. AOCS does not have laboratories. Since GIPSA/ FGIS is a certified laboratory already participating in the AOCS Soybean Quality Traits program, GIPSA air-oven results could be reported for comparison.

At the sector's August 2012 meeting the sector learned that Ms. Christine Atkinson will be taking over the Proficiency Testing program for States and interested manufacturers formerly headed by Ms. Amy Johnson. Ms. Atkinson verified that participant's cost will remain $100 per year. The sector reiterated that the program should focus solely on the standard FGIS air-oven method. Instrument results will not be reported. Participants' air-oven results will be compared against GIPSA's standard FGIS air-oven results. In response to Ms. Atkinson's question about scheduling, the sector was in general agreement that samples should ship after harvest, preferably between mid-January and mid-February with participants' results due 30 days after the shipping date.

The sector agreed upon the following Program Details:

Samples – Soybeans 2, Corn 2, Hard Red Winter Wheat 2

- Cost to Participants - $100.00/year
- Schedule:
  - Samples (6) ship between January 15 and February 15.
  - Samples must be tested within 5 business days of receipt with results due 30 days after the shipping date.
- Reports to be posted on www.SoybeanQualityTraits.org by 1 May.
- Only the GIPSA oven results will be identified. Individual manufacturer's and State participant's oven results will be assigned an identifier known only to the manufacturer or State participant. Instrument results will not be reported.
- Detailed Participant Instructions will be provided to each participant.

At the August 2013 Grain Analyzer Sector meeting no report was provided on AOAC's efforts to conduct proficiency testing for grain moisture. Karl Cunningham, IL and Kevin Hanson, MO agreed to work together to conduct a grain moisture proficiency test. Karl Cunningham, IL, agreed to provide the samples for proficiency testing and Kevin Hanson, MO, agreed to analyze the data in accordance with the procedures used to conduct proficiency testing in the State laboratory program. Kevin also agreed to collect data on test weight per bushel which may be useful in field test procedures for evaluating test weight per bushel on instruments. Following the August 2013 sector meeting arrangements were made for shipping grain samples to State participants.

At the August 2014 Grain Analyzer Sector meeting Mr. Karl Cunningham provide an update on the status of proficiency testing. Mr. Cunningham informed the Grain Analyzer Sector that he collected some wheat grain samples that can be used for grain moisture proficiency testing and that corn and soybeans will be collected during the 2014 harvest. Mr. Cunningham noted that after January 2015 wheat, corn and soybeans grain samples may be ready for distribution to the participating States. Mr. Cunningham agreed to analyze the data in cooperation with NIST and requested a list of contact information for participating States and other interested parties.

12. The Feasibility of a Phase II program for Near Infrared Grain Analyzers

Source:
Dr. Hurburgh, Iowa State University

Background/Discussion:
The GIPSA Grain Inspection Advisory Committee recommends that GIPSA initiate research to determine the feasibility of extending the theory of "equivalency" to multiple-constituent instruments in order to utilize standardized technology while maintaining accuracy and consistency in measurement of wheat protein.

Ms. Eigenmann provided an update on the Grain Inspection Advisory Committee's Resolutions. The Sector discuss the feasibility of an ongoing calibration program also referred to as a Phase II program for Near Infrared Grain Analyzers (NIR) instruments that measure wheat program. The Phase II program for grain moisture is a program that monitors the moisture calibrations on grain moisture meters annually. As changes to the calibrations occur due to grains, climate, etc., data collected in this program allows for changes to moisture calibrations annually and ensure equivalency among the different moisture meter models. The Advisory committee is recommending that this program be extended to include NIR instruments that measure wheat protein. It was noted that there could be multiple NIR instruments for wheat protein introduced into the market and that it may be advisable to have the Phase II program extended to NIR instruments that measure wheat protein. It was also mentioned that currently there are few States that are checking wheat protein on multi-constituent instruments.

GIPSA currently has an annual review program for the official protein system but would have to consider the cost associated with extending the program for other NIR wheat protein analyzers. It was noted during the discussion that GIPSA currently has hourly rate fees set that could be applied to a phase II program for wheat program.

Unlike moisture where there may be changes to the calibrations annually, there will not be year to year changes for wheat protein. As such, consideration may be given to conducting the program less than annually, and considering reviewing wheat protein calibrations every 3, 4, or 5 years, as appropriate. In addition it was noted that there also has to be a mechanism to get manufacturers calibration data for calibration review.

The sector will continue to discuss the feasibility of a phase II program for wheat protein giving consideration to the following issues:

- How the program will be funded,
- How often the calibrations for wheat protein will be updated,
- How many devices are currently being used in commercial transactions, and
- If being used commercially in a State, what is needed by States to begin testing these devices?

At the August 2014 Grain Analyzer Sector meeting USDA, GIPSA representatives provided an update on the activities concerning a phase II program for wheat protein. The Sector was informed that USDA, GIPSA is discussing funding options for this program. It was noted that the frequency of calibration for wheat protein is being considered and that this will impact the cost of the program. The Sector was also informed that Dr. David Funk is writing a discussion paper that will address many of the issues concerning a Phase II program for wheat protein.

13. Next Sector Meeting

The next meeting is tentatively planned for Wednesday, August 19 and Thursday, August 20, 2015, at the Chase Suites by Woodfin at KCI in Kansas City, MO. Sector members are asked to hold these days open pending confirmation of availability of facility, determination of agenda items, exact meeting times, and meeting duration. Final meeting details will be announced by early June 2015.

If you would like to submit an agenda item for the 2015 meeting, please contact any of the following persons by June 1, 2014:

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

At the August 2014 Grain Analyzer Sector meeting, the sector discussed the proposed dates and location for the August 2015 Grain Analyzer Sector Meeting. It was noted during the discussion that the Sector may consider holding a web meeting, depending on the number of sector items that are received. Following the August 2014 meeting the NCWM, Inc. posted a list of the 2015 Sector meetings on their web site. The August 2015 Grain Analyzer Sector meeting is scheduled for August 19 – 20, 2015 as a live web meeting.

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Grain Analyzer Sector Summary

September 13, 2016

INTRODUCTION

The charge of the NTETC Grain Analyzer Sector is important in providing appropriate type evaluation criteria based on specifications, tolerances and technical requirements of *NIST Handbook 44* Sections 1.10. General Code, 5.56. Grain Moisture Meters and 5.57. Near-Infrared Grain Analyzers. The sector's recommendations are presented to the National Type Evaluation Program (NTEP) Committee each January for approval and inclusion in *NCWM Publication 14 Technical Policy, Checklists, and Test Procedures* for national type evaluation.

The sector is also called upon occasionally for technical expertise in addressing difficult *NIST Handbook 44* issues on the agenda of National Conference on Weights and Measures (NCWM) Specifications and Tolerances (S&T) Committee. Sector membership includes industry, NTEP laboratory representatives, technical advisors, and the NTEP Administrator. Meetings are held annually, or as needed and are open to all NCWM members and other registered parties.

Suggested revisions are shown in **bold face print** by **~~striking out~~** information to be deleted and **<u>underlining</u>** information to be added. Requirements that are proposed to be nonretroactive are printed in ***bold faced italics***.

Table A
Table of Contents

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
BIML	International Bureau of Legal Metrology	NTETC	National Type Evaluation Technical Committee
CD	Committee Draft	OCP	Ongoing Calibration Program
CIML	International Committee of Legal Metrology	OIML	International Organization of Legal Metrology
CIPM	International Committee of Weights and Measures	OWM	Office of Weights and Measures

D	Document	R	Recommendation
EMRP	European Metrology Research Program	S&T	Specifications and Tolerances
FGIS	Federal Grain Inspection Service	SC	Subcommittee
GA	Grain Analyzer	SD	Secure Digital
GIPSA	Grain Inspection, Packers and Stockyards Administration	TC	Technical Committee
GMM	Grain Moisture Meter	TW	Test Weight
MRA	Mutual Recognition Agreement	UGMA	Unified Grain Moisture Algorithm
NCWM	National Conference on Weights and Measures	USB	Universal Serial Bus
NIR	Near Infrared Grain Analyzer	USDA	United States Department of Agriculture
NIST	National Institute of Standards and Technology	USNWG	United States National Working Group
NTEP	National Type Evaluation Program		

Details of All Items
(In order by Reference Key)

1. Report on the 2016 NCWM Interim and Annual Meetings

The 2016 NCWM Iterim Meeting was held January 10-13 in San Diego, California. The 2016 NCWM Annual Meeting was held July 24-28 in Denver, Colorado. At these meetings there were no Grain Analyzer Sector recommended changes to NCWM Publication 14 or NIST Handbook (HB) 44. The Grain Analyzer Sector has an item which remains a developmental item on the S&T agenda. See Grain Analyzer Agenda Item 4 for an update of activities on this item. Two Software Sector proposal for changes to NIST HB 44 concerning Software Identification and Metrological Significant Software were reviewed by the Grain Analyzer Sector. S&T agenda item 310-1 "Software Identification" to amend G-S.1. and S&T agenda item 310-2 "Metrological Significant Software" Adding G-S.9.were voted on and approved at the 2016 Annual Meeting. These items were reviewed in detail during the Software Sector meeting on September 14, 2016, following the Grain Analyzer Sector meeting.

Mr. Jim Truex, NTEP Administrator, provide an update on the Interim and Anuual Meetings. He reviewed the membership status and as per the Board of Directors report in the National Conference on Weights and Measures (NCWM) Publication 16, membership from 2012 to 2016 has shown about a 16% increase. Mr. Truex also reported the that the Grain Analyzer Sector did not have any voting items at the 2016 Annual Meeting.

2. Report on NTEP Evaluations and Ongoing Calibration Program (OCP) (Phase II) Testing

Mr. Jason Jordan, Grain Inspection, Packers and Stockyards Administration (GIPSA), the NTEP Participating Laboratory for grain analyzers, provided a list of grain analyzers that are enrolled in the Phase II for the 2016 harvest. There are 8 grain analyzer models enrolled for the 2016 harvest.

The 8 models:

1. Dickey-john Corp. – GAC2500-UGMA
2. Dickey-john Corp. – GAC2000, GAC2100, GAC2100a and GAC2100b
3. Perten Instruments Inc. - AM5200 and AM5200-A (UGMA)
4. Perten Instruments Inc. – IM9500 and IM9500 HLW/TW
5. Foss North America – Infratec 1241
6. Foss North America – Infratec Nova

7. The Steinlite Corp. – SL95
8. MTC Moisture Analyzers – MTC 999 ES

Mr. Jordan provided the sector with an update on the NTEP Phase I evaluations and reported on the collection and analysis of the OCP (Phase II) data from the 2015 crop year. Mr. Jordan reported that 4 instruments required updates. He also reported that there could be as many as 10 instruments in he NTEP program next year.

Mr. Jordan also mentioned that very little oat samples were received during the request for grains used for Phase II testing. It was suggested that a request be sent to SD, WI, ND and MN requesting any oats samples the States could provide.

During Mr Jordan's report, it was noted that there were compaints with high moisture corn samples on the UGMA meters. Mr. Jordan noted that the UGMA meters have been updated on an annual basis with only small changes needed for these devices. It was noted during further discussion that these complaints were likely from states with increased modified corn used in ethanol production. As such these corn types are likely under represented in the grains used to test the calibrations of the NTEP meters.

3. Review of OCP (Phase II) Performance Data For Moisture and Test Weight per Bushel

At the Sector's August 2005 meeting it was 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, Mr. Jordan, GIPSA, the NTEP Participating Laboratory for grain analyzers provided data for inclusion in the 2016 Grain Analyzer Sector Report showing the performance of NTEP meters compared to the air oven. This data is based on the last three crop years (2013–2015) using calibrations updated for use during the 2016 harvest season.

The 2013-2015 Grain Moisture Meter (GMM) Phase II comparison graphs are available for view or can be downloaded for printing at the following web address:

http://www.ncwm.net/_resources/dyn/files/75601146zc793ed4d/_fn/2013-2015+NCWM+Sector+GMM+Biases.pdf

At the Sector's August 2012 meeting, it was agreed that TW comparison and correlation charts should be prepared for the 3 grains which are most likely to be subject to discounts on the basis of TW: Corn and two wheat classes and limited to Air Oven reference values less than 20% moisture. The wheat classes selected were: Hard Red Winter and Soft Red Winter. Accordingly, Mr. Jordan, GIPSA, the NTEP Participating Laboratory for Grain analyzers prepared data showing the performance of NTEP meters compared to the GIPSA reference Quart Kettle Test Weight Apparatus. Mr. Jordan provided this information for the Grain Analyzer Sector 2016 report. This data is based on the last three crop years (2013 – 2015) using calibrations updated for use during the 2016 harvest season.

The 2013-2015 TW comparison and correlation charts and TW Phase II data are available for view or can be downloaded for printing at the following web address:

http://www.ncwm.net/_resources/dyn/files/75601147zb094dddb/_fn/2013-2015+NCWM+Sector+TW+plots.pdf

The sector reviewed the moisture and test weight comparison charts. In conjunction with the review of Agenda item number 3. No comments or further discussion was provided based on the Sectors review of the graphs.

4. Modify the Definition of Remote Configuration Capability Appearing in Appendix D of NIST Handbook 44 to Recognize the Expanded Scope of "Remote Configuration Capability" (S&T Developing item 360-7)

Source:
Grain Analyzer Sector

Purpose:
Table S.2.5. *Categories of Device and Methods of Sealing* that appears in §5.56.(a) of *NIST Handbook 44* lists acceptable methods of sealing for various categories of GMMs. When the sector first recommended adding the table to *NIST Handbook 44* at their September 1996 meeting, the concept of making a change to a GMM from a remote site involved information " …sent by to the device by modem (or computer)." In 2011 this concept has expanded to include the ability of the measuring device to accept new or revised sealable parameters from a memory chip (e.g., an SD Memory Card that may or may not itself be necessary to the operation of the device), external computer, network, or other device plugged into a mating port (e.g., Universal Serial Bus (USB) port) on the measuring device or connected wirelessly to the measuring device. The changes proposed in Item Under Consideration expand the scope of "remote configuration capability" to cover instances where the "other device" may be necessary to the operation of the weighing or measuring device or which may be considered a permanent part of that device.

Item Under Consideration:

> **remote configuration capability. –** The ability to adjust a weighing or measuring device or change its sealable parameters from or through some other device that ~~**is not**~~ **<u>may or may not</u>** itself **<u>be</u>** necessary to the operation of the weighing or measuring device or ~~**is not**~~ **<u>may or may not be</u>** a permanent part of that device.[2.20, 2.21, 2.24, 3.30, 3.37, 5.56(a)]
>
> (Added 1993, **<u>Amended 20XX</u>**)

Background / Discussion:
Two common types of removable data storage devices are the USB flash drive and the Secure Digital (SD) memory card. A USB flash drive is a data storage device that includes flash memory with an integrated USB interface. USB flash drives are typically removable and rewritable, and physically much smaller than a floppy disk. A SD card is a non-volatile memory card format originally designed for use in portable devices. The SD standard is maintained by the SD Card Association.

Removable digital storage devices can be used in GMMs as either "data transfer" devices which are not necessary to the operation of the GMM or as "data storage devices" which are necessary to the operation of the GMM.

A USB flash drive is most likely to be used as a "data transfer" device. In a typical "data transfer" application, the USB flash drive is first connected to a computer with access to the web. The computer visits the GMM manufacturer's web site and downloads the latest grain calibrations that are then stored in the USB flash drive. The USB flash drive is removed from the computer and plugged into a USB port on the GMM. The GMM is put into "remote configuration" mode to copy the new grain calibration data into the GMM's internal memory. When the GMM has been returned to normal operating (measuring) mode the USB flash drive can be removed from the GMM.

Although an SD memory card could also be used as a "data transfer device" it is more likely to be used as a "data storage device". In a typical "data storage device" application, the SD memory card stores the grain calibrations used on the GMM. The SD memory card must be plugged into an SD memory card connector on a GMM circuit card for the GMM to operate in measuring mode. To install new grain calibrations the GMM must be turned "off" or put into a mode in which the SD memory card can be safely removed. The SD memory card can either be replaced with an SD memory card that has been programmed with the new grain calibrations or the original SD memory card can be re-programmed with the new grain calibrations in much the same way as that described in the preceding paragraph to copy new grain calibrations into a USB flash drive. In either case, the SD memory card containing the new calibrations must be installed in the GMM for the GMM to operate in measuring mode. In that regard, the SD memory card can be considered a "permanent part" of the GMM in that the GMM cannot operate without it.

Note: In the above example "SD memory card" could be any removable flash memory card such as the Secure Digital Standard-Capacity, the Secure Digital High-Capacity, the Secure Digital Extended-Capacity, and the Secure Digital Input/Output, which combines input/output functions with data storage. These come in three form factors: the original size, the "mini" size, and the "micro" size. "Memory Stick" is a removable flash memory card format, launched by Sony in 1998, and is also used in general to describe the whole family of Memory Sticks. In addition to the original Memory Stick, this family includes the Memory Stick PRO, the Memory Stick Duo, the Memory Stick PRO Duo, the Memory Stick Micro, and the Memory Stick PRO-HG.

At its 2012 meeting the Grain analyzer Sector agreed by consensus to accept the Item Under Consideration and recommended forwarding this item to the S&T Committee for consideration.

2012 WWMA Annual Meeting: Ms. Juana Williams (NIST OWM) supported the intent. She talked about this item in conjunction with Item 356-1, S.2.5. Categories of Device and Methods of Sealing. This is a complex item affecting multiple other devices; therefore the proposal requires further consideration. The language in the proposal to amend the definition of remote configuration capability is confusing. The Committee believes the current definition already allows the use of remote configuration devices and allows the flexibility desired. The ramifications of changing the definition could affect other devices in HB 44. WWMA did not forward this item to NCWM.

2012 SWMA Annual Meeting: There were no comments. After reviewing the proposal and considering the potential impact on other device types, the Committee recommended this as a Developing Item. The Committee asks that the Sector continue to obtain input on the definition and the impact the changes would have on other device types. SWMA forwarded the item to NCWM, recommending it as a Developing Item and assigning its development to the Grain Analyzer Sector.

