Grain Analyzer Sector Summary

October 1, 2019

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
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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 2019 NCWM Interim and Annual Meetings

The 2019 NCWM Interim Meeting was held January 13 – 16, 2019 in Charleston, SC and the 2019 NCWM Annual Meeting was held July 13-18, 2019 in Milwaukee, Wisconsin. At these meetings, there were a total of four recommendations for changes to the NIST HB 44 GMM Code (B1: GMA-1, "Terminology for Testing Standards", B3: GMA-2 "Address Devices and Systems Adjusted Using a Removable Digital Storage Device." GMA-3 "Table S.2.5. Category of Devices and Method of Sealing" and GMA–4 "Table T.2.1 Acceptance and Maintenance Tolerances for all Grains and Oil Seeds". There were no recommended changes to Publication 14 for grain analyzers. The status of the items following the NCWM Annual Meeting are as follows:

- B1: GMA-1 "Terminology for Testing Standards" is an assigned item.
- B3: GMA-1 "Address Devices and Systems Adjusted Using a Removable Digital Storage Device." was approved at the 2019 NCWM Annual Meeting and changes will appear in the 2020 version of NIST HB 44.
- GMA-2 Table S.2.5. "Category of Devices and Method of Sealing" was approved at the 2019 NCWM Annual Meeting and will appear in the 2020 version of NIST HB 44 and is discussed in this 2019 Grain Analyzer Sector Agenda, Item 5.
- GMA- 3 "Table T.2.1. Acceptance and Maintenance Tolerances Air Oven Method for all Grains and Oil Seeds" is a developing item and is discussed in this 2019 Grain Analyzer Sector Agenda, Item 10.

The following was reported during the 2019 Grain Analyzer Sector Meeting:

B1: GMA-1 "Terminology for Testing Standards" Ms. Lee reported this item is included in a block of items that was given an assigned status and a work group was assigned. Mr. Lorein Minnich (KS) noted during the discussion of this item since there are GMA items within the block of items it may be benificial to have someone from the GA Sector participate in the work group activities. He asked for volunteers and Mr. Randy Burns (AR) volunteered to participate. Mr. Minnich stated that he would forward the request to the work group chair.

B3: GMA-1 "Address Devices and Systems Adjusted Using a Removable Digital Storage Device." Ms. Lee reported that this item was approved at the 2019 NCWM Annual Meeting and changes will appear in the 2020 version of NIST HB 44.

GMA-2 Table S.2.5. "Category of Devices and Method of Sealing" was approved at the 2019 NCWM Annual Meeting and will appear in the 2020 version of NIST HB 44. Ms. Lee reported that after a subsequent review by NIST OWM, an error in the Table S.2.5 was created with the adoption of these changes. Discussion of this error and proposed solutions to correct the error are included in the Sector's discussion of Agenda item 5 of this summary.

GMA-3 "Table T.2.1. Acceptance and Maintenance Tolerances Air Oven Method for all Grains and Oil Seeds" Ms. Lee reported that the S&T committee agreed to a developing status so that the Sector members can review additional data on other grain types to verify that a single tolerance would apply to all grain types. Discussion of this item is included under agenda item 10 of this summary.

2. Report on NTEP Evaluations and Ongoing Calibration Program (OCP) (Phase II) Testing

Mr. Jason Jordan (USDA, FGIS), the NTEP Participating Laboratory for grain analyzers, provided a list of grain analyzers that were enrolled in the 2019 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. Jason Jordan provided the sector with an update on NTEP Phase II ongoing calibration program evaluations and reported that that the same 8 models are in the 2019 Ongoing Calibration program. Mr. Jordan reported that there is one device in phase 1 testing that will not be included in phase II testing this year. Mr. Jordan also reported more variability and low number of samples for high moisture rice.

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 of the NTEP Participating Laboratory for grain analyzers provided data for inclusion in the 2019 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 (2016–2018) using calibrations updated for use during the 2018 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 of the NTEP Participating Laboratory for grain analyzers provided data showing the performance of NTEP meters compared to the GIPSA reference Quart Kettle Test Weight Apparatus. This data is based on the last three crop years (2016 – 2018) using calibrations updated for use during the 2018 harvest season.

The 2016-2018 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.com.

Mr. Jordan provided the sector with an update on the OCP (Phase II) performance data for moisture and test weight per bushel for the 2016-2018 crop year and reviewed the comparison graphs. The Sector members provided no additional comments.

4. Address Devices and Systems Adjusted Using a Removable Digital Storage Device (Formerly S&T Developing Item B7: GEN-2 and GMM-2; Currently S&T Voting item B3: GEN-2 and GMA-1) and Corresponding Changes to NCWM Publication 14

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 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:

- **B3: GEN-2 G-S.8.2 Devices and Systems Adjusted Using Removable Digital Storage Device**

  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:

- **B3: GMA-1 S.2.5. Provision for Sealing**

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:

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.

(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 the 2017 agenda) and is not currently being proposed for consideration.

During the 2018 GA Sector meeting Ms. Diane Lee (NIST, OWM) 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 informed 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.

Both items B3: GEN-2 G-S.8.2 and GMA-1 S.2.5 were approved at the 2019 NCWM Annual Meeting and changes will appear in the 2020 version of NIST HB 44. As such, changes to NCWM Publication 14 GMM checklist are also needed to correctly reflect the changes to NIST HB 44. At its 2019 Meeting, the GA Sector reviewed the proposed changes to Publication 14:

Proposal to add language to GMM Publication 14 Checklist, Page GMM-19

Code Reference: S.2.5. Provision for Sealing

4.6 **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:** ☐ Yes ☐ No ☐ N/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 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.

GMM Publication 14 Appendix C, Page GMM-36

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 has 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.