During its Open Hearings at the 2013 NCWM Interim Meeting, the Committee heard comments from Ms. Juana Williams (NIST OWM). OWM suggests the Committee consider this item as a Developing item to allow other Sectors to discuss how a change to the definition may affect other device types of similar design and to consider changes if needed. OWM recognizes that the current definition for "remote configuration capability" may <u>not</u> address those grain moisture meters (GMMs) which can only be operated with a removable data storage device, containing, among other things, the grain calibrations intended for use with the GMM, inserted in the device (as was described by the Grain Analyzer Sector). As such, OWM notes that current sealing requirements were developed at a time when such technology likely didn't exist, nor could be envisioned, and are based on the current definition of remote configuration capability. Because the current definition was never intended to apply to this "next generation" technology, OWM suggests that those charged with further development of this item may wish to revisit the five philosophies of sealing and consider whether a new paragraph, completely separate from current sealing requirements, might be appropriate and a better option, than the one currently proposed. The five philosophies of sealing are included in the 1992 Report of the 77th National Conference on Weights and Measures (Report of the Specifications and Tolerances Committee). Another option, preferred over the changes currently proposed, would be to add a separate statement to the current definition of "remote configuration capability" to address removable storage devices. For example, the following sentence might be considered as an addition to the current definition for "remote configuration capability:"

> **<u>Devices which are programmed using removable media (such as SD cards, flash drives, etc.) that may or may not be required to remain with the device during normal operation are also considered to be remotely configured devices.</u>**

The Committee also heard comments from Dmitri Karimov (LC), speaking on behalf of the MMA, who made two points: (1) Flow computers may already have these capabilities, thus it may be more appropriate to consider adding requirements to the General Code so that the requirements will be uniformly applied to all device types; and (2) the Committee should look ahead and consider other capabilities that may or already have emerged such as wireless communication and configuration.

The Committee acknowledged the comments indicating that the current definition of "remote configuration capability" was developed at a time when certain technologies, such as blue tooth, SD storage devices, flash drives, etc., didn't exist. The Committee recognized that it may be difficult to modify the existing definition and associated requirements to be flexible enough to address emerging and future technologies without having a significant (and possibly detrimental impact) on existing devices. Consequently, rather than modifying the current definition, the

Committee concluded that a better approach might be to develop an entirely separate set of security requirements that would apply to emerging technologies. The Committee believes that additional work is needed to develop proposed definition(s) and associated requirements and decided to designate the item as Developmental. The Committee requests other Sectors review the Grain Sector's proposed modification to the definition as well as OWM's suggestions and provide input.

At their 2013 Annual Meetings, both NEWMA and CWMA supported this as a "Developing" item. NEWMA heard from NIST who encouraged members to consider this work as it applies to all device types.

On the 2013 NCWM Online Position Forum, one Government representative indicated a neutral position on this item with no additional comments.

At the 2013 NCWM Annual Meeting Open Hearings, the Committee heard comments from Juana Williams (NIST OWM) who reiterated OWM's comments from the 2013 Interim Meeting, suggesting that it may be appropriate to develop separate requirements to address new and future technologies which can be remotely configured with removable media. OWM plans to develop draft language and ask for input from the various Sectors at their upcoming meetings. Ms. Williams also noted the suggestion made at the 2013 NCWM Interim Meeting by Dmitri Karimov, LC, speaking on behalf of the MMA, that a provision might be added to the General Code to address this type of equipment.

Julie Quinn (MN) agreed with OWM's comments and indicated support for possibly including requirements in the General Code to address newer and emerging technologies. Dmitri Karimov (LC), speaking on behalf of MMA, concurred with this suggestion.

At the August 2013 Grain Analyzer Sector Meeting, OWM had not drafted a definition for remote configuration capability to address devices which are programed using removable media such as SD cards or flash drives. During the August 2013 grain analyzer sector meeting, the Sector discussed other ways devices can be remotely configured that should also be considered when drafting a definition for remote configuration capability to address these devices.

Mr. Hurburgh mentioned that we also need to consider devices that use cloud computing to remotely configure a device and suggested that we consider the various ways a device can be remotely configured.

The sector agreed that OWM should develop a proposal for a definition for remote configuration capability that addresses devices that use removable media such as SD cards, flash drives or other methods not covered by the existing definition.

At the 2013 Weighing Sector meeting, OWM requested members of the Sector help identify the various types of removable storage media (e.g., USB flash drives, SD memory cards, etc.) currently in use with weighing equipment and to describe the functionality of that media. The information provided would likely be used by OWM to develop some draft proposals to amend NIST Handbook 44 to adequately address the security of the metrological significant parameters of devices using such media.

The following feedback was provided by members of the Sector to OWM:

- I am not in favor of changing standards for advances in technology.
- Both SD cards and USB Flash drives can be used for data transfer and data storage. It would be difficult to address all devices by changing the General Code.
- There are other technologies besides SD and Flash digital storage devices that must be considered, e.g. Eprom and EEE, etc.,
- Several members commented that they felt it would likely be necessary to separate requirements in the various codes of NIST Handbook 44.
- It is not reasonable to expect manufacturers to share the technologies used in a public forum such as this meeting and it might be better to speak individually with representatives of the different manufacturers.

At the end of the discussion, a few weighing sector members offered to provide technical expertise to assist OWM in answering any questions that might arise during future development of proposed requirements to address this issue.

At the 2013 Measuring Sector Meeting, the Sector did not support the language "may or may not be necessary" because this phrase changes the category of what is considered "remote configuration capability." The Sector agreed that, if the card (or other removable device) needs to be a part of the measuring device for normal operation, then the card is effectively part of the device; in that case, the measuring device is a Category 1. If the card is only used for configuration or calibration and is not necessary for the operation of the measuring device, the measuring device is a Category 2. The Sector discussed whether or not additional guidance might be needed on what is covered by each sealing category; however, concluded that the definitions are adequate as currently written.

2014 Regional Association Meetings:
At its 2014 Interim Meeting, CWMA did not receive any comments on this item and believes the item is sufficiently developed. CWMA recommended that the item be a Voting item on the NCWM Agenda. During the 2015 CWMA Annual Meeting, the SMA reported that it looks forward to the further clarification of this item, yet it has concerns about changing metrological parameters without proper re-sealing. The CWMA agreed to recommend the item move forward as a Developing item noting that it supported the continued development of this item.

During open hearing at the 2014 WWMA Annual Meeting and industry representative questioned whether or not this item would affect definitions for other device types. An NCWM representative expressed the opinion that it does affect other devices. The WWMA recommended that this item remain as a Developing item to allow additional input and consideration.

At its 2014 Annual Meeting, SWMA recommended that this item be withdrawn noting it believes this item is not necessary and the existing definition in Appendix D of Handbook 44 is adequate.

At its 2014 Interim Meeting, NEWMA recommended this item be withdrawn noting it believes the existing definition in Appendix D of Handbook 44 is adequate. At the 2015 NEWMA Annual Meeting, no comments were received on this item. NEWMA agreed to recommend the item move forward as a Developing item as OWM continues its work on the proposal.

Additional letters, presentations and data may have been part of the S&T Committee's consideration. Please refer to http://www.ncwm.net/meetings/interim/publication to review these documents.

2014 Grain Analyzer Sector Meeting
At the August 2014 Grain Analyzer sector meeting, the sector considered the responses from NIST OWM, SWMA, WWMA, Measuring Sector and Weighing Sector concerning devices that use SD cards, flash drives or other methods for configuration. The Grain Analyzer Sector agreed that the current proposed language may be confusing and agreed to withdraw their proposal for changes to the definition of remote configuration.

Update for 2015 Grain Analyzer Sector Report:
At the 2015 NCWM Interim Meeting S&T open hearings, Mrs. Tina Butcher (OWM) requested that the Committee reassign this item to OWM noting that the issue identified by the Grain Analyzer Sector had not been resolved. Mrs. Butcher noted that a gap still exists concerning the sealing of equipment in which the sealable parameters of that equipment can be changed by use of a removable digital storage device. She stated that members of OWM's Legal Metrology Devices Program (LMDP) have agreed to take up this issue after the 2015 Interim Meeting in hopes of being able to develop a proposal that addresses the issue and be able to report on its progress at the next NCWM Conference.

Mr. Michael Keilty (Endress + Hauser Flowtec AG USA) stated he too would be willing to work with OWM on a proposal to address this issue.

The SMA commented that it looks forward to further clarification of this item.

The Committee agreed to reassign this item to OWM for additional development based on OWM's assessment there remains an unresolved issue involving the sealing of equipment using removable digital storage devices.

At the 2015 NCWM Annual Meeting, Mrs. Tina Butcher (OWM) provided an update to the Committee on OWM's progress in developing this item. Mrs. Butcher noted that OWM's Legal Metrology Devices Program (LMDP) had met several times since the 2015 Interim Meeting to work on this issue. Rather than attempting to modify current sealing requirements, which never envisioned this method of adjustment, the LMDP propose creating a separate set of sealing requirements for this technology. Members of the LMDP developed a draft General Code paragraph they believe will address the sealing of devices using this technology to make adjustments. The LMDP requests the following draft General Code paragraph be included in this item to begin generating feedback to assist in further development of this item:

> **G-S.8.2. Devices Adjusted Using Removable Digital Storage Device. - For devices in which the configuration or calibration parameters can be changed by use of a removable digital storage device, such as a secure digital (SD) card, USB flash drive, etc., security shall be provided by use of an event logger in the device. The event logger shall include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available on demand through the device or through another on-site device. In addition to providing a printed copy of the information, the information may be made available electronically. The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)**

Mrs. Butcher also noted that OWM plans to propose modifications to a number of the individual device codes in HB 44 to reference the new General Code sealing requirement. The following draft example requirement was developed by the LMDP and included in OWM's written analysis of this item, to provide an indication of how some of the device codes in HB 44 will need to be amended that this type of sealing can be addressed:

Proposed changes to Scales Code paragraph S.1.11. Provision for Sealing:

> ***S.1.11. Provision for Sealing.***
>
> ***S.1.11.1 Devices Adjusted Using a Removable Digital Storage Device. - For those devices adjusted using a removable digital storage device, G-S.8.2. applies.***
>
> ***S.1.11.2 All Other Devices.- Except on Class I scales and devices specified in S.1.11.1. the following provisions for sealing applies:***
>
> *(a) Provision shall be made for applying a security seal in a manner that requires the security seal to be broken before an adjustment can be made to any component affecting the performance of an electronic device.*
> *[Nonretroactive as of January 1, 1979]*
>
> *(b) A device shall be designed with provision(s) for applying a security seal that must be broken, or for using other approved means of providing security (e.g., data change audit trail available at the time of inspection), before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism.*
> *[Nonretroactive as of January 1, 1990]*
>
> *(c) Audit trails shall use the format set forth in Table S.1.11.*
> *[Nonretroactive as of January 1, 1995]*
>
> A device may be fitted with an automatic or a semi-automatic calibration mechanism. This mechanism shall be incorporated inside the device. After sealing, neither the mechanism nor the calibration process shall facilitate fraud.
> (Amended 1989, 1991, and 1993)

As final comment regarding this item, Mrs. Butcher indicated that devices using other means to access adjustments would continue to be addressed by current sealing requirements.

In the 2015 GA report, Sector members were encouraged to review the OWM proposal for changes to NIST HB 44 to address devices that use removable storage devices and provide any additional feedback.

Recommendation (2016 Grain Analyzer Sector):
The sector is asked to comment on the following propose modifications to the Grain Moisture Meter Code Section 5.56.(a) in NIST HB 44, which follows the draft example requirement for the scales code that was developed by the NIST, Legal Metrology Device Program.

Proposed Draft General Code Paragraph:
G-S.8.2. Devices Adjusted Using Removable Digital Storage Device. - For devices in which the configuration or calibration parameters can be changed by use of a removable digital storage device, such as a secure digital (SD) card, USB flash drive, etc., security shall be provided by use of an event logger in the device. The event logger shall include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available on demand through the device or through another on-site device. In addition to providing a printed copy of the information, the information may be made available electronically. The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)

Proposed changes to Grain Moisture Meter Code 5.56(a), paragraph S.2.5. Provision for Sealing:

S.2.5. Provision for Sealing.

S.2.5.1. Devices Adjusted Using a Removable Digital Storage Device. - For those devices adjusted using a removable digital storage device, G-S.8.2. applies.

S.2.5.2. All Other Devices.- Provision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., audit trail available at the time of inspection as defined in Table S.2.5. Categories of Device and Methods of Sealing) before any change that affects the metrological integrity of the device can be made to any mechanism.

During the 2016 Grain analyzer Sector Meeting, the sector reviewed the language proposed by NIST, Legal Metrology Devices Program to address devices the use removeable storage devices in weighing or measuring devices. There was no opposition to the proposed language. But during the discussion it was suggested that the proposed language, G-S.8.2 could be simplified to state that devices adjusted using removable digital storage must meet the requirements for category 3.

During discussion it was also suggested that the Grain Moisture Meter Code could be changed such that all grain moisture meters are required to meet category 3 sealing requirements; all grain moisture meters must have an event logger, which is what is required for NIR devices in NIST handbook 44. Manufacturers that were present at the meeting did not object to the proposal, but it was noted that all manufacturers were not represented at the meeting. Jim Truex also noted that we may need to consider State laws that require that a commercial device must have a lead and wire seal. It was also mentioned that the proposed NIST, LMDP language for the general code would be reduntant for the grain code if language is added to the grain moisture meter code that grain moisture meters be equipped with an event logger.

It was suggested that the Technical Advisor, Ms. Lee develop the proposed changes to the grain moisture meter code and include the information in the Grain Analyzer Sector summary for review and comments at the Grain Analyzer Sector's next meeting. Following the meeting Ms. Lee research the status of sealing methods for NTEP meters using the NTEP database The current status for the sealing methods of grain moisture meters are as follows:

Inactive Certificates of Conformance (CC)

- Nine inactive certificates; an inactive status for grain analyzers means that a CC was previously active for a device, but now the device is no longer being mnufacturered or remanufactured. Existing devices may be used, sold, or repaired and resold under inactive certificates. As such, these devices are likely still in use.
- Three inactive devices are *not* sealed using an event logger.

Active CC

- Nine active certificates
- One active device is *not* sealed using an event logger.

Per the sectors request, below is proposed language for discussion at the Sectors next meeting. In consideration of the current Inactive and active NTEP meters in use that do not have an event logger, the proposed draft language is nonetroactive and table S.2.5 remains in effect for those current inactive and active NTEP meters that do not have event loggers. The proposed draft language also includes a reference to the proposed draft general code paragraph:

S.2.5. Provision for Sealing.

S.2.5.1. Devices Adjusted Using a Removable Digital Storage Device. - For those devices adjusted using a removable digital storage device, G-S.8.2. applies.

S.2.5.2. All Other Devices.- Provision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., audit trail available at the time of inspection as defined in Table S.2.5. Categories of Device and Methods of Sealing) before any change that affects the metrological integrity of the device can be made to any mechanism.

S.2.5.3. *An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants.)*

*A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to 25 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*
[Nonretroactive as of January 1, 20XX]
(Amended 20XX)

5. Report on International Organization of Legal Metrology (OIML) TC 17/SC 1 R 59 *Moisture Meters for Cereal Grains and Oilseeds*

Background / Discussion:

This item is included on the sector's agenda to provide a summary of the activities of OIML TC17/SC1 for the grain analyzer sector and to those Sector members that participate on the United States National Working Group (USNWG) on grain moisture meters. In addition the sector is asked to review a proposal to change the Humidity test in NCWM Publication 14 to align with the OIML D11 and IEC damp heat test procedure.

OIML TC17/SC1 was tasked to revise OIML R 59 *Moisture Meters for Cereal Grains and Oilseeds* to reflect new technologies and actual grain analysis. The Co-Secretariats (China and the United States) are working closely with an International Project Group to revise OIML Recommendation R 59 *Moisture Meters for Cereal Grains and Oilseeds*. The U.S. completed a six committee draft (6th CD) of OIML R 59, which was circulated to the international project group and the U.S. National Working Group (USNWG) on grain moisture measuring devices for review and comment on March 6, 2013. The U.S. Co-secretariat requested that the comments to the 6th CD be submitted by June 6, 2013. The U.S. Secretariat collated the U.S. and international comments to the 6th CD and these comments were reviewed at the TC17/SC1 meeting hosted by NIST/OWM July 23-24, 2013.

At the TC17/SC1 July 23-24, 2013 meeting, comments to the 6th CD were reviewed and the major discussion was harmonization of test procedures between OIML TC17/SC1 R59 *Moisture Meters for Cereal Grains and Oilseeds* and OIML TC17/SC8 Recommendation on *Protein Measuring Instruments for Cereal Grain and Oil Seeds.*

At the July 2013 meeting it was discussed that the international damp heat test (OIML D11 and IEC) is significantly different from the NTEP Humidity test. The international test is more robust and more accurately reflects the environmental conditions an instrument is likely to encounter in field use. The damp heat test is conducted at a maximum temperature of either the manufacturer specified upper ambient temperature or 30 °C and a maximum relative humidity of 85%. The damp heat test is designed to evaluate the device under the environmental (temperature and relative humidity) conditions it will encounter during operation.

During the August 2013 Grain Analyzer Sector meeting the Sector reviewed the proposal to replace the NTEP Publication 14 GMM and NIR Humidity test procedure with the OIML D11 Damp Heat test procedure. It was noted that the proposed changes to the humidity test in Publication 14 were based on OIML D11 requirements Damp heat test, Severity level 1. During discussion of this item, It was mentioned that the temperature and humidity levels as specified in OIML D11 may pose unsafe operating conditions to laboratory staff and also that grain moisture meters are not designed to operate in these extreme conditions. A question was asked if another severity level in D11 would more closely match the testing that is currently in Publication 14 and that has been used for many years in the U.S. Ms. Lee, reviewed OIML D11 requirements following the meeting and found that both severity level 1 and 2 exceed the temperature and humidity levels specified in Publication 14. The Sector agreed by consensus that the OIML D11, Damp heat test, is much too severe for grain moisture meters and that publication 14 should not be changed to meet the requirements of OIML D11.

The U.S. will develop a 7th CD that will be distributed for voting based on comments to the 6th CD, the July 2013 TC17/SC1 meeting and the GA Sector feedback from the August 2013 meeting.

At the August 2014 Grain Analyzer Sector meeting, Ms. Diane Lee, NIST OWM, provided an update on the status of the 7th CD on *Moisture Meters for Cereal Grains and Oilseed.* Ms. Lee reported that the U.S. is nearing completion of the 7th CD on *Moisture Meters for Cereal Grains and Oilseed.* This document will be forwarded to the TC17/SC1 participating and observing countries for a vote and will also be forwarded to participants of the USNWG on Grain Moisture Measuring Devices for vote and comment.

2015 Grain Analyzer Sector Report Update:

The 7th CD on *Moisture Meters for Cereal Grains and Oilseed.*was completed and forwarded to OIML TC 17/SC1 participating and observing countries in December 2014 for a vote by the participating countries by March 2015. The 7 CD received 7 yes votes and 1 no vote with some additional comments. The additional comments will be considered. With a majority "yes" vote from the participating countries, the document will be forwarded as a Draft Recommendation for final voting by the CIML.

2016 Grain Analyzer Sector Meeting:

The OIML R59 was submitted to BIML for registration as a Draft Recommendation and the BIML distributed the Draft Recommendation to all CIML members for preliminary ballot and comment. The total number of votes cast were 25. 23 yes votes, 2 no votes, and 3 abstentions were received, and 32 did not respond. Since a majority of the votes received were in favor of the Recommendation, the TC17/SC1 conveynors, China and U.S. updated OIML R59 (DR) per the editorial comments that were received and BIML registered the Recommendation as a Final Draft Recommendation (FDR). The BIML sent the OIML R59 FDR to CIML members.

Diane Lee forwarded the FDR and results of the preliminary ballot to the U.S. National Working Group on Grain Moisture Meters on July 26, 2016 via e-mail for review and comments. Many of requirements and test in OIML R 59 are similiar to tests conducted in the U.S. Type evaluation program. Some of the test which are typically included in OIML Recommendations such as disturbance tests (AC mains voltage dips, short interuptions, and voltage dips, Burst on AC mains, Radiated radiofrequency, electromagnetic fields, Conducted radiofrequency, electromagnetic fields, and electrostatic discharge) are included in both documents. Many efforts were made to harmonize the OIML R 59 and the OIML Protein Recommendaton, but there remains some differences between the two Recommendations which include but are not limited to the following:

- Damp Heat Test and Humidity Test: OIML R 59 includes the humidity test and the procedures used are those that have been used in the U.S. type evaluation testing for many years. The Protein recommendation includes what is called a damp heat test referencing standards IEC 60068-2-78 and IEC60068-3-4.

- Vibration Test: This test is not included in OIML R 59, but is included in the OIML Protein Recommendation.

- Dry Heat and Cold Tests and Instrument Temperture Sensitivity: The protein Recommendation includes a Dry heat test that references IEC 60068-2-2 and IEC 60068-3-1, and a cold test that reference IEC 60068-2-1 and IEC 60068-3-1. OIML R 59 includes the Instrument Temperature Sensitivity Test that includes testing at a cold and hot temperature and are the test procedures used in U.S. Type evaluation testing for many years

During the 51st CIML Meeting to be held on October 17-21, 2016 in Strasbourg, France a final vote will be taken on OIML R 59 (FDR). The publication will be approved if at least 80% of the votes cast are in favour. At least 75% of the Members must be present or represented for the vote. Below is a link to additional information concerning the CIML meeting and a copy of OIML R59 FDR.

http://strasbourg.oiml.org/ciml.html

Recommendation:
GA Sector members and members of the U.S. National Working Group on Grain Moisture are asked to review OIML R59 FDR and provide any comments during the GA Sector Meeting.

During the 2016 Grain Analyzer Sector Meeting, no additional comments were received on OIML R59 FDR. Ms. Lee reviewed the difference in the OIML protein Recommendation and OIML R59 *Moisture Meters for Cereal Grains and Oilseeds* and informed the Sector that OIML R59 would be voted on at the 51st CIML Meeting. During the review of this item there was a request for the difference in U.S. test procedures and the IEC test procedures included in the OIML protein Recommendation. The following is a link to IEC standards so that those interested can obtain and review the IEC test procedures: http://www.iec.ch/about/activities/standards.htm?ref=home

Following the Grain Analyzer Sector meeting and following the October 17-21, 2016 CIML meeting, the NIST CIML representatives reported that OIML R 59 *Moisture Meters for Cereal Grains and Oilseeds* was approved at the CIML meeting.

6. Report on OIML TC 17/SC 8 *Protein Measuring Instruments for Cereal Grain and Oil Seeds*

Background / Discussion:
This item was included on the sector's agenda to provide a summary of the activities of OIML TC 17/SC 8 to the grain analyzer sector and to those Sector members that participate on the United States National Working Group (USNWG) on grain protein measuring instruments. OIML TC17/SC8 was formed to study the issues and to develop a Recommendation on *Protein Measuring Instruments for Cereal Grain and Oil Seeds.* Australia is the Secretariat for this subcommittee. The third committee draft (3rd CD) for this Recommendation was circulated to the US national Working group for comments on July 3, 2012 for review and comment and comments were requested by September 8, 2012. The U.S. Comments to the 3rd CD were forwarded to the secretariat and the secretariat developed the 4th CD based on these comments.

The 4th CD was circulated to the USNWG on grain protein measuring instruments on April 9, 2013 and comments to the 4th CD of TC 17/SC 8 were requested by June 13, 2013. The U.S. comments to the 4th CD were forwarded to the secretariat. The U.S. was requested to vote on the 4th CD and a vote of no was provided due to a number of differences in the test procedures of the OIML Recommendation for *Protein Measuring Instruments for Cereal Grain and Oil Seeds* and the OIML Recommendation 59 *Moisture Meters for Cereal Grain and Oilseeds*.

A meeting was hosted by NIST, OWM, July 24-25, 2013 to discuss the comments to the 4th CD for the Recommendation on *Protein Measuring Instruments for Cereal Grain and Oil Seeds*. Discussions on 4th CD dealt mostly with harmonization of testing with the 6th CD of the OIML Recommendation R59 *Moisture Meters for Cereal Grain and Oilseeds*, software requirements, and influence quantities and test sample temperature.

At the August 2013 Grain Analyzer Sector meeting, the Sector reiterated their concerns with the OIML D11 damp heat test and agreed that the damp heat test in OIML Recommendation on Protein Measuring Instruments for Cereal Grain and Oil Seeds, 4th CD should be replaced with the humidity test as written in OIML R59 CD6.

The TC17/SC8 Secretariat will distribute a 5th CD for voting.

At the August 2014 Grain Analyzer Sector meeting, Ms. Diane Lee, NIST OWM, provided an update on the status of the 5th CD on *Protein Measuring Instruments for Cereal Grain and Oil Seeds*. The 5th CD on *Protein Measuring Instruments for Cereal Grain and Oil Seeds* was sent via e-mail to the USNWG on Protein Measuring Device on August 26, 2014 for a vote and comments. The USNWG participants were requested to provide their vote and any comments to the 5th CD by October 14, 2014. Ms. Lee encouraged the Grain Analyzer Sector members that are also participating on the USNWG to provide a vote and any comment to the 5th CD on *Protein Measuring Instruments for Cereal Grain and Oil Seed.*

2015 Grain Analyzer Sector Report Update:
The U.S. provided a yes vote on the 5th CD of the Protein Measuring Instruments for Cereal Grain and Oil Seeds with a comment to remove the vibration test from the document. The 5th CD of the Protein Measuring Instruments for Cereal Grains and Oil Seeds received a majority "yes" vote from the participating countries. With a majority "yes" vote by the participating countries, the document was forwarded as a Draft Recommendation for final voting by the CIML. Prior to the U.S. CIML member providing the U.S. vote, Diane lee circulated the DR to the USNWG and requested any final comments by October 11, 2015.

2016 Grain Analyzer Sector Meeting:
The OIML Protein Recommendation was submitted to BIML for registration as a Draft Recommendation and the BIML distributed the Draft Recommendation to all CIML members for preliminary ballot and comment. The total number of votes cast were 22. 20 yes votes, 2 no votes, and 1 abstention were received and 38 did not respond. Since a majority of the votes received were in favor of the Recommendation, The TC17/SC8 conveynor, Australia, updated the OIML Protein Recommendation (DR) per the editorial comments that were received and BIML registered the Recommendation as a Final Draft Recommendation (FDR). The BIML sent the FDR to CIML members. Diane Lee forwarded the FDR and results of the preliminary ballot to the U.S. National Working Group on Protein Meters on July 26, 2016 via e-mail for review and comments. Many of requirements and test in OIML the Protein Recommendation are similiar to tests conducted in the U.S. Type evaluation program. Some of the test which are typically included in international recommendations such as disturbance tests (AC mains voltage dips, short interuptions, and voltage dips, Burst on AC mains, Radiated radiofrequency, electromagnetic fields, Conducted radiofrequency, electromagnetic fields, and electrostatic discharge) are included in both the OIML Protein Recommendation and OIML R59. Many efforts were made to harmonize the the OIML Protein Recommendaton and OIML R 59, but there remains some differences between the two Recommendations which include but are not limited to the following:

- Damp Heat Test and Humidity Test: OIML R 59 includes the humidity test and the procedures used are those that have been used in the U.S. type evaluation testing for many years. The Protein recommendation includes what is called a damp heat test referencing standards IEC 60068-2-78 and IEC60068-3-4.

- Vibration Test: This test is not included in OIML R 59, but is included in the OIML Protein Recommendation.

- Dry Heat and Cold Tests and Instrument Temperture Sensitivity: The protein Recommendation includes a Dry heat test that references IEC 60068-2-2 and IEC 60068-3-1, and a cold test that reference IEC 60068-2-1 and IEC 60068-3-1. OIML R 59 includes the Instrument Temperature Sensitivity Test that includes testing at a cold and hot temperature and are the test procedures used in U.S. Type evaluation testing for many years

During the 51st CIML Meeting to be held on October 17-21, 2016 in Strasbourg, France a vote will be taken on the OIML Protein Recommendation (FDR) and the publication will be approved if at least 80% of the votes cast are in favour; at least 75% of the Members must be present or represented for the vote.

Below is a link to additional information concerning the CIML meeting and a copy of the OIML Recommendation on Protein.

http://strasbourg.oiml.org/ciml.html

Recommendation:
Grain Analyzer Sector members and members of the U.S. National Working Group on Protein Meters are asked to review the OIML Recommendation on Protein FDR and provide any comments during the Grain Analyzer Sector Meeting.

During the 2016 Grain Analyzer Sector Meeting, no additional comments were received on the OIML Protein FDR. Ms. Lee reviewed the difference in the OIML protein Recommendation and OIML R59 *Moisture Meters for Cereal Grains and Oilseeds* and informed the Sector that the OIML protein Recommendation would be voted on at the 51st CIML Meeting. During the review of this item there was a request for the difference in U.S. test procedures and the IEC test procedures included in the OIML protein Recommendation. The following is a link to IEC standards so that those interested can obtain and review the IEC test procedures:
http://www.iec.ch/about/activities/standards.htm?ref=home

Following the Grain Analyzer Sector meeting and following the October 17-21, 2016 CIML meeting, the NIST CIML representatives reported that the OIML protein Recommendation was approved at the CIML meeting.

7. The Feasibility of a Phase II program for Near Infrared Grain Analyzers

Source:
Dr. Hurburgh, Iowa State University

Background/Discussion:
The GIPSA Grain Inspection Advisory Committee recommends that GIPSA initiate research to determine the feasibility of extending the theory of "equivalency" to multiple-constituent instruments in order to utilize standardized technology while maintaining accuracy and consistency in measurement of wheat protein.

Ms. Eigenmann provided an update on the Grain Inspection Advisory Committee's Resolutions. The Sector discuss the feasibility of an ongoing calibration program also referred to as a Phase II program for Near Infrared Grain Analyzers (NIR) instruments that measure wheat program. The Phase II program for grain moisture is a program that monitors the moisture calibrations on grain moisture meters annually. As changes to the calibrations occur due to grains, climate, etc., data collected in this program allows for changes to moisture calibrations annually and ensure equivalency among the different moisture meter models. The Advisory committee is recommending that this program be extended to include NIR instruments that measure wheat protein. It was noted that there could be multiple NIR instruments for wheat protein introduced into the market and that it may be advisable to have the Phase II program extended to NIR instruments that measure wheat protein. It was also mentioned that currently there are few States that are checking wheat protein on multi-constituent instruments.

GIPSA currently has an annual review program for the official protein system but would have to consider the cost associated with extending the program for other NIR wheat protein analyzers It was noted during the discussion that GIPSA currently has hourly rate fees set that could be applied to a phase II program for wheat program.

Unlike moisture where there may be changes to the calibrations annually, there will not be year to year changes for wheat protein. As such, consideration may be given to conducting the program less than annually, and considering reviewing wheat protein calibrations every 3, 4, or 5 years, as appropriate. In addition it was noted that there also has to be a mechanism to get manufacturers calibration data for calibration review.

The sector will continue to discuss the feasibility of a phase II program for wheat protein giving consideration to the following issues:

- How the program will be funded,
- How often the calibrations for wheat protein will be updated,
- How many devices are currently being used in commercial transactions, and
- If being used commercially in a State, what is needed by States to begin testing these devices?

At the August 2014 Grain Analyzer Sector meeting USDA, GIPSA representatives provided an update on the activities concerning a phase II program for wheat protein. The Sector was informed that USDA, GIPSA is discussing funding options for this program. It was noted that the frequency of calibration for wheat protein is being considered and that this will impact the cost of the program. The Sector was also informed that Dr. David Funk is writing a discussion paper that will address many of the issues concerning a Phase II program for wheat protein.

2015 Grain Analyzer Sector Report Update:
USDA, GIPSA repesentatives mentioned that they are not aware of a discussion paper from Dave Funk concerning the feasibility of a Phase II program for Near Infrared Grain Analyzers. The sector should continue to provide feedback on the four bullet items listed above and USDA, GIPSA should provide any updates on any internal discussions.

2016 Grain Analyzer Sector Meeting
Mr Jordan, GIPSA, the NTEP Participating Laboratory for grain analyzers provided information on some work involving applying data transforms to spectra of multiple instrument models. Mr. Jordan will provide an update of these activities along with others involved in considering Phase II testing for Near Infrared Grain Analyzers.

Recommendation:
Sector members are asked to review the background information on this item in preparation for discussion of the current work in determining the feasibility of Phase II testing for Near Infrared Grain Analyzers.

During the 2016 Grain Analyzer Sector meeting, the sector agreed that a program is needed based on observations and some feedback from sector members that review calibration data for these instruments. As such, the sector "brain stormed" ideas on what would be needed to develop a phase II program to periodically verify the calibrations on Near Infrared devices. The sector memebers generated the following information based on its discussion:

Near Infrared Phase II Program Needs:

- Set of robust samples that can be used every year,
- A reference laboratory to perform the testing,
- 100 samples for all meters or less per grain type on each meter,
- The program should verify calibratons for basic grains where there is a commercially impact to included protein in wheat, soybeans, barley, and corn and oil in corn and soybeans (it was noted during discussion that there is a large economic impact in the area of wheat protein and that protein and oil in corn and soybeans are used in many non-trade applications).
- The program would currently include a total number of three instruments (There are three instruments that measure protein and oil in the NTEP program)
- Testing should include a slope bias test for each 2 point intervals and include a confidence interval.
- The current NCWM, Inc policies for participating in the grain moisture phase II testing can be used for the near infrared phase II program.
- An estmate of the cost of the program is needed. There was also a question as to whether or not the cost of the program would be distributed among the participating manufacturers, similar to the Phase II program for grain moisture.

In addition to the discussion of program needs for Phase II testing for near infrared devices, it was noted that although States test near infrared device for grain moisture measurements, not many States are evaluating these devices for protein or other other grain constituents (oil or starch). The GA Sector also discussed the needs of State weights and measures jurisdictions in testing near infrared devices for protein, starch and oil. It was noted that State resourses: staff and money are needed for testing and that currently, per the States that attended the Sector meeting, commercial transactions involving protein measurements are lower than for grain moisture measurments.

8. State Weights and Measures Issues with Inspection of Grain Moisture Meters for Corn

Source:
G. Diane Lee, NIST, OWM, Legal Metrology Device Group

Background / Discussion:
Diane Lee, NIST OWM received calls requesting a copy of the annual request for grain samples and list of grains that GIPSA request from States to include in the ongoing calibration program. These request came from various States and other interested parties. One State reported seeing a difference between a UGMA meter and another meter on corn samples and wanted to ensure that grain samples in their State were represented in the ongoing calibration program.

Recommendation:
Grain Analyzer Sector members are asked to report on any issues they are having with commercial grain moisture meter inspections for corn.

During the discussion of this item at the 2016 Grain Analyzer Sector meeting it was mentioned that this issue arised when two states would not accept the new corn calibrations for grain moisture meters when they observed a difference in results for corn on different meter technologies. During the discussion it was noted that the States that reported problems with the corn calibrations were States that have high ethanol production. It was explained that States with high ethanol production may have a high production of modified corn (corn modified to increase ethanol production). Since calibrations are based on a national sample set with grains collected from across the U.S., these modified samples may not have been included in the national sample set which could have contributed to the irregularities with the updated corn calibrations. It was suggested during the Sector meeting that modified corn samples be included in the national sample set and to monitor corn calibrations and modified corns for ethanol production. It was also noted that States should use the recommended procedures in NIST HB 44 when testing to ensure that error are not introduced due to incorrect test procedures.

Following the discussion of this agenda item, Jeff McCluer, who had submitted an item to include on the 2016 sector agenda, that was ultimately not included on the agenda based on the request to change GIPSA tolerances, which is not in the scope of the GA Sector, presented information in reference to tolerance for UGMA meters. He explained that if the UGMA meter technology can get better measurements , then he recommends that a reduction in the tolerances should be made. Charlie Hurburgh noted that the Sector has not conducted a study of the new technology and that a task force could be developed to take a look at the results of these meters. Charlie Hurburgh agreed to chair the task group to look at results from UGMA meters.

After some discussion with Dave Funk, Grain Quality Analytics, LLC and some research on the tolerances for UGMA meters. At the temperature extremes errors in measurement are increased so the tolerances were set to account for an average error in these meters. As such, the task group should include a review of the measurements at varing temperature ranges.

Next Sector Meeting
The next meeting is planned for Wednesday, August 16 (1:00 p.m. to 5:00 p.m) and Thursday, August 17 (8:00 a.m. to 12:00 noon), 2017, at the Hyatt Place at the Kansas City Airport.

If you would like to submit an agenda item for the 2017 meeting, please contact any of the following persons by June 1, 2017:

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

2017 NTEP Grain Analyzer Sector Summary

November 1, 2017

INTRODUCTION

The charge of the NTETC Grain Analyzer Sector is important in providing appropriate type evaluation criteria based on specifications, tolerances and technical requirements of *NIST Handbook 44* Sections 1.10. General Code, 5.56. Grain Moisture Meters and 5.57. Near-Infrared Grain Analyzers. The sector's recommendations are presented to the National Type Evaluation Program (NTEP) Committee each January for approval and inclusion in *NCWM Publication 14 Technical Policy, Checklists, and Test Procedures* for national type evaluation.

The sector is also called upon occasionally for technical expertise in addressing difficult *NIST Handbook 44* issues on the agenda of National Conference on Weights and Measures (NCWM) Specifications and Tolerances (S&T) Committee. Sector membership includes industry, NTEP laboratory representatives, technical advisors, and the NTEP Administrator. Meetings are held annually, or as needed and are open to all NCWM members and other registered parties.

Suggested revisions are shown in **bold face print** by **~~striking out~~** information to be deleted and **<u>underlining</u>** information to be added. Requirements that are proposed to be nonretroactive are printed in ***bold faced italics***.

Table A
Table of Contents

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
BIML	International Bureau of Legal Metrology	NTETC	National Type Evaluation Technical Committee
CD	Committee Draft	OCP	Ongoing Calibration Program
CIML	International Committee of Legal Metrology	OIML	International Organization of Legal Metrology
CIPM	International Committee of Weights and Measures	OWM	Office of Weights and Measures
D	Document	R	Recommendation
EMRP	European Metrology Research Program	S&T	Specifications and Tolerances
FGIS	Federal Grain Inspection Service	SC	Subcommittee
GA	Grain Analyzer	SD	Secure Digital
GIPSA	Grain Inspection, Packers and Stockyards Administration	TC	Technical Committee
GMM	Grain Moisture Meter	TW	Test Weight
MRA	Mutual Recognition Agreement	UGMA	Unified Grain Moisture Algorithm
NCWM	National Conference on Weights and Measures	USB	Universal Serial Bus
NIR	Near Infrared Grain Analyzer	USDA	United States Department of Agriculture
NIST	National Institute of Standards and Technology	USNWG	United States National Working Group
NTEP	National Type Evaluation Program		

Details of All Items
(In order by Reference Key)

1. Selecting a new NTETC GA Chairperson

The Grain Analyzer (GA) Sector nominated Karl Cunningham to serve as the NTETC GA Chairperson and he has served in this position since the 2015 Grain Analyzer Sector Meeting. Karl requested that the selection of a new NTETC chairperson be added to the 2017 GA Sector agenda. Karl has been instrumental in assistance with grain sample distributions for proficiency test and has agreed to continue to assist in this capacity. In accordance with the NTEP Administrative policies there is no fixed term for the NTETC GA Chair position, the Sector Chair must be a member of NCWM, and the Sector Chair is appointed by the NTEP committee Chair. Sector members are asked to consider nominations for a New Committee Chair for the 2018 NTETC GA Sector.

During the 2017 GA Sector Meeting, Mr. Jim Truex, NTEP Administrator reviewed Publication 14 administrative policy for Sector Committee Chair and Diane Lee talked about the benefits to being the GA Sector Committee Chair, one being the ability to participate in the development of the Sector agenda. Following discussion of this item, no one was nominated or volunteered for the position. Karl Cunningham, the current Committee Chair, noted after the discussion of this item that since no one was nominated or volunteered for the chair position, that he is willing to continue working with the GA Sector as Committee Chair.

2. Report on the 2016 NCWM Interim and Annual Meetings

The 2017 NCWM Interim Meeting was held January 8-11 in San Antonio, Texas. The 2017 NCWM Annual Meeting was held July 16-20 in Pittsburgh, Pennsylvania. At these meetings, there were no Grain Analyzer Sector recommended changes to NCWM Publication 14 or NIST Handbook (HB) 44. The Grain Analyzer Sector originally submitted an item on the S&T agenda, which was subsequently reassigned to NIST, OWM for development. See Grain Analyzer Agenda Item 4 concerning the definition of remote configuration for an update of activities on this item.

During the 2017 GA Sector Meeting Mr. Jim Truex, NTEP Administrator, provide an update on the NCWM Interim and Annual Meetings. Mr. Truex reported that the total conference membership decreased from 2197 in 2016 to 2159 in 2017. He also confirmed that there were no Grain Analyzer Sector voting items on the 2017 interim or annual meeting agenda and that one developing item remains on the agenda concerning revisions to the definition of remote configuration capabilities. Further discussion on the Grain Analyzer Sector developing item is included under Agenda Item 4 of this summary.

3. Report on NTEP Evaluations and Ongoing Calibration Program (OCP) (Phase II) Testing

Mr. Jason Jordan, Grain Inspection, Packers and Stockyards Administration (GIPSA), the NTEP Participating Laboratory for grain analyzers, provided a list of grain analyzers that are enrolled in the Ongoing Calibration Program (OCP), Phase II testing for the 2016 harvest. There are 8 grain analyzer models enrolled for the 2016 harvest.

The 8 models:

1. Dickey-john Corp. – GAC2500-UGMA
2. Dickey-john Corp. – GAC2000, GAC2100, GAC2100a and GAC2100b
3. Perten Instruments Inc. - AM5200 and AM5200-A (UGMA)
4. Perten Instruments Inc. – IM9500 and IM9500 HLW/TW
5. Foss North America – Infratec 1241
6. Foss North America – Infratec Nova
7. The Steinlite Corp. – SL95
8. MTC Moisture Analyzers – MTC 999 ES

During discussion of this item at the 2017 GA Sector meeting, Mr. Jordan provided the sector with an update on the NTEP Phase I evaluations and reported on the collection and analysis of the OCP (Phase II) data from the 2016 crop year. He reported that there is one instrument currently in phase I testing and this instrument may potentially be added to phase II testing for next year. Manufacturers should review the payment schedule for the year of test with a potential total number of 9 models in phase II testing to determine their appropriate contribution to the cost for phase II testing. See the 2015 Grain Analyzer Sector Report for the NTEP On-going Calibration Program (Phase II) Fee Schedule. Mr. Jordan also reported that the same 8 instrument models as listed above are the same models as last year and are in phase II testing for the current year.

4. Review of OCP (Phase II) Performance Data for Moisture and Test Weight per Bushel

At the Sector's August 2005 meeting it was 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, Mr. Jordan, GIPSA, the NTEP Participating Laboratory for grain analyzers provided data for inclusion in the 2017 Grain Analyzer Sector Meeting Agenda showing the performance of NTEP meters compared to the air oven. This data is based on the last three crop years (2014–2016) using calibrations updated for use during the 2016 harvest season.

The 2014-2016 Grain Moisture Meter (GMM) Phase II comparison graphs are available for view or can be downloaded for printing at the following web address:

http://www.ncwm.net/_resources/dyn/files/75601146zc793ed4d/_fn/2014-2016+NCWM+Sector+GMM+Biases.pdf

At the Sector's August 2012 meeting, it was agreed that TW comparison and correlation charts should be prepared for the 3 grains which are most likely to be subject to discounts on the basis of TW: Corn and two wheat classes and limited to Air Oven reference values less than 20% moisture. The wheat classes selected were: Hard Red Winter and Soft Red Winter. Accordingly, Mr. Jordan, GIPSA, the NTEP Participating Laboratory for Grain analyzers prepared data showing the performance of NTEP meters compared to the GIPSA reference Quart Kettle Test Weight Apparatus. Mr. Jordan provided this information for the Grain Analyzer Sector 2017 meeting agenda. This data is based on the last three crop years (2014 – 2016) using calibrations updated for use during the 2016 harvest season.

The 2014-2016 TW comparison and correlation charts and TW Phase II data are available for view or can be downloaded for printing at the following web address:

http://www.ncwm.net/_resources/dyn/files/75601147zb094dddb/_fn/2014-2016+NCWM+Sector+TW+plots.pdf

During the 2017 GA Sector meeting, the Sector reviewed the phase II performance charts for moisture and test weight. During this review Ms. Diane Lee, NIST, asked if the data shows a reduction in the variation among the meters in the phase II program since the start of the NTEP phase II program. Mr. Jordan provided an example with corn and noted that the variation between moisture for the meters measuring corn has reduced from an average of about 0.6% to about 0.2% which provides some evidence that the NTEP phase II program is working to reduce measurement variability in the program. Seedburo asked if there was a problem with some of the grain samples shown in the chart and Cathy Brenner responded that there was a reduction in the overall number of samples needed due to the new meter technology, UGMA.

5. Modify the Definition of Remote Configuration Capability Appearing in Appendix D of NIST Handbook 44 to Recognize the Expanded Scope of "Remote Configuration Capability" (S&T Developing item 3600-5)

Source:
Originally proposed by the Grain Analyzer Sector but because NIST, OWM recognized that this item would affect other device types it was reassigned to NIST, OWM for further development.

Purpose:
Table S.2.5. *Categories of Device and Methods of Sealing* that appears in §5.56. (a) of *NIST Handbook 44* lists acceptable methods of sealing for various categories of GMMs. When the sector first recommended adding the table to *NIST Handbook 44* at their September 1996 meeting, the concept of making a change to a GMM from a remote site involved information "…sent by to the device by modem (or computer)." In 2011 this concept has expanded to include the ability of the measuring device to accept new or revised sealable parameters from a memory chip (e.g., an SD Memory Card that may or may not itself be necessary to the operation of the device), external computer, network, or other device plugged into a mating port (e.g., Universal Serial Bus (USB) port) on the measuring device or connected wirelessly to the measuring device. The changes proposed in Item Under Consideration expand the scope of "remote configuration capability" to cover instances where the "other device" may be necessary to the operation of the weighing or measuring device or which may be considered a permanent part of that device.

Item Under Consideration:
Modify the General Code by adding the following paragraph to address security for systems adjusted using removable media:

G-S.8.2. Devices and Systems Adjusted Using Removable Digital Storage Device. - For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, such as a secure digital (SD) card, USB flash drive, etc., security shall be provided for those parameters using an event logger in the device. The event logger shall include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available on demand through the device or through another on-site device. In addition to providing a printed copy of the information, the information may be made available electronically. The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)

(Added 20XX)

and exempt current sealing requirements from applying to devices and systems adjusted using a removable digital storage device by proposing changes to the sealing requirements in the following HB 44 code sections: 2.20., 2.21., 2.22., 2.24., 3.30., 3.31., 3.32., 3.33., 3.34., 3.35., 3.36., 3.37., 3.38., 3.39, 3.40., 5.55., 5.56. (a), and 5.58. This exemption is needed because the General Code paragraph being proposed will address the sealing of all device types and systems that can be adjusted using a removable digital storage device.

The following is an example of proposed changes to the Grain Moisture Meter Code, which are intended to provide the exemption noted for NIST HB 44, Section 5.56(a):

S.2.5. Provision for Sealing.

S.2.5.1. Devices and Systems Adjusted Using a Removable Digital Storage Device. - For those devices and systems in which calibration and configuration parameters, as defined in Appendix D, can be changed by use of removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2.

S.2.5.2. All Other Devices. - Except on devices specified in S.2.5.1 and S.2.5.3. Provision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., audit trail available at the time of inspection as defined in Table S.2.5. Categories of Device and Methods of Sealing) before any change that affects the metrological integrity of the device can be made to any mechanism.

(The paragraphs below are currently being discussed by the GA Sector. See discussion of this proposed change in Agenda Item 6)

S.2.5.3. *An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants.)*

*A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to 25 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*

[Nonretroactive as of January 1, 20XX]

(Amended 20XX)

Background / Discussion:

Two common types of removable data storage devices are the USB flash drive and the Secure Digital (SD) memory card. A USB flash drive is a data storage device that includes flash memory with an integrated USB interface. USB flash drives are typically removable and rewritable, and physically much smaller than a floppy disk. A SD card is a non-volatile memory card format originally designed for use in portable devices. The SD standard is maintained by the SD Card Association.

Removable digital storage devices can be used in GMMs as either “data transfer” devices which are not necessary to the operation of the GMM or as “data storage devices” which are necessary to the operation of the GMM.

A USB flash drive is most likely to be used as a "data transfer" device. In a typical "data transfer" application, the USB flash drive is first connected to a computer with access to the web. The computer visits the GMM manufacturer's web site and downloads the latest grain calibrations that are then stored in the USB flash drive. The USB flash drive is removed from the computer and plugged into a USB port on the GMM. The GMM is put into "remote configuration" mode to copy the new grain calibration data into the GMM's internal memory. When the GMM has been returned to normal operating (measuring) mode the USB flash drive can be removed from the GMM.

Although an SD memory card could also be used as a "data transfer device" it is more likely to be used as a "data storage device". In a typical "data storage device" application, the SD memory card stores the grain calibrations used on the GMM. The SD memory card must be plugged into an SD memory card connector on a GMM circuit card for the GMM to operate in measuring mode. To install new grain calibrations the GMM must be turned "off" or put into a mode in which the SD memory card can be safely removed. The SD memory card can either be replaced with an SD memory card that has been programmed with the new grain calibrations or the original SD memory card can be re-programmed with the new grain calibrations in much the same way as that described in the preceding paragraph to copy new grain calibrations into a USB flash drive. In either case, the SD memory card containing the new calibrations must be installed in the GMM for the GMM to operate in measuring mode. In that regard, the SD memory card can be considered a "permanent part" of the GMM in that the GMM cannot operate without it.

Note: In the above example "SD memory card" could be any removable flash memory card such as the Secure Digital Standard-Capacity, the Secure Digital High-Capacity, the Secure Digital Extended-Capacity, and the Secure Digital Input/Output, which combines input/output functions with data storage. These come in three form factors: the original size, the "mini" size, and the "micro" size. "Memory Stick" is a removable flash memory card format, launched by Sony in 1998, and is also used in general to describe the whole family of Memory Sticks. In addition to the original Memory Stick, this family includes the Memory Stick PRO, the Memory Stick Duo, the Memory Stick PRO Duo, the Memory Stick Micro, and the Memory Stick PRO-HG.

See the NCWM S&T Committee 2013-2016 Final Reports and the Grain Analyzer Sector 2013-2016 summaries for additional background information and to review the different proposals considered by the NCWM S&T committee and Grain Analyzer Sectors.

During the 2017 GA Sector meeting, the Sector members reviewed the proposed changes and by consensus agreed with the proposed changes to NIST Handbook 44, Section 5.56(a) and the General Code. The Sector recognized that the proposed paragraph S.2.5.3included in the item for consideration as changes to NIST HB44 Section 5.56(a) is still under discussion (See agenda Item 6 in this summary) and is not currently being proposed for consideration.

6. Adding a Nonretroactive Requirement to NIST HB 44 Grain Moisture Meter Code 5.56(a) that Grain Moisture Meters meet Category 3 Sealing Requirements

Source:
Grain Analyzer Sector

Purpose:
At the 2016 Grain Analyzer Sector Meeting during its discussion of Agenda Item 5 "Modify the Definition of Remote Configuration Capability that is defined in Appendix D of NIST Handbook 44 to Recognize the Expanded Scope of "Remote Configuration Capability" (S&T Developing item 3600-5)" it was noted that the current technology for sealing grain moisture meters are with event loggers (category 3 sealing requirements). Due to the complexity of these devices, a Category 3 sealing provides a record of what calibration and configuration parameters were changed. As such, the GA Sector discussed including a non-retroactive requirement for category 3 sealing for all grain moisture meters. Currently NIST HB 44 NIR code for devices that measure protein, oil and starch requires that the device be sealed with an event logger. These meters also measure moisture and currently meet category 3 requirements.

Item Under Consideration:

The GA Sector's technical advisor included the following proposal for changes to the Grain Analyzer Code 5.56(a) in the 2016 Grain Analyzer Sector Summary for review:

S.2.5. Provision for Sealing.

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.
.

S.2.5.3. *An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants.)*

*A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to 25 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*

[Nonretroactive as of January 1, 20XX]
(Amended 20XX)

Doug Musik, Kansas Weights and Measures, submitted the following alternate proposal:

Table S.2.5.

Categories of Device	***Methods of Sealing***
Category 1[1]***:*** *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999). If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.*

Category 2[1]: *Remote configuration capability, but access is controlled by physical hardware.* *A device shall clearly indicate that it is in the remote configuration mode and shall not be capable of operating in the measure mode while enabled for*	*The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999). If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.*
Category 3[2]: *Remote and/or no remote configuration capability access. Access may be unlimited or controlled through a software switch (e.g., password).* *When accessed for modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not can operate in the measuring mode.*	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants). A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to 25 times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)*
~~***Category 3a:*** *No remote capability, but operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc.) in normal operation.*~~ ~~**When accessed for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of*~~	~~*Same as Category 3*~~
~~***Category 3b:*** *No remote capability, but access to metrological parameters is controlled through a software switch (e.g., password).*~~ ~~**When accessed for modifying sealable parameters, the device shall clearly indicate that it is in the*~~	~~*Same as Category 3*~~

[1] Not allowed for devices manufactured on or after January 1, 2019

[2] Required for all devices manufactured on or after January 1, 2019

[Nonretroactive as of January 1, 1999]
*[*Nonretroactive as of January 1, 2014]*
(Amended 1998 and 2013 and XXXX)

Background / Discussion:
During discussion of Agenda Item 5 above during the 2016 GA Sector meeting, it was suggested that the Grain Moisture Meter Code requirements for sealing be changed such that all grain moisture meters are required to meet

category 3 sealing requirements as of a specific date; e.g. all grain moisture meters must have an event logger. With the increase in ease of switching out removable SD cards and making changes to metrological components it may be time to require a form of sealing that provides information on what was changed and the date of the change to the device. Category 3 sealing is currently required in NIST HB 44, Section 5.57, NIR Code. Manufacturers that were present at the meeting did not object to the proposal, but it was noted that all manufacturers were not represented at the meeting. During the 2016 GA sector meeting, Jim Truex also noted that we may need to consider State laws that require that a commercial device have a lead and wire seal. It was also mentioned that the proposed NIST, LMDP language for the general code would be redundant for the devices manufactured on or after the non-retroactive date because these meters will also require an event logger.

The current status for sealing methods of grain moisture meters are as follows:
Inactive Certificates of Conformance (CC):

- 9 inactive certificates; an inactive status for grain analyzers means that a CC was previously active for a device, but now the device is no longer being manufactured or remanufactured. Existing devices may be used, sold, or repaired and resold under inactive certificates. As such, these devices are likely still in use.
    - 3 inactive devices are *not* sealed using an event logger.

Active CC

- 9 active certificates
    - 1 active device is *not* sealed using an event logger.

The Grain Analyzer Sector members reviewed the proposed changes and provide comments and discussion on the proposed language for changes to the sealing requirements in NIST HB 44, Section 5.56(a). During the discussion States participants noted that they would rather have an event logger as it provides more information than a lead and wire seal and noted that when seals are removed no information is available to determine what changes were made to the grain moisture meter and agreed that the Category 3 method of sealing provides much more information to determine the changes made to the device. Some discussion was held on implementation with some older meters still having Category 1 sealing while others new devices would have Category 3 devices. Karl Cunningham mentioned that IL has a similar situation with NTEP and Non-NTEP meters in use in their State. Since as noted above currently, one active meter is not sealed using an event logger, the Sector recommended that additional work is needed to talk about impact of this requirement on manufacturers and to get additional feedback on an appropriate non-retroactive date for this proposed change.

7. Report on International Organization of Legal Metrology (OIML) TC 17/SC 1 R 59 *Moisture Meters for Cereal Grains and Oilseeds*

Background / Discussion:

This item is included on the Sector's agenda to provide a summary of the activities of OIML TC17/SC1 to the grain analyzer sector and to those Sector members that participate on the United States National Working Group (USNWG) on grain moisture meters.

OIML TC17/SC1 was tasked to revise OIML R 59 *Moisture Meters for Cereal Grains and Oilseeds* to reflect new technologies and actual grain analysis. The Co-Secretariats (China and the United States) worked closely with an International Project Group to revise OIML Recommendation R 59 *Moisture Meters for Cereal Grains and Oilseeds*.

As reported at the 2016 GA Sector meeting, OIML R59 would be voted on at the 51st CIML Meeting. OIML R 59 *Moisture Meters for Cereal Grains and Oilseeds* was approved at the 51st CIML meeting, held October 17-21, 2016.

Grain moisture meter manufacturers were notified by e-mail on May 9, 2017 that OIML R59 2016 was published and available on the OIML website at https://www.oiml.org/en/files/pdf_r/r059-p-e16.pdf . In this e-mail NIST OWM requested any feedback or statement on how this standard impacts your company that can be used in NIST highlights to demonstrate the impact of our work in OIML. If you have not provided a statement or feedback please send this information to diane.lee@nist.gov.

During the 2017 GA Sector meeting, the Sector members were reminded that OIML R59 2016 was revised and published and available on the OIML web site and that the requirements include many U.S. requirements for evaluating grain moisture meters making it easier for U.S. manufacturers to meet the global regulations and metrological controls set for these devices. Sector manufacturers were reminded to provide any feedback on how the Standard impacts their company. For example, providing feedback on experiences with the use of the international standard.

8. Report on OIML TC 17/SC 8 *Protein Measuring Instruments for Cereal Grains and Oil Seeds*

Background / Discussion:
This item is included on the sector's agenda to provide a summary of the activities of OIML TC 17/SC 8 to the grain analyzer sector and to those Sector members that participate on the United States National Working Group (USNWG) on grain protein measuring instruments.

OIML TC17/SC8 was formed to study the issues and to develop a Recommendation on *Protein Measuring Instruments for Cereal Grain and Oil Seeds (OIML R 146).* Australia is the Secretariat for this subcommittee.

As reported at the 2016 GA Sector meeting, OIML R 146 would be voted on at the 51st CIML Meeting. OIML R 146 *Protein Measuring Instruments for Cereal Grain and Oil Seeds* was approved at the CIML meeting, held October 17-21, 2016.

Grain moisture meter manufacturers were notified by e-mail on May 9, 2017 that OIML R146 *Protein Measuring Instruments for Cereal Grain and Oil Seeds* was published and available on the OIML website at https://www.oiml.org/en/files/pdf_r/r146-p-e16.pdf . In this e-mail NIST OWM requested any feedback or statement on how this standard impacts your company that can be used in NIST highlights to demonstrate the impact of our work in OIML. If you have not provided a statement or feedback please send this information to diane.lee@nist.gov.

During the 2017 GA Sector meeting, the Sector members were reminded that OIML R146 2016 was published and available on the OIML web site and that the requirements include many U.S. requirements for evaluating grain protein analyzers making it easier for U.S. manufacturers to meet the global regulations and metrological controls set for these devices. Sector members were reminded to provide any feedback on how the OIML Recommendation impacts their company. For example, providing feedback on experiences with the use of the international standard.

9. Air-Oven Grain Moisture Proficiency/Collaborative Study/Interlaboratory Comparison Testing

Source:
Grain Analyzer Sector

Purpose:
Develop an air-oven proficiency/collaborative study/interlaboratory comparison testing program to ensure state laboratory and manufacturer's air-oven measurements are traceable to the official USDA, GIPSA air-oven measurements.

Item Under Consideration:
Establish a timeline for consistent and periodic grain moisture proficiency testing.

Background/Discussion:
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-OWM's laboratory measurement traceability program requires that State Weights and Measures laboratories participate in interlaboratory and other collaborative experiments. State Weights and Measures programs with grain moisture laboratories typically meet this requirement by one of two methods: 1) 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 laboratory, including GIPSA, measure the same sample. 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.

A collaborative air oven study has been conducted with States and meter manufacturers periodically over a number of years and results discussed during the GA Sector meetings. These studies were conducted in 1995, 2001 and 2015.

At the 2009 NTETC Grain Analyzer Sector Meeting, Dr. Hurburgh, Iowa State University, urged the representatives from the American Oil Chemists Society (AOCS) to prepare a proposal so that the collaborative (air-oven) study could be conducted on an on-going basis rather than on an ad hoc basis. He cautioned that the proposal would have to include corn and wheat as well as soybeans and at the 2011 NTETC Grain Analyzer Sector Meeting, Ms. Johnson, AOCS, proposed an air-oven/GMM proficiency testing series designed specifically to address the needs of GMM manufacturers and states maintaining a grain moisture laboratory. The intent was for the AOCS to administer, oversee distribution of samples, compile results, perform statistical analysis of results, and distribute a report to participants. AOCS does not collect the samples. This is subcontracted to suitable providers. AOCS does not have laboratories. Since GIPSA/ FGIS is a certified laboratory already participating in the AOCS Soybean Quality Traits program, GIPSA air-oven results could be reported for comparison

At the sector's August 2012 meeting the sector learned that Ms. Christine Atkinson will be taking over the Proficiency Testing program for States and interested manufacturers formerly headed by Ms. Amy Johnson. Ms. Atkinson verified that participant's cost will remain $100 per year. The sector reiterated that the program should focus solely on the standard FGIS air-oven method. Instrument results will not be reported. Participants' air-oven results will be compared against GIPSA's standard FGIS air-oven results. In response to Ms. Atkinson's question about scheduling, the sector was in general agreement that samples should ship after harvest, preferably between mid-January and mid-February with participants' results due 30 days after the shipping date.

The sector agreed upon the following Program Details:

Samples – Soybeans 2, Corn 2, Hard Red Winter Wheat 2

- Cost to Participants - $100.00/year
- Schedule:
  - Samples (6) ship between January 15 and February 15.
  - Samples must be tested within 5 business days of receipt with results due 30 days after the shipping date.
- Reports to be posted on www.SoybeanQualityTraits.org by 1 May.
- Only the GIPSA oven results will be identified. Individual manufacturer's and State participant's oven results will be assigned an identifier known only to the manufacturer or State participant. Instrument results will not be reported.
- Detailed Participant Instructions will be provided to each participant.

At the August 2013 Grain Analyzer Sector meeting no report was provided on AOAC's efforts to conduct proficiency testing for grain moisture. As such, Karl Cunningham, IL and Kevin Hanson, MO agreed to work together to conduct a grain moisture proficiency test. Karl Cunningham, IL, agreed to provide the samples for proficiency testing and Kevin Hanson, MO, agreed to analyze the data in accordance with the procedures used to conduct proficiency testing in the State laboratory program. Kevin also agreed to collect data on test weight per bushel which may be useful in field test procedures for evaluating test weight per bushel on instruments. Following the August 2013 sector meeting arrangements were made for shipping grain samples to State participants.

At the August 2014 Grain Analyzer Sector meeting Mr. Karl Cunningham provide an update on the status of proficiency testing. Mr. Cunningham informed the Grain Analyzer Sector that he collected some wheat grain samples that can be used for grain moisture proficiency testing and that corn and soybeans will be collected during the 2014

harvest. Mr. Cunningham noted that after January 2015 wheat, corn and soybeans grain samples may be ready for distribution to the participating States. Mr. Cunningham agreed to analyze the data in cooperation with NIST and requested a list of contact information for participating States and other interested parties. Proficiency testing was conducted in 2015 and reported in the 2015 Grain Analyzer Sector Report (Note: In 2015, a Grain Analyzer Sector meeting was not held but a report of activities was generated)

Recommendation:
Although the Sector has periodically conducted proficiency testing over the years, a schedule of ongoing proficiency testing is needed to ensure that these tests are performed on a consistent basis. With changes in responsibilities in AOAC and loss connections, establishing an ongoing collaborative study with AOAC may be difficult to manage. As such the Grain Analyzer Sector is asked to consider the following timeline previously discussed for sending out samples and using the guidelines for proficiency testing which includes frequency of testing included in NISTIR 7082 "Proficiency Test Policy and Plan (For State Weights and Measures Laboratories), and tools and forms for analyzing the results which are located on the NIST OWM Website at:

https://www.nist.gov/sites/default/files/documents/2017/05/09/nistir-7082.pdf

It is suggested that the proficiency testing be managed and oversite provided by State Weights and Measures, Grain Analyzer Sector members on a rotating basis. Per NISTIR 7082, the frequency of proficiency testing for grain moisture air oven measurements is 4 years or more often. As such the following scheduled is proposed for discussion. Please note that in addition to testing corn, soybeans and wheat the sector is asked to consider any benefits to including one specialty grain such as corn modified for high ethanol production to the proficiency testing. The schedule will be reviewed at the Sector meeting preceding the scheduled proficiency test date to confirm responsible parties and any specialty grains for inclusion in the proficiency test year. The specialty grain will change based on specific market concerns during the proficiency test year.

Air Oven Grain Moisture Proficiency Testing Schedule (Previous PTs 1995, 2001 and 2015)					
PT Test Date 4 yr. Cycle	**Sample Collection Date**	**Samples for Testing 2 of each (corn, wheat, soybeans)**	**Sample Ship Date**	**Responsible for Sample Distribution w/ Instructions**	**Responsible for Data Collection and Analysis**
Spr 2019	Spr 2018	✓	Jan/Feb 2019	IL	IL
Spr 2023	Spr 2022	✓	Jan/Feb 2023	_____?	_____?
Spr 2027	Spr 2026	✓	Jan/Feb 2027	_____?	_____?

During the 2017 GA Sector meeting the Sector agreed that there was no need to test specialty grain and that including these grains will not provide any useful information. The Sector decided that the three major grains, wheat, corn, and soybeans would be the grains included for proficiency testing. States and industry sector members participating in the proficiency testing were encouraged to provide their current contact information to Karl Cunningham for sample distribution. The above table represent the schedule for proficiency testing which was edited after the 2017 Sector meeting discussion of this item.

10. The Feasibility of a Phase II program for Near Infrared Grain Analyzers

Source:
Dr. Hurburgh, Iowa State University

Background/Discussion:
The GIPSA Grain Inspection Advisory Committee recommends that GIPSA initiate research to determine the feasibility of extending the theory of "equivalency" to multiple-constituent instruments to utilize standardized technology while maintaining accuracy and consistency in measurement of wheat protein.

Ms. Eigenmann provided an update on the Grain Inspection Advisory Committee's Resolutions. The Sector discuss the feasibility of an ongoing calibration program also referred to as a Phase II program for Near Infrared Grain Analyzers (NIR) instruments that measure wheat program. The Phase II program for grain moisture is a program that monitors the moisture calibrations on grain moisture meters annually. As changes to the calibrations occur due to grains, climate, etc., data collected in this program allows for changes to moisture calibrations annually and ensure equivalency among the different moisture meter models. The Advisory committee is recommending that this program be extended to include NIR instruments that measure wheat protein. It was noted that there could be multiple NIR instruments for wheat protein introduced into the market and that it may be advisable to have the Phase II program extended to NIR instruments that measure wheat protein. It was also mentioned that currently there are few States that are checking wheat protein on multi-constituent instruments.

GIPSA currently has an annual review program for the official protein system but would have to consider the cost associated with extending the program for other NIR wheat protein analyzers. It was noted during the discussion that GIPSA currently has hourly rate fees set that could be applied to a phase II program for wheat program.

Unlike moisture where there may be changes to the calibrations annually, there will not be year to year changes for wheat protein. As such, consideration may be given to conducting the program less than annually, and considering reviewing wheat protein calibrations every 3, 4, or 5 years, as appropriate. In addition, it was noted that there also has to be a mechanism to get manufacturers calibration data for calibration review.

The sector will continue to discuss the feasibility of a phase II program for wheat protein giving consideration to the following issues:

- How the program will be funded,
- How often the calibrations for wheat protein will be updated,
- How many devices are currently being used in commercial transactions, and
- If being used commercially in a State, what is needed by States to begin testing these devices?

At the August 2014 Grain Analyzer Sector meeting USDA, GIPSA representatives provided an update on the activities concerning a phase II program for wheat protein. The Sector was informed that USDA, GIPSA is discussing funding options for this program. It was noted that the frequency of calibration for wheat protein is being considered and that this will impact the cost of the program. The Sector was also informed that Dr. David Funk is writing a discussion paper that will address many of the issues concerning a Phase II program for wheat protein.

2015 Grain Analyzer Sector Report Update:
USDA, GIPSA representatives mentioned that they are not aware of a discussion paper from Dave Funk concerning the feasibility of a Phase II program for Near Infrared Grain Analyzers. The sector should continue to provide feedback on the four bullet items listed above and USDA, GIPSA should provide any updates on any internal discussions.

2016 Grain Analyzer Sector Meeting Update
Mr Jordan, GIPSA, the NTEP Participating Laboratory for grain analyzers provided information on some work involving applying data transforms to spectra of multiple instrument models and provided an update of these activities along with others involved in considering Phase II testing for Near Infrared Grain Analyzers.

During the 2016 Grain Analyzer Sector meeting, the sector agreed that a program is needed based on observations and some feedback from sector members that review calibration data for these instruments. As such, the sector "brain stormed" ideas on what would be needed to develop a phase II program to periodically verify the calibrations on Near Infrared devices. The sector members generated the following information based on its discussion:

Near Infrared Phase II Program Needs:

- Set of robust samples that can be used every year,
- A reference laboratory to perform the testing,
- 100 samples for all meters or less per grain type on each meter,
- The program should verify calibrations for basic grains where there is a commercially impact to included protein in wheat, soybeans, barley, and corn and oil in corn and soybeans (it was noted during discussion that there is a large economic impact in the area of wheat protein and that protein and oil in corn and soybeans are used in many non-trade applications).
- The program would currently include a total number of three instruments (There are three instruments that measure protein and oil in the NTEP program)
- Testing should include a slope bias test for each 2 point intervals and include a confidence interval.
- The current NCWM, Inc policies for participating in the grain moisture phase II testing can be used for the near infrared phase II program.
- An estimate of the cost of the program is needed. There was also a question as to whether or not the cost of the program would be distributed among the participating manufacturers, similar to the Phase II program for grain moisture.

In addition to the discussion of program needs for Phase II testing for near infrared devices, it was noted that although States test near infrared devices for grain moisture measurements, not many States are evaluating these devices for protein or other grain constituents (oil or starch). The GA Sector also discussed the needs of State weights and measures jurisdictions in testing near infrared devices for protein, starch and oil. It was noted that State resources: staff and money are needed for testing and that currently, per the States that attended the Sector meeting, commercial transactions involving protein measurements are lower than for grain moisture measurements.

Recommendation:
Sector members are asked to review the background information and list of program needs for this item in preparation for discussion on how to meet the needs for a Phase II testing program for Near Infrared Grain Analyzers.

During the 2017 Grain Analyzer Sector meeting, the Sector discussed the cost of an ongoing calibration program (Phase II Testing) for near infrared grain analyzers. Dr. Charlie Hurburgh mentioned that he is aware of continuity problems with protein and oil calibrations. It was mentioned that funding the moisture Phase II testing is handled through the interagency agreement where NIST, GIPSA, and Manufacturers contribute to funding the program. It was noted that the largest cost will be the labor in collecting the instrument data. It was reported that 50 samples are used in the official system for near infrared meters and a monitoring system is also in place for the official system that is similar to that of the Phase II program for moisture. Dr. Charlie Hurbugh agreed to develop a Near Infrared Phase II Testing program cost analysis and share it with Ms. Cathy Brenner, USDA, GIPSA. Ms. Cathy Brenner agreed to review the cost analysis and write a proposed program for a phase II Near Infrared testing program. This information will be available for review at the 2018 Grain Analyzer Sector meeting.

11. State Weights and Measures Issues with Inspection of Grain Moisture Meters for Corn /Tolerances for UGMA meters

Source:
G. Diane Lee, NIST, OWM, Legal Metrology Device Group

Background / Discussion:
Diane Lee, NIST OWM received calls requesting a copy of the annual request for grain samples and list of grains that GIPSA request from States to include in the ongoing calibration program. These requests came from various States and other interested parties. One State reported seeing a difference between a UGMA meter and another meter on corn samples and wanted to ensure that grain samples in their State were represented in the ongoing calibration program.

2016 Grain Moisture Meter Sector Meeting
During the discussion of this item at the 2016 Grain Analyzer Sector meeting it was mentioned that this issue was raised when two states would not accept the new corn calibrations for grain moisture meters when they observed a difference in results for corn on different meter technologies. During the discussion, it was noted that the States that reported problems with the corn calibrations were States that have high ethanol production. It was explained that States with high ethanol production may have a high production of modified corn (corn modified to increase ethanol production). Since calibrations are based on a national sample set with grains collected from across the U.S., these modified samples may not have been included in the national sample set which could have contributed to the irregularities with the updated corn calibrations. It was suggested during the Sector meeting that modified corn samples be included in the national sample set and to monitor corn calibrations and modified corns for ethanol production. It was also noted that States should use the recommended procedures in NIST HB 44 when testing to ensure that errors are not introduced due to incorrect test procedures.

Following the discussion of this agenda item, Jeff McCluer, who had submitted an item to include on the 2016 sector agenda, that was ultimately not included on the agenda based on his request to change GIPSA tolerances, which is not in the scope of the GA Sector, presented information in reference to tolerance for UGMA meters. He explained that if the UGMA meter technology can make better measurements, he recommends that a reduction in the tolerances should be made. Charlie Hurburgh noted that the Sector has not conducted a study of the new technology and that a task force could be developed to look at the results of these meters. Charlie Hurburgh agreed to chair the task group to look at results from UGMA meters.

After some discussion with Dave Funk, Grain Quality Analytics, LLC and some research on the tolerances for UGMA meters. At the temperature extremes errors in measurement are increased so the tolerances were set to account for an average error in these meters. As such, the task group should include a review of the measurements at varying temperature ranges.

Recommendation:
The Sector is asked to review this item and discuss specific arrangements for developing a task group to review tolerances and different technologies.

During discussion of this issue at the 2017 Grain Analyzer Sector meeting, it was suggested that different tolerances for this technology may be needed. Jim Truex mentioned that different tolerance for technology has been considered in the past for other devices. The Sector decided to form a task group to take a closer look at field tolerances associated with UGMA meters. Charlie Hurburgh agreed to chair the work group and the following State weights and measures GA Sector members agreed to participate on the work group:

Karl Cunningham – IL
Randy Burns – AR
Tom Hughes - MO

It was noted that the task group may review previous inspection data for UGMA meters for wheat and corn samples.

12. Meter to Like-Type Meter Testing and Definition of Like-Type Meter

Source:
Grain Analyzer Sector

Background/Discussion:
Following the discussion of the Items included on the 2017 Grain Analyzer Sector's 2017 Agenda, the GA Sector members were asked if there were any additional topics for discussion. A discussion on Meter to like-type meter testing and the definition of a liker-type meter followed. During the discussion test procedures for meter to like-type meter testing were requested. It was noted that there may be only about two states using this type of test method and that it may be due to the cost of obtaining like-type meters to perform the test. A question was raised as to what is considered a like-type meter and it was explained that like-type meant that the make and model were the same.

Recommendation:
Suggestions were made to include a definition for like-type in NIST HB 44 and to consider documenting test procedures for meter to like-type meter testing. Diane Lee, NIST Technical advisor agreed to collect current procedures in use for review at the 2018 GA Sector Meeting.

13. Next Sector Meeting

The next meeting is tentatively planned for Wednesday, August 15 (1:00 p.m. to 5:00 p.m.) and Thursday, August 16, 2018, at the Hyatt Place at the Kansas City, MO Airport. Sector members are asked to hold these days open pending confirmation of availability of facility, determination of agenda items, exact meeting times, and meeting duration. Final meeting details will be announced by early June 2018.

If you would like to submit an agenda item for the 2018 meeting, please contact any of the following persons by June 1, 2018:

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

Grain Analyzer Sector Agenda

September 27, 2018

INTRODUCTION

The charge of the NTETC Grain Analyzer Sector is important in providing appropriate type evaluation criteria based on specifications, tolerances and technical requirements of *NIST Handbook 44* Sections 1.10. General Code, 5.56. Grain Moisture Meters and 5.57. Near-Infrared Grain Analyzers. The sector's recommendations are presented to the National Type Evaluation Program (NTEP) Committee each January for approval and inclusion in *NCWM Publication 14 Technical Policy, Checklists, and Test Procedures* for national type evaluation.

The sector is also called upon occasionally for technical expertise in addressing difficult *NIST Handbook 44* issues on the agenda of National Conference on Weights and Measures (NCWM) Specifications and Tolerances (S&T) Committee. Sector membership includes industry, NTEP laboratory representatives, technical advisors, and the NTEP Administrator. Meetings are held annually, or as needed and are open to all NCWM members and other registered parties.

Suggested revisions are shown in **bold face print** by **~~striking out~~** information to be deleted and **<u>underlining</u>** information to be added. Requirements that are proposed to be nonretroactive are printed in ***bold faced italics***.

Table A
Table of Contents

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
BIML	International Bureau of Legal Metrology	NTEP Sector	National Type Evaluation Program Sector
CD	Committee Draft	OCP	Ongoing Calibration Program
CIML	International Committee of Legal Metrology	OIML	International Organization of Legal Metrology
CIPM	International Committee of Weights and Measures	OWM	Office of Weights and Measures
D	Document	R	Recommendation
EMRP	European Metrology Research Program	S&T	Specifications and Tolerances
FGIS	Federal Grain Inspection Service	SC	Subcommittee
GA	Grain Analyzer	SD	Secure Digital
GIPSA	Grain Inspection, Packers and Stockyards Administration	TC	Technical Committee
GMM	Grain Moisture Meter	TW	Test Weight
MRA	Mutual Recognition Arrangement	UGMA	Unified Grain Moisture Algorithm
NCWM	National Conference on Weights and Measures	USB	Universal Serial Bus
NIR	Near Infrared Grain Analyzer	USDA	United States Department of Agriculture
NIST	National Institute of Standards and Technology	USNWG	United States National Working Group
NTEP	National Type Evaluation Program		

Details of All Items
(In order by Reference Key)

1. Report on the 2018 NCWM Interim and Annual Meetings

The 2018 NCWM Interim Meeting was held January 21 – 24, 2018 in St. Pete Beach, Florida and the 2018 NCWM Annual Meeting was held July 15-19, 2018 in Tulsa, Oklahoma. At these meetings, there were no Grain Analyzer Sector recommended changes to NCWM Publication 14 or NIST Handbook (HB) 44. The Grain Analyzer Sector originally submitted an item on the S&T agenda, which was subsequently reassigned to NIST, OWM for development. See Grain Analyzer Agenda Item 4 "Address Devices and Systems Adjusted Using a Removable Digital Storage Device."

Mr. Jim Truex, NTEP Administrator provided an update on the annual meeting and software sector activities. Mr. Truex noted that S&T items B7: GEN-2 and B7: GMM-2, "Address Devices and Systems Adjusted Using a Removable Digital Storage Device," which was originally proposed by the Grain Analizer Sector, then further developed by NIST, OWM because of its impact to all devices, remains a developing item. The sector provided no additional comments on thses items. He also informed the GA sector that the software sector has been encouraged to incorporate a separate software section in publication 14.

2. Report on NTEP Evaluations and Ongoing Calibration Program (OCP) (Phase II) Testing

Mr. Jason Jordan, Grain Inspection, Packers and Stockyards Administration (GIPSA), the NTEP Participating Laboratory for grain analyzers, provided a list of grain analyzers that were enrolled in the 2018 Ongoing Calibration Program (OCP); there are 8 grain analyzer models enrolled.

The 8 models:

1. Dickey-john Corp. – GAC2500-UGMA
2. Dickey-john Corp. – GAC2000, GAC2100, GAC2100a and GAC2100b
3. Perten Instruments Inc. - AM5200 and AM5200-A (UGMA)
4. Perten Instruments Inc. – IM9500 and IM9500 HLW/TW
5. Foss North America – Infratec 1241
6. Foss North America – Infratec Nova
7. The Steinlite Corp. – SL95
8. MTC Moisture Analyzers – MTC 999 ES

Mr. Jordan provided the sector with an update on the NTEP Phase I evaluations and reported on the collection and analysis of the Phase II OCP data from the 2018 crop year and any changes to NTEP meters in the Phase II OCP. Mr. Jordan reported that the same 8 models as listed above are in the 2018 Phase II OCP. He reported two issues with grains which were that medium grain rough rice experienced unusually high rainfall during the 2017 growing season, and that wheat samples currently being harvested in 2018 have unusually low test weight that could be due to drought situations in parts of the country. He noted that the NTEP laboratory is monitoring these samples.

Mr. Jordan also reported that one of the two instrument for a single model in the Phase II OCP program needed repairs during the collection of data. The instrument was returned to the manufacturer for repair and data was collected on one of the models until the other was returned. This resulted in one of instrument for that model missing approximately 11% of the data collection. But, based on all the data collected, the NTEP laboratory is confident in the calibrations for that instrument model. Mr. Jordan mentioned that currently there are no administrative procedures in NTEP Publication 14 for Grain Analyzers to addresses this issue. As such the Sector discussed and made the following comments and suggestions to address this issue:

- Remove the instrument from the Phase II OCP when sufficient data is not available for assurance of adequate meter calibrations and for comparison to other instruments.
- Manufacturer can exchange instrument and/or fix existing instrument.
- Manufacturer must make repairs in a timely manner.
- If calibrations fail the calibration is not included on the certificate.

Following the discussion of this issue, the Sector recommended that language be added to Publication 14 for GA's that includes that a manufacturer must repair both instruments within a timely matter prior to the Phase II OCP to ensure that all samples are tested on both instrument models in the program. Ms. Cathy Brenner and Mr. Jason Jordan agreed to work on recommended language to add to publication 14 to address this issue. It was noted that proposed language should be submitted in September 2018. Following the Grain Analyzer Sector Meeting Ms. Brenner and Mr. Jordan submitted the following proposed language for changes to the NTEP application:

> <u>To achieve full benefits of the Phase II Ongoing Calibration Program, manufacturers must meet the following requirements by July 1 of each year of participation:</u>
>
> 1. <u>Standardization results, as defined by the NTEP laboratory and manufacturer, must be submitted to the NTEP laboratory.</u>

2. Two functional units of the same model must be installed at the NTEP testing laboratory and verified.
3. Both units must have all required calibrations corresponding to the current Certificate of Conformance installed and ready for testing.

In the event of an instrument malfunction during the Ongoing Calibration Program, the manufacturer must provide an appropriate course of action for resolving the issue to the NTEP laboratory within one week of being notified of the malfunction. Agreement on the proposed course of action will allow one additional week (2 weeks total) for the manufacturer to implement the proposed resolution and have the instrument back to the NTEP laboratory to resume testing.

Any instrument that enters the program without complying to the above requirements will have any calibrations that were not fully tested be removed from the associated NTEP Certificate of Conformance. The certificate may also be declared expired by NTEP.

3. Review of OCP (Phase II) Performance Data for Moisture and Test Weight per Bushel

At the Sector's August 2005 meeting it was 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, Mr. Jordan, GIPSA, the NTEP Participating Laboratory for grain analyzers provided data for inclusion in the 2018 Grain Analyzer Sector Meeting Agenda showing the performance of NTEP meters compared to the air oven. This data is based on the last three crop years (2015–2017) using calibrations updated for use during the 2017 harvest season.

At the Sector's August 2012 meeting, it was agreed that TW comparison and correlation charts should be prepared for the 3 grains which are most likely to be subject to discounts on the basis of TW: Corn and two wheat classes and limited to Air Oven reference values less than 20% moisture. The wheat classes selected were: Hard Red Winter and Soft Red Winter. Accordingly, Mr. Jordan, GIPSA, the NTEP Participating Laboratory for Grain analyzers prepared data showing the performance of NTEP meters compared to the GIPSA reference Quart Kettle Test Weight Apparatus. Mr. Jordan will provide an update of this information for the Grain Analyzer Sector meeting agenda. This data is based on the last three crop years (2015 – 2017) using calibrations updated for use during the 2017 harvest season.

The 2015-2017 Grain Moisture Meter (GMM) Phase II comparison graphs are available for view or can be downloaded for printing on the NCWM website at www.ncwm.net.

At the 2018 GA Sector meeting, The 2015-2017 Grain Moisture Meter (GMM) Phase II comparison graphs were reviewed and no comments were received. Discussion of an instruments, where partial data was collected during the Phase II OCP were discussed during item 2 of this Summary.

4. Address Devices and Systems Adjusted Using a Removable Digital Storage Device (S&T Developing Item B7: GEN-2 and B7: GMM-2)

Source:
Originally proposed by the Grain Analyzer Sector but because NIST, OWM recognized that this item would affect other device types it was reassigned to NIST, OWM for further development.

Purpose:
Table S.2.5. *Categories of Device and Methods of Sealing* that appears in §5.56. (a) of *NIST Handbook 44* lists acceptable methods of sealing for various categories of GMMs. When the sector first recommended adding the table to *NIST Handbook 44* at their September 1996 meeting, the concept of making a change to a GMM from a remote site involved information sent by to the device by modem (or computer). In 2011 this concept expanded to include the ability of the measuring device to accept new or revised sealable parameters from a memory chip (e.g., an SD Memory

Card that may or may not itself be necessary to the operation of the device, external computer, network, or other device plugged into a mating port (e.g., Universal Serial Bus (USB) port) on the measuring device or connected wirelessly to the measuring device. The original changes proposed by the GA Sector included changes to the definition for "remote configuration" to cover instances where the "other device" may be necessary to the operation of the weighing or measuring device or which may be considered a permanent part of that device. NIST OWM revised the original proposal put forward by the GA Sector and developed a proposed General Code requirement G-S.8.2 to address all devices using a removable digital storage device.

Item Under Consideration:
Modify the General Code by adding the following paragraph to address security for systems adjusted using removable media:

> **G-S.8.2. Devices and Systems Adjusted Using Removable Digital Storage Device. - For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device*, such as a secure digital (SD) card, USB flash drive, etc., security shall be provided for those parameters using either (1) an event logger in the device; or (2) a physical seal, that must be broken in order to remove the digital storage device from the device (or system). If security is provided using an event logger, the event logger shall include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available on demand through the device or through another on-site device. In addition to providing a printed copy of the information, the information may be made available electronically. The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)**
>
> ***Applies only to removable digital storage devices that must remain in the device or system for it to be operational.**
>
> **(Added 20XX)**

and added language to the current sealing requirements for devices and systems adjusted using a removable digital storage device by proposing changes to the sealing requirements in the following HB 44 code sections: 2.20., 2.21., 2.22., 2.24., 3.30., 3.31., 3.32., 3.33., 3.34., 3.35., 3.36., 3.37., 3.38., 3.39, 3.40., 5.55., 5.56. (a), and 5.58. because the General Code paragraph will address the sealing of all device types and systems.

The following is the proposed changes to the Grain Moisture Meter HB 44, Section 5.56(a):

Item Under Consideration:
Modify 5.56.(a) Grain Moisture Meters Code as follows:

> S.2.5. Provision for Sealing. – **For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:**
>
> ~~P~~rovision shall be made for applying a security seal in a manner that requires the security seal to be broken, or for using other approved means of providing security (e.g., audit trail available at the time of inspection as defined in Table S.2.5. Categories of Device and Methods of Sealing) before any change that affects the metrological integrity of the device can be made to any mechanism.
>
> **(Amended 20XX)**

(NOTE: The paragraphs below are currently being discussed by the GA Sector. See discussion of these proposed changes in Agenda Item 5)
S.2.5.3. *An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants.)*

*A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to 25 times the number of sealable parameters in the device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.) [Nonretroactive as of January 1, 20XX]*
(Amended 20XX)

Background / Discussion:
Two common types of removable data storage devices are the USB flash drive and the Secure Digital (SD) memory card. A USB flash drive is a data storage device that includes flash memory with an integrated USB interface. USB flash drives are typically removable and rewritable, and physically much smaller than a floppy disk. A SD card is a non-volatile memory card format originally designed for use in portable devices. The SD standard is maintained by the SD Card Association.

Removable digital storage devices can be used in GMMs as either "data transfer" devices which are not necessary to the operation of the GMM or as "data storage devices" which are necessary to the operation of the GMM.

A USB flash drive is most likely to be used as a "data transfer" device. In a typical "data transfer" application, the USB flash drive is first connected to a computer with access to the web. The computer visits the GMM manufacturer's web site and downloads the latest grain calibrations that are then stored in the USB flash drive. The USB flash drive is removed from the computer and plugged into a USB port on the GMM. The GMM is put into "remote configuration" mode to copy the new grain calibration data into the GMM's internal memory. When the GMM has been returned to normal operating (measuring) mode the USB flash drive can be removed from the GMM.

Although an SD memory card could also be used as a "data transfer device" it is more likely to be used as a "data storage device". In a typical "data storage device" application, the SD memory card stores the grain calibrations used on the GMM. The SD memory card must be plugged into an SD memory card connector on a GMM circuit card for the GMM to operate in measuring mode. To install new grain calibrations the GMM must be turned "off" or put into a mode in which the SD memory card can be safely removed. The SD memory card can either be replaced with an SD memory card that has been programmed with the new grain calibrations or the original SD memory card can be re-programmed with the new grain calibrations in much the same way as that described in the preceding paragraph to copy new grain calibrations into a USB flash drive. In either case, the SD memory card containing the new calibrations must be installed in the GMM for the GMM to operate in measuring mode. In that regard, the SD memory card can be considered a "permanent part" of the GMM in that the GMM cannot operate without it.

Note: In the above example "SD memory card" could be any removable flash memory card such as the Secure Digital Standard-Capacity, the Secure Digital High-Capacity, the Secure Digital Extended-Capacity, and the Secure Digital Input/Output, which combines input/output functions with data storage. These come in three form factors: the original size, the "mini" size, and the "micro" size. "Memory Stick" is a removable flash memory card format, launched by Sony in 1998, and is also used in general to describe the whole family of Memory Sticks. In addition to the original Memory Stick, this family includes the Memory Stick PRO, the Memory Stick Duo, the Memory Stick PRO Duo, the Memory Stick Micro, and the Memory Stick PRO-HG.

See the NCWM S&T Committee 2013-2016 Final Reports and the Grain Analyzer Sector 2013-2016 summaries for additional background information and to review the different proposals considered by the NCWM S&T committee and Grain Analyzer Sectors.

During the 2017 GA Sector meeting, the Sector members reviewed the proposed changes and by consensus agreed with the proposed changes to NIST Handbook 44, Section 5.56(a) and the General Code. The Sector recognized that the proposed paragraph S.2.5.3 included in the item for consideration as changes to NIST HB44 Section 5.56(a) is still under discussion (See agenda Item 5 in this agenda) and is not currently being proposed for consideration.

During the 2018 meeting Ms. Diane Lee, NIST Technical Advisor, updated the sector on the status of S&T Item B7: Gen-2 and B7: GMM-2 following the 2018 NCWM Annual meeting. The Sector was informaed that the items remain developing. Two questions were raised during the GA sector meeting;

- why does the proposed S&T item B7 Gen-2 apply only to removable storage devices that must remain in the device, and
- do these changes addressed access to sealable parameter via the cloud?.

In responce to the first question, it was explained that the sectors original proposal was to change the definition of remote configuration because the definition applies to changes made to a system through some other device that "is not itself necessary to the operation". But, some grain analyzers do not meet the definition of remote configuration. Some grain analyzers have digital storage devices that "are necessary to the operation of the device". So the existing language for remote confirguration applies to those devices that are not necessary to the operation of the device and the new language address those removable storage devices that are necessary to the operation of the device. In response to the second question, it was explained that the issue of changes to devices made via the cloud are being addressed by the software sector.

Conclusion:
The Sector is in agreement with S&T Items B7 Gen-2 and GMM-2.

5. Adding a Nonretroactive Requirement to NIST HB 44 Grain Moisture Meter Code 5.56(a) that Grain Moisture Meters meet Category 3 Sealing Requirements

Source:
Grain Analyzer Sector

Purpose:
At the 2016 Grain Analyzer Sector Meeting during its discussion of Agenda Item 4 Address Devices and Systems Adjusted Using a Removable Digital Storage Device (S&T Developing Item B7: Gen-2 and B7: GMM-2) previously title "Modify the Definition of Remote Configuration Capability that is defined in Appendix D of NIST Handbook 44 to Recognize the Expanded Scope of "Remote Configuration Capability" (S&T Developing item 3600-5)" on the GA Sector Meeting Agenda, it was noted that the current technology for sealing grain moisture meters are with event loggers (category 3 sealing requirements). Due to the complexity of these devices, a Category 3 sealing provides a record of what calibration and configuration parameters were changed. As such, the GA Sector discussed including a non-retroactive requirement for category 3 sealing for all grain moisture meters. Currently NIST HB 44 NIR code for devices that measure protein, oil and starch requires that the device be sealed with an event logger. These meters also measure moisture and currently meet category 3 requirements.

Item Under Consideration:

The GA Sector's technical advisor included the following proposal for changes to the Grain Analyzer Code 5.56(a) in the 2016 Grain Analyzer Sector Summary for review:

S.2.5. Provision for Sealing.

.
.
.

S.2.5.3. *An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants.)*

A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to 25 times the number of sealable parameters in the

*device, but not more than 1000 records are required. (**Note:** Does not require 1000 changes to be stored for each parameter.)*

[Nonretroactive as of January 1, 20XX]

(Amended 20XX)

Mr. Doug Musik, Kansas Weights and Measures, submitted the following alternate proposal:

Table S.2.5.	
Categories of Device	***Methods of Sealing***
Category 1[1]: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999). If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.*
Category 2[1]: *Remote configuration capability, but access is controlled by physical hardware.* *A device shall clearly indicate that it is in the remote configuration mode and shall not be capable of operating in the measure mode while enabled for*	*The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999). If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.*
Category 3[2]: *Remote and/or no remote configuration capability access. Access may be unlimited or controlled through a software switch (e.g., password).* *When accessed for modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not can operate in the measuring mode.*	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants). A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to 25 times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)*
~~***Category 3a:*** *No remote capability, but operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc.) in normal operation.*~~ ~~**When accessed for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of*~~	~~*Same as Category 3*~~

~~***Category 3b:*** *No remote capability, but access to metrological parameters is controlled through a software switch (e.g., password).*~~ ~~**When accessed for modifying sealable parameters, the device shall clearly indicate that it is in the*~~	~~*Same as Category 3*~~
[1] Not allowed for devices manufactured on or after January 1, 2019 [2] Required for all devices manufactured on or after January 1, 2019	

[Nonretroactive as of January 1, 1999]
*[*Nonretroactive as of January 1, 2014]*
(Amended 1998 and 2013 and XXXX)

Background / Discussion:
During discussion of Agenda Item 4 above during the 2016 GA Sector meeting, it was suggested that the Grain Moisture Meter Code requirements for sealing be changed such that all grain moisture meters are required to meet category 3 sealing requirements as of a specific date; e.g. all grain moisture meters must have an event logger. With the increase in ease of switching out removable SD cards and making changes to metrological components it may be time to require a form of sealing that provides information on what was changed and the date of the change to the device. Category 3 sealing is currently required in NIST HB 44, Section 5.57, NIR Code. Manufacturers that were present at the meeting did not object to the proposal, but it was noted that all manufacturers were not represented at the meeting. During the 2016 GA sector meeting, Jim Truex also noted that we may need to consider State laws that require that a commercial device have a lead and wire seal. It was also mentioned that the proposed NIST, LMDP language for the general code would be redundant for the devices manufactured on or after the non-retroactive date because these meters will also require an event logger.

The current status for sealing methods of grain moisture meters are as follows:
Inactive Certificates of Conformance (CC):

- 9 inactive certificates; an inactive status for grain analyzers means that a CC was previously active for a device, but now the device is no longer being manufactured or remanufactured. Existing devices may be used, sold, or repaired and resold under inactive certificates. As such, these devices are likely still in use.
    - 3 inactive devices are *not* sealed using an event logger.

Active CC

- 9 active certificates
    - 1 active device is *not* sealed using an event logger.

2017 Grain Analyzer Sector Meeting:
During the 2017 GA Sector Meeting, the Sector members reviewed the proposed changes and provide comments and discussion on the proposed language for changes to the sealing requirements in NIST HB 44, Section 5.56(a). During the discussion States participants noted that they would rather have an event logger as it provides more information than a lead and wire seal and noted that when seals are removed no information is available to determine what changes were made to the grain moisture meter and agreed that the Category 3 method of sealing provides much more information to determine the changes made to the device. Some discussion was held on implementation with some older meters still having Category 1 sealing while others new devices would have Category 3 devices. Karl Cunningham mentioned that IL has a similar situation with NTEP and Non-NTEP meters in use in their State. Since as noted above currently, one active meter is not sealed using an event logger, the Sector recommended that additional

work is needed to talk about impact of this requirement on manufacturers and to get additional feedback on an appropriate non-retroactive date for this proposed change.

2018 Grain Analyzer Sector Meeting:
During the 2018 GA Sector Meeting the Sector reviewed two proposal to require that all Grain Analyzers meet the categaory 3 sealing requirements. The first proposal was to make a change to the Paragraph S.2.5 similir to the paragraph in the NIR code. The second proposal was to make changes to table S.2.5. The Sector chose The second proposal. This proposal makes it easier for transitioning to the new nonretroactive requirements that grain analyzers meet category 3 sealing requirements.

Conclusion:
The GA sector reviewed a form 15 develop by Doug Musik, Kansas Weights and Measures and agreed to the following proposed changes to NIST HB 44 Section 5.56(a) Table S.2.5.

Table S.2.5. ***Categories of Device and Methods of Sealing***	
Categories of Device	***Methods of Sealing***
Category 1[1]: *No remote configuration capability.*	*Seal by physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999). If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.*
Category 2[1]: *Remote configuration capability, but access is controlled by physical hardware.* *A device shall clearly indicate that it is in the remote configuration mode and shall not be capable of operating in the measure mode while enabled for remote configuration.*	*The hardware enabling access for remote communication must be at the device and sealed using a physical seal or two event counters: one for calibration parameters (000 to 999) and one for configuration parameters (000 to 999). If equipped with event counters, the device must be capable of displaying, or printing through the device or through another on-site device, the contents of the counters.*
Category 3[2]: *~~Remote~~ C~~c~~onfiguration capability access ~~Access~~ may be unlimited or controlled through a software switch (e.g., password).* *When accessed for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measuring mode.*	*An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants). A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to 25 times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)*

~~***Category 3a:*** *No remote capability, but operator is able to make changes that affect the metrological integrity of the device (e.g., slope, bias, etc.) in normal operation.*~~ ~~**When accessed for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measuring mode.*~~	~~*Same as Category 3*~~
~~***Category 3b:*** *No remote capability, but access to metrological parameters is controlled through a software switch (e.g., password).*~~ ~~**When accessed for the purpose of modifying sealable parameters, the device shall clearly indicate that it is in the configuration mode and shall not be capable of operating in the measuring mode.*~~	~~*Same as Category 3*~~
[1] Not allowed for devices manufactured on or after January 1, 20XX [2] Required for all devices manufactured on or after January 1, 20XX	

[Nonretroactive as of January 1, 20XX]
~~*[*Nonretroactive as of January 1, 2014]*~~
(Amended 1998 and 2013 and 20XX)

6. Report on International Organization of Legal Metrology (OIML) TC 17/SC 1 R 59 *Moisture Meters for Cereal Grains and Oilseeds*

Background / Discussion:

This item is included on the Sector's agenda to provide a summary of the activities of OIML TC17/SC1 to the grain analyzer sector and to those Sector members that participate on the United States National Working Group (USNWG) on grain moisture meters.

OIML TC17/SC1 was tasked to revise OIML R 59 *Moisture Meters for Cereal Grains and Oilseeds* to reflect new technologies and actual grain analysis. The Co-Secretariats (China and the United States) worked closely with an International Project Group to revise OIML Recommendation R 59 *Moisture Meters for Cereal Grains and Oilseeds*.

As reported at the 2016 GA Sector meeting, OIML R59 would be voted on at the 51st CIML Meeting. OIML R 59 *Moisture Meters for Cereal Grains and Oilseeds* was approved at the 51st CIML meeting, held October 17-21, 2016.

Grain moisture meter manufacturers were notified by e-mail on May 9, 2017 that OIML R59 2016 was published and available on the OIML website at https://www.oiml.org/en/files/pdf_r/r059-p-e16.pdf . In this e-mail NIST OWM requested any feedback or statement on how this standard impacts your company that can be used in NIST highlights to demonstrate the impact of our work in OIML. If you have not provided a statement or feedback please send this information to diane.lee@nist.gov.

During the 2017 GA Sector meeting, the Sector members were reminded that OIML R59 2016 was revised and published and available on the OIML web site and that the requirements include many U.S. requirements for evaluating grain moisture meters making it easier for U.S. manufacturers to meet the global regulations and

metrological controls set for these devices. Sector manufacturers were reminded to provide any feedback on how the Standard impacts their company. For example, providing feedback on experiences with the use of the international standard.

During the 2018 GA Sector meeting manufacturers were asked to report on any impact from the use of this international standard. During the sector meeting, there were no reports on impact due to the use of OIML R59. It was reported that Mexico is looking into adopting requirements in R59.

7. Report on OIML TC 17/SC 8 *Protein Measuring Instruments for Cereal Grains and Oil Seeds*

Background / Discussion:
This item is included on the sector's agenda to provide a summary of the activities of OIML TC 17/SC 8 to the grain analyzer sector and to those Sector members that participate on the United States National Working Group (USNWG) on grain protein measuring instruments.

OIML TC17/SC8 was formed to study the issues and to develop a Recommendation on *Protein Measuring Instruments for Cereal Grain and Oil Seeds (OIML R 146).* Australia is the Secretariat for this subcommittee.

As reported at the 2016 GA Sector meeting, OIML R 146 would be voted on at the 51st CIML Meeting. OIML R 146 *Protein Measuring Instruments for Cereal Grain and Oil Seeds* was approved at the CIML meeting, held October 17-21, 2016.

Grain moisture meter manufacturers were notified by e-mail on May 9, 2017 that OIML R146 *Protein Measuring Instruments for Cereal Grain and Oil Seeds* was published and available on the OIML website at https://www.oiml.org/en/files/pdf_r/r146-p-e16.pdf . In this e-mail NIST OWM requested any feedback or statement on how this standard impacts your company that can be used in NIST highlights to demonstrate the impact of our work in OIML. If you have not provided a statement or feedback please send this information to diane.lee@nist.gov.

During the 2017 GA Sector meeting, the Sector members were reminded that OIML R146 2016 was published and available on the OIML web site and that the requirements include many U.S. requirements for evaluating grain protein analyzers making it easier for U.S. manufacturers to meet the global regulations and metrological controls set for these devices. Sector members were reminded to provide any feedback on how the OIML Recommendation impacts their company. For example, providing feedback on experiences with the use of the international standard.

During the 2018 GA Sector meeting manufacturers were asked to report on any impact from the use of this international standard. During the sector meeting, there were no reports on impact due to the use of OIML R146.

8. Air-Oven Grain Moisture Proficiency/Collaborative Study/Interlaboratory Comparison Testing

Source:
Grain Analyzer Sector

Purpose:
Develop an air-oven proficiency/collaborative study/interlaboratory comparison testing program to ensure state laboratory and manufacturer's air-oven measurements are traceable to the official USDA, GIPSA air-oven measurements.

Item Under Consideration:
Establish a timeline for consistent and periodic grain moisture proficiency testing.

Background/Discussion:
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-OWM's laboratory measurement traceability program requires that State Weights and Measures laboratories participate in interlaboratory and other collaborative experiments. State Weights and Measures programs with grain moisture laboratories typically meet this requirement by one of two methods: 1) 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 laboratory, including GIPSA, measure the same sample. 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.

A collaborative air oven study has been conducted with States and meter manufacturers periodically over a number of years and results discussed during the GA Sector meetings. These studies were conducted in 1995, 2001 and 2015.

At the 2009 NTETC Grain Analyzer Sector Meeting, Dr. Hurburgh, Iowa State University, urged the representatives from the American Oil Chemists Society (AOCS) to prepare a proposal so that the collaborative (air-oven) study could be conducted on an on-going basis rather than on an ad hoc basis. He cautioned that the proposal would have to include corn and wheat as well as soybeans and at the 2011 NTETC Grain Analyzer Sector Meeting, Ms. Johnson, AOCS, proposed an air-oven/GMM proficiency testing series designed specifically to address the needs of GMM manufacturers and states maintaining a grain moisture laboratory. The intent was for the AOCS to administer, oversee distribution of samples, compile results, perform statistical analysis of results, and distribute a report to participants. AOCS does not collect the samples. This is subcontracted to suitable providers. AOCS does not have laboratories. Since GIPSA/ FGIS is a certified laboratory already participating in the AOCS Soybean Quality Traits program, GIPSA air-oven results could be reported for comparison

At the sector's August 2012 meeting the sector learned that Ms. Christine Atkinson will be taking over the Proficiency Testing program for States and interested manufacturers formerly headed by Ms. Amy Johnson. Ms. Atkinson verified that participant's cost will remain $100 per year. The sector reiterated that the program should focus solely on the standard FGIS air-oven method. Instrument results will not be reported. Participants' air-oven results will be compared against GIPSA's standard FGIS air-oven results. In response to Ms. Atkinson's question about scheduling, the sector was in general agreement that samples should ship after harvest, preferably between mid-January and mid-February with participants' results due 30 days after the shipping date.

The sector agreed upon the following Program Details:

Samples – Soybeans 2, Corn 2, Hard Red Winter Wheat 2

- Cost to Participants - $100.00/year
- Schedule:
  - Samples (6) ship between January 15 and February 15.
  - Samples must be tested within 5 business days of receipt with results due 30 days after the shipping date.
- Reports to be posted on www.SoybeanQualityTraits.org by 1 May.
- Only the GIPSA oven results will be identified. Individual manufacturer's and State participant's oven results will be assigned an identifier known only to the manufacturer or State participant. Instrument results will not be reported.
- Detailed Participant Instructions will be provided to each participant.

At the August 2013 Grain Analyzer Sector meeting no report was provided on AOAC's efforts to conduct proficiency testing for grain moisture. As such, Karl Cunningham, IL and Kevin Hanson, MO agreed to work together to conduct a grain moisture proficiency test. Karl Cunningham, IL, agreed to provide the samples for proficiency testing and Kevin Hanson, MO, agreed to analyze the data in accordance with the procedures used to conduct proficiency testing in the State laboratory program. Kevin also agreed to collect data on test weight per bushel which may be useful in

field test procedures for evaluating test weight per bushel on instruments. Following the August 2013 sector meeting arrangements were made for shipping grain samples to State participants.

At the August 2014 Grain Analyzer Sector meeting Mr. Karl Cunningham provide an update on the status of proficiency testing. Mr. Cunningham informed the Grain Analyzer Sector that he collected some wheat grain samples that can be used for grain moisture proficiency testing and that corn and soybeans will be collected during the 2014 harvest. Mr. Cunningham noted that after January 2015 wheat, corn and soybeans grain samples may be ready for distribution to the participating States. Mr. Cunningham agreed to analyze the data in cooperation with NIST and requested a list of contact information for participating States and other interested parties. Proficiency testing was conducted in 2015 and reported in the 2015 Grain Analyzer Sector Report (Note: In 2015, a Grain Analyzer Sector meeting was not held but a report of activities was generated)

Although the Sector has periodically conducted proficiency testing over the years, a schedule of ongoing proficiency testing is needed to ensure that these tests are performed on a consistent basis. With changes in responsibilities in AOAC and loss connections, establishing an ongoing collaborative study with AOAC may be difficult to manage. As such the Grain Analyzer Sector is asked to consider the following timeline previously discussed for sending out samples and using the guidelines for proficiency testing which includes frequency of testing included in NISTIR 7082 "Proficiency Test Policy and Plan (For State Weights and Measures Laboratories), and tools and forms for analyzing the results which are located on the NIST OWM Website at:

https://www.nist.gov/sites/default/files/documents/2017/05/09/nistir-7082.pdf

It is suggested that the proficiency testing be managed and oversite provided by State Weights and Measures, Grain Analyzer Sector members on a rotating basis. Per NISTIR 7082, the frequency of proficiency testing for grain moisture air oven measurements is 4 years or more often. As such the following scheduled is proposed for discussion. Please note that in addition to testing corn, soybeans and wheat the sector is asked to consider any benefits to including one specialty grain such as corn modified for high ethanol production to the proficiency testing. The schedule will be reviewed at the Sector meeting preceding the scheduled proficiency test date to confirm responsible parties and any specialty grains for inclusion in the proficiency test year. The specialty grain will change based on specific market concerns during the proficiency test year.

Air Oven Grain Moisture Proficiency Testing Schedule (Previous PTs 1995, 2001 and 2015)					
PT Test Date 4 yr. Cycle	**Sample Collection Date**	**Samples for Testing 2 of each (corn, wheat, soybeans)**	**Sample Ship Date**	**Responsible for Sample Distribution w/ Instructions**	**Responsible for Data Collection and Analysis**
Spr 2019	Spr 2018	✓	Jan/Feb 2019	IL	IL
Spr 2023	Spr 2022	✓	Jan/Feb 2023	_____?	_____?
Spr 2027	Spr 2026	✓	Jan/Feb 2027	_____?	_____?

During the 2017 GA Sector meeting the Sector agreed that there was no need to test specialty grain and that including these grains will not provide any useful information. The Sector decided that the three major grains, wheat, corn, and soybeans would be the grains included for proficiency testing. States and industry sector members participating in the proficiency testing were encouraged to provide their current contact information to Karl Cunningham for sample distribution. The above table represent the schedule for proficiency testing which was edited after the 2017 Sector meeting discussion of this item.

During the 2018 GA Sector meeting, Mr. Karl Cunningham report on the Grain Analyzer Sector's 2018 grain moisture proficiency testing activities. He noted that states are required to participate in proficiency testing and that any manufacturer may participate.

Conclusion: Mr. Cunningham stated that round robins/proficiency testing will begin shortly after January 1, 2019 and that samples of corn, wheat and soybeans will be sent to participants.

9. The Feasibility of a Phase II program for Near Infrared Grain Analyzers

Source:
Dr. Hurburgh, Iowa State University

Background/Discussion:
The GIPSA Grain Inspection Advisory Committee recommends that GIPSA initiate research to determine the feasibility of extending the theory of "equivalency" to multiple-constituent instruments to utilize standardized technology while maintaining accuracy and consistency in measurement of wheat protein.

Ms. Eigenmann, now a former member of the GA Sector, provided an update on the Grain Inspection Advisory Committee's Resolutions. Afterwhich, the Sector discuss the feasibility of an ongoing calibration program also referred to as a Phase II program for Near Infrared Grain Analyzers (NIR) instruments that measure wheat program. The Phase II program for grain moisture is a program that monitors the moisture calibrations on grain moisture meters annually. As changes to the calibrations occur due to grains, climate, etc., data collected in this program allows for changes to moisture calibrations annually and ensure equivalency among the different moisture meter models. The Advisory committee is recommending that this program be extended to include NIR instruments that measure wheat protein. It was noted that there could be multiple NIR instruments for wheat protein introduced into the market and that it may be advisable to have the Phase II program extended to NIR instruments that measure wheat protein. It was also mentioned that currently there are few States that are checking wheat protein on multi-constituent instruments.

GIPSA currently has an annual review program for the official protein system but would have to consider the cost associated with extending the program for other NIR wheat protein analyzers. It was noted during the discussion that GIPSA currently has hourly rate fees set that could be applied to a phase II program for wheat program.

Unlike moisture where there may be changes to the calibrations annually, there will not be year to year changes for wheat protein. As such, consideration may be given to conducting the program less than annually, and considering reviewing wheat protein calibrations every 3, 4, or 5 years, as appropriate. In addition, it was noted that there also has to be a mechanism to get manufacturers calibration data for calibration review.

The sector discussed the feasibility of a phase II program for wheat protein giving consideration to the following issues:

- How the program will be funded,
- How often the calibrations for wheat protein will be updated,
- How many devices are currently being used in commercial transactions, and
- If being used commercially in a State, what is needed by States to begin testing these devices?

2014 Grain Analyzer Sector Report:
At the August 2014 Grain Analyzer Sector meeting USDA, GIPSA representatives provided an update on the activities concerning a phase II program for wheat protein. The Sector was informed that USDA, GIPSA is discussing funding options for this program. It was noted that the frequency of calibration for wheat protein is being considered and that this will impact the cost of the program. The Sector was also informed that Dr. David Funk is writing a discussion paper that will address many of the issues concerning a Phase II program for wheat protein.

2015 Grain Analyzer Sector Report:
USDA, GIPSA representatives mentioned that they are not aware of a discussion paper from Dave Funk concerning the feasibility of a Phase II program for Near Infrared Grain Analyzers. The sector should continue to provide feedback on the four bullet items listed above and USDA, GIPSA should provide any updates on any internal discussions.

2016 Grain Analyzer Sector Meeting:
Mr Jordan, GIPSA, the NTEP Participating Laboratory for grain analyzers provided information on some work involving applying data transforms to spectra of multiple instrument models and provided an update of these activities along with others involved in considering Phase II testing for Near Infrared Grain Analyzers.

During the 2016 Grain Analyzer Sector meeting, the sector agreed that a program is needed based on observations and some feedback from sector members that review calibration data for these instruments. As such, the sector "brain stormed" ideas on what would be needed to develop a phase II program to periodically verify the calibrations on Near Infrared devices. The sector members generated the following information based on its discussion:

Near Infrared Phase II Program Needs:

- Set of robust samples that can be used every year,
- A reference laboratory to perform the testing,
- 100 samples for all meters or less per grain type on each meter,
- The program should verify calibrations for basic grains where there is a commercially impact to included protein in wheat, soybeans, barley, and corn and oil in corn and soybeans (it was noted during discussion that there is a large economic impact in the area of wheat protein and that protein and oil in corn and soybeans are used in many non-trade applications).
- The program would currently include a total number of three instruments (There are three instruments that measure protein and oil in the NTEP program)
- Testing should include a slope bias test for each 2 point intervals and include a confidence interval.
- The current NCWM, Inc policies for participating in the grain moisture phase II testing can be used for the near infrared phase II program.
- An estimate of the cost of the program is needed. There was also a question as to whether or not the cost of the program would be distributed among the participating manufacturers, similar to the Phase II program for grain moisture.

In addition to the discussion of program needs for Phase II testing for near infrared devices, it was noted that although States test near infrared devices for grain moisture measurements, not many States are evaluating these devices for protein or other grain constituents (oil or starch). The GA Sector also discussed the needs of State weights and measures jurisdictions in testing near infrared devices for protein, starch and oil. It was noted that State resources: staff and money are needed for testing and that currently, per the States that attended the Sector meeting, commercial transactions involving protein measurements are lower than for grain moisture measurements.

2017 Grain Analyzer Sector Meeting:

During the 2017 Grain Analyzer Sector meeting, the Sector discussed the cost of an ongoing calibration program (Phase II Testing) for near infrared grain analyzers. Dr. Charlie Hurburgh mentioned that he is aware of continuity problems with protein and oil calibrations. It was mentioned that funding the moisture Phase II testing is handled through the interagency agreement where NIST, GIPSA, and Manufacturers contribute to funding the program. It was noted that the largest cost will be the labor in collecting the instrument data. It was reported that 50 samples are used in the official system for near infrared meters and a monitoring system is also in place for the official system that is similar to that of the Phase II program for moisture. Dr. Charlie Hurbugh agreed to develop a Near Infrared Phase II Testing program cost analysis and share it with Ms. Cathy Brenner, USDA, GIPSA. Ms. Cathy Brenner agreed to review the cost analysis and write a proposed program for a phase II Near Infrared testing program. This information will be available for review at the 2018 Grain Analyzer Sector meeting.

For the 2018 Grain Analyzer Sector, FGIS prepared a cost estimate for an on-going calibration program for near infrared (NIR) grain analyzers which is based on collecting 50 samples per grain type for a total of 500 samples. The cost estimates are for the additional work above the cost FGIS incurs to maintain the official inspection system. For some of the grains, such as barley and corn, FGIS does not routinely select 50 samples per year for reference analysis due to the narrow constituent range and/or low volume of samples received for the FGIS NIR quality control program. Therefore, FGIS will need to select additional samples to achieve 50 per year that require refererence analysis. FGIS will share 50% of the cost associated with preparing the additional samples for reference analysis and for the reference costs.

The estimate fees for an ongoing NIR calibration program are included in the table below. These fees are based on the FGIS Directive 9180.74 dated 1/18/2018 fee schedule of $83.90 hourly rate, $13 for reference moisture, $20 for reference oil, and $16 for reference protein.

The estimates are based on the current funding outlook for FGIS. Ms. Cathy Brenner reviewed the cost analysis with the GA sector and Dr. Charlie Hurburgh noted that this is being driven by the market and that we should push forward on this effort.

Total NIR Models (including official model) =TM	Number of NTEP only models =N	Total Program Cost =TP	Mfg's Cost Per Model =TP/TM
3	1	$ 6,137	$ 2,046
4	2	$ 12,274	$ 3,069
5	3	$ 18,411	$ 3,682
6	4	$ 24,548	$ 4,091
7	5	$ 30,686	$ 4,384
8	6	$ 36,823	$ 4,603
9	7	$ 42,960	$ 4,773
10	8	$ 49,097	$ 4,910

Conclusion:
The Sector was in agreement with establishing a Phase II ongoing calibration for NIR grain analyers. It was recognized that testing requirements and changes to Publication 14 are needed.

10. State Weights and Measures Issues with Inspection of Grain Moisture Meters for Corn /Tolerances for UGMA Meters

Source:
Ms. Diane Lee, NIST, OWM, Legal Metrology Device Group

Background / Discussion:
Diane Lee, NIST OWM received calls requesting a copy of the annual request for grain samples and list of grains that GIPSA request from States to include in the ongoing calibration program. These requests came from various States and other interested parties. One State reported seeing a difference between a UGMA meter and another meter on corn samples and wanted to ensure that grain samples in their State were represented in the ongoing calibration program.

2016 Grain Analyzer Sector Meeting

During the discussion of this item at the 2016 Grain Analyzer Sector meeting it was mentioned that this issue was raised when two states would not accept the new corn calibrations for grain moisture meters when they observed a difference in results for corn on different meter technologies. During the discussion, it was noted that the States that reported problems with the corn calibrations were States that have high ethanol production. It was explained that States with high ethanol production may have a high production of modified corn (corn modified to increase ethanol production). Since calibrations are based on a national sample set with grains collected from across the U.S., these modified samples may not have been included in the national sample set which could have contributed to the irregularities with the updated corn calibrations. It was suggested during the Sector meeting that modified corn samples be included in the national sample set and to monitor corn calibrations and modified corns for ethanol production. It was also noted that States should use the recommended procedures in NIST HB 44 when testing to ensure that errors are not introduced due to incorrect test procedures.

Following the discussion of this agenda item, Jeff McCluer, who had submitted an item to include on the 2016 sector agenda, that was ultimately not included on the agenda based on his request to change GIPSA tolerances, which is not in the scope of the GA Sector, presented information in reference to tolerance for UGMA meters. He explained that if the UGMA meter technology can make better measurements, he recommends that a reduction in the tolerances should be made. Charlie Hurburgh noted that the Sector has not conducted a study of the new technology and that a task force could be developed to look at the results of these meters. Charlie Hurburgh agreed to chair the task group to look at results from UGMA meters.

After some discussion with Dave Funk, Grain Quality Analytics, LLC and some research on the tolerances for UGMA meters. At the temperature extremes errors in measurement are increased so the tolerances were set to account for an average error in these meters. As such, the task group should include a review of the measurements at varying temperature ranges.

2017 Grain Analyzer Sector Meeting

During discussion of this issue at the 2017 Grain Analyzer Sector meeting, it was suggested that different tolerances for this technology may be needed. Jim Truex mentioned that different tolerance for technology has been considered in the past for other devices. The Sector decided to form a task group to take a closer look at field tolerances associated with UGMA meters. Charlie Hurburgh agreed to chair the work group and the following State weights and measures GA Sector members agreed to participate on the work group:

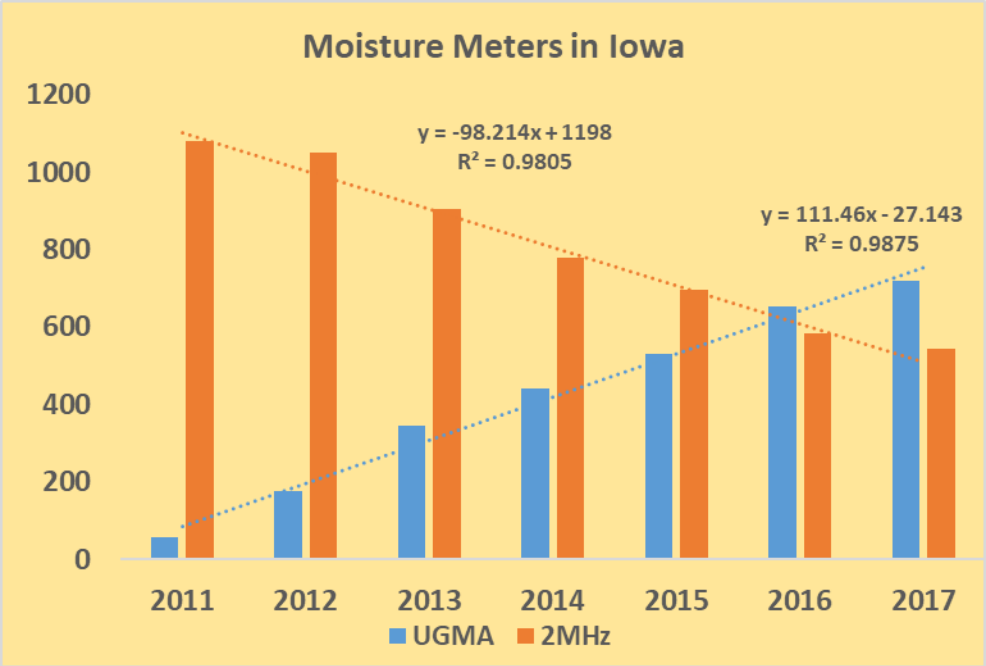
Karl Cunningham – IL
Randy Burns – AR
Tom Hughes - MO

It was noted that the task group may review previous inspection data for UGMA meters for wheat and corn samples.

2018 Grain Analyzer Sector Meeting

Dr. Charlie Hirburgh collected and analyzed data from Iowa State Weights and Measures Program to compare UGMA meters and 2MHz meters to assess a need for changes to the tolerances in NIST HB 44 Section 5.56(a) for the air-oven test method. During the 2018 meeting, Mr. Hurburgh reported that based on the data, UGMA meters read closer to the reference air oven moisture results than non-UGMA meters. See data below. The Y-axis on the chart below represents the number of meters (UGMA and 2MHz meters) and shows that as of 2017 the number of UGMA meters exceed the number of 2MHz meters in Iowa. It was also noted during the 2018 Grain Analyzer Sector meeting that the current tolerances were developed in 1991 and have not changed with the change in technology for these devices; and is needed for grain industry risk management.

Iowa Moisture Meter Inspection Results				**2014-2017**	
			Average Result on Inspector Sample		
Year	Tech	Number of	Corn 1	Corn 2	Soybean
		Meters	Meter-Std (% pts)	Meter-Std (% pts)	Meter-Std (% pts)
2014	UGMA	440	-0.02	0.02	-0.01
2015	UGMA	531	0.04	-0.06	-0.02
2016	UGMA	654	0.05	-0.06	0.01
2017	UGMA	720	-0.18	-0.06	-0.05
	Avg		**-0.03**	**-0.04**	**-0.02**
2014	2MHz	679	-0.25	0.04	-0.07
2015	2MHz	595	-0.29	-0.38	0.02
2016	2MHz	483	-0.28	-0.42	0.04
2017	2MHz	445	-0.15	-0.35	-0.01
	Avg		**-0.24**	**-0.28**	**0.00**
Different samples each year for Corn 1, Corn 2, Soy					



Conclusion: The Sector agreed to make changes to the tolerances for the air-oven reference method in NIST Handbook 44 Section 5.56(a) and following the review and discussion of the data, the NIST Technical advisor, Ms. Diane Lee, developed the Form 15 that included the proposed changes to NIST HB 44 that was agreed to by the Sector along with a table that provided specific tolerances per the proposed changes to NIST HB 44. The table of specific tolerances that will result from the proposed changes to the HB and the proposed changes to NIST HB 44 are included below:

Specific tolerances resulting from the proposed change to NIST HB 44 Section 5.56(a) tolerances for air-oven method field tolerances.

Moisture (%)	Tolerance (0.03% percent of the moisture content)	Minimum Tolerance (0.5% in moisture content)
8	0.24	0.5
9	0.27	0.5
10	0.30	0.5
11	0.33	0.5
12	0.36	0.5
13	0.39	0.5
14	0.42	0.5
15	0.45	0.5
16	0.48	0.5
17	0.51	0.5
18	0.54	0.5
19	0.57	0.6
20	0.60	0.6
21	0.63	0.6
22	0.66	0.7

Proposed changes to NIST HB 44 Section 5.56(a) Air-Oven Reference Method Tolerances

T.2.Tolerances.

T.2.1.Air Oven Reference Method. – Maintenance and acceptance tolerances shall be as shown in Table T.2.1. Acceptance and Maintenance Tolerances Air Oven Reference Method. Tolerances are expressed as a fraction of the percent moisture content of the official grain sample, together with a minimum tolerance.
(Amended 2001)

Table T.2.1. **Acceptance and Maintenance Tolerances Air Oven Reference Method <u>for All Grains and Oil Seeds</u>**		
~~Type of Grain, Class, or Seed~~	**Tolerance**	**Minimum Tolerance**
~~Corn, oats, rice, sorghum, sunflower~~ ~~All other cereal grains and oil seeds~~	0.~~05~~<u>03</u> of the percent moisture content ~~0.04 of the percent moisture content~~	0.~~8~~<u>5</u> % in moisture content ~~0.7 % in moisture content~~

(Amended ~~2001~~<u>20xx</u>)

11. Meter to Like-Type Meter Testing and Definition of Like-Type Meter

Source:
Grain Analyzer Sector

Background/Discussion:
Following the discussion of the Items included on the 2017 Grain Analyzer Sector's 2017 Agenda, the GA Sector members were asked if there were any additional topics for discussion. A discussion on Meter to like-type meter testing and the definition of a liker-type meter followed. During the discussion test procedures for meter to like-type meter testing were requested. It was noted that there may be only about two states using this type of test method and that it may be due to the cost of obtaining like-type meters to perform the test. A question was raised as to what is considered a like-type meter and it was explained that like-type meant that the make and model were the same. Suggestions were made to include a definition for like-type in NIST HB 44 and to consider documenting test procedures for meter to like-type meter testing.

During the 2018 grain analyzer sector meeting, the sector discussed industry and State weights and measures programs that used meter to like-type meter testing and master meter test methods. Kansas reported that reference meters are used to collect moisture results on samples. The samples are then taken to the field to compare to commercial field moisture meters. It was also reported that most State weights and Measures that use a meter to meter test method for testing field meters do not use a meter to like-type meter testing program which is specified in NIST HB44. The Perten representative reported that Perten uses three layers of mater meters when calibrating their devices.

Conclusion:
It was noted that an analysis of the failure rate for meter to meter test methods should be investigated and an analysis of all the issues for meter to meter test methods is needed along with test methods for this type of field testing.

12. 2020-2024 Interagency Agreement to Fund the GMM Ongoing Calibration (Phase II) Program

Source:
Ms. Cathy Brenner, USDA, GIPSA
Ms. Diane Lee, NIST, OWM

Background/Discussion: The current 2015-2019 Interagency Agreement is the fifth 5-year agreement of the on-going calibration program. The current agreement was signed in July 2015 and runs through analysis of the 2018 crop and issuance of the 2019 Certificates of Conformance. The 2019 certificates mark the final year of the current agreement. It should be noted that annual calibration activities occur in two government fiscal years and are better defined by a starting date of July 1.

During the 2018 Grain Analyzer Sector meeting, Ms. Cathy Brenner reviewed a cost estimate for the Phase II, Ongoing Calibration Program that was prepared by FGIS (See cost estimates below). The cost estimate is based on collecting a total of 740 samples for the 15 NTEP grains and assumes that NIST and FGIS are able to provide funding upto $30,000 to subsidize the program. In response to the review Mr. Andy Gell noted that the cost are similar to the current ongoing calibration program for grain moisture meters. The proposed cost analysis table is provided below:
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Total NIR Models (including official model) = TM	Number of NTEP only models = N	Total Program Cost = TP	Funding From NIST =TP/3	Funding from FGIS =TP/3	Funding from Manufacturers = TP-NIST-FGIS	Cost per model
3	1	$ 12,362	$ 4,121	$ 4,121	$ 4,120	$ 1,373
4	2	$ 24,724	$ 8,241	$ 8,241	$ 8,242	$ 2,061
5	3	$ 37,086	$ 12,362	$ 12,362	$ 12,362	$ 2,472
6	4	$ 49,448	$ 16,483	$ 16,483	$ 16,482	$ 2,747
7	5	$ 61,810	$ 20,603	$ 20,603	$ 20,604	$ 2,943
8	6	$ 74,172	$ 24,724	$ 24,724	$ 24,724	$ 3,091
9	7	$ 86,534	$ 28,845	$ 28,845	$ 28,844	$ 3,205
10	8	$ 98,896	$ 30,000	$ 30,000	$ 38,896	$ 3,890

13. Next Sector Meeting

The next meeting is confirmed for Tuesday, August 13, 2019 (8:00 am to 5:00 pm) at the Hyatt Place at the Kansas City, MO Airport.

If you would like to submit an agenda item for the 2019 meeting, please contact any of the following persons by June 1, 2019:

Mr. Jim Truex, NTEP Administrator at jim.truex@ncwm.net
Ms. Diane Lee, NIST Technical Advisor, at diane.lee@nist.gov