General Code: 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.**

Grain Moisture Meters Code: 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:

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.

Note: Does not require 1000 changes to be stored for each parameter.

Some clarification was provided to the GA sector members. No comments were received following the review and by consensus the sector agreed to the proposed changes.

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 and Corresponding Changes to NCWM Publication 14

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.

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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)

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 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.

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*~~ *Ceonfiguration 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)

Following the 2018 GA Sector meeting, NIST OWM reviewed the proposal put forward by the Grain Analyzer Sector for changes to HB 44, GMM Code Table S.2.5 and provided an alternate proposal in the NIST OWM analysis of the 2019 S&T Interim meeting agenda. The NIST OWM alternate proposal provided two paragraphs that addressed sealing for devices manufactuered between 1999 and 2020 and sealing for devices manufactured on or after 2020 believing it would provide clarity for when to apply the requirements. The NIST OWM proposal was not considered at the 2019 Interim Meeting and was not accepted at the 2019 Annual meeting. The Sector's proposal was adopted at the 2019 annual meeting with a change to the non-retroactive date of January 1, 2019 to January 1, 2020 and will appear in the 2020 NIST HB 44. As such, changes to NCWM Publication 14 GMM checklist are also needed to correctly reflect the changes to NIST HB 44. At its 2019 GA Sector Meeting, the sector reviewed the proposed changes to Publication 14 and agreed with the following change as follows:

Proposal to amend GMM Publication 14 Appendix C, Page GMM-37

Table S.2.5. Categories of Device and Methods of Sealing

Categories of Device	Method 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.* *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*~~ *Ceonfiguration capability, 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 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.~~	~~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 measure mode.~~	~~Same as Category 3~~
[1] Not allowed for devices manufactured on or after January 1, 2020 [2] Required for all devices manufactured on or after January 1, 2020		

*Non-retroactive as of January 1, ~~1999~~ **2020**.*
*Amended 1998, **2013, 2019***

Ms. Diane Lee (NIST, OWM) reported during the 2019 GA Sector Meeting, that after review of the changes made to NIST HB 44, GMM Code 5.56(a) Table S.2.5 during the 2019 NCWM Annual Meeting, NIST OWM identified an error with the change. With the removal of previous non-retroactive dates and the addition of a January 1, 2020 non-retroactive date along with the addition of two footnotes added to the table (1) Not allowed for devices manufacturered on or after January 1, 2020 and (2) Required for all devices manufactured on or after January 1, 2020 the HB 44 requirement now only applies to devices as of January 1, 2020 and no longer address devices in service prior to this date. Ms. Lee noted changes are needed to correct this error in the 2020 version of HB 44.

Ms. Lee also reported during the 2019 GA sector meeting NIST provided alternative language during the 2019 interim and annual meeting that may have provided clarity and that this proposed language is currently used in HB 44 in other codes, but was not accepted by the S&T committee. Mr. Darrell Flocken reported that the NIST proposal matched what was done in the scales code.

Ms.Lee asked if a change to Publication 14 could be delayed because there is a known error in the 2020 HB 44 adopted language. Mr. Darrell Flocken (NTEP Administrator) stated that with the approved change to the 2020 version of

NIST HB 44, the change should be made to the 2020 version of Publication 14. Then, corections should be made to both HB 44 and Publication 14 for the 2021 publications to correct the error.

The GA Sector members, during the 2019 GA sector meeting discussed suggested changes to correct the error in the 2020 NIST HB 44. Mr. Flocken suggested the removal of the retroactive date in the proposal making the entire table retroactive and applying to all devices and keeping the notes as an explanation of when devices will need to meet category 3 sealing requirements. The sectors considered the proposal and agreed with Mr. Flocken's proposed changes to correct the error in the 2020 version of HB 44 which follows:

Table S.2.5. Categories of Device and Methods of Sealing

Categories of Device	Method 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. 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 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 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.)
[1] Not allowed for devices manufactured on or after January 1, 2020 [2] Required for all devices manufactured on or after January 1, 2020	

~~*Non-retroactive as of January 1, 2020.*~~
*Amended 1998, 2013, 2019**, 2020***

The Sector requested that the NIST technical advisor further review the proposal with others within NIST and following no additional concerns, submit a draft form 15 for changes to the 2021 GMM Code Table S.2.5 to the GA sector for approval by ballot and upon approval forward the form 15 to the NCWM so that it may be forward to some of the the regional weights and measures for review. It was noted that the current deadline would have required immediate Sector balloting and responses, but Mr. Flocken pointed out that the deadline for Sector proposed changes to NIST HB 44 is still November 1.

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 OIML R59.

During the 2019 GA Sector meeting, meter manufacturers were asked to report on any impact from the use of this international standard. Rachel Beiswenger (TSI, Inc.) reported that some countries are adopting the OIML standards directly as their country requirements. She report that Mexico has adopted OIML requirements. Larry Speaks (Perten Instruments) reported some countries do not accept U.S. requirements and some added their own requirements. Mr. Darrell Flocken (NTEP Administrator) provided an update on the OIML type efvaluation activities. Mr Flocken reported the change from Mutual Acceptance Agreements to OIML Certification Systems. Mr. Flocken mentioned that information is located on the OIML website. Ms. Beiswenger (TSI, Inc) and Mr. Speaks (Perten Instruments) commented that they must get certified by each country but it helps that the device passed in the U.S. Ms. Diane Lee (NIST, OWM) reported the OIML standards are up for review every 5 years.

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.

During the 2019 GA Sector, meter manufacturers provided reports on impact from the use of this international standard. See comments to Agenda Item 6 of this summary.

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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 (IL) report on the Grain Analyzer Sector's 2018 grain moisture proficiency testing activities. Mr. Cunningham reported that States are required to participate in proficiency testing and that any manufacturer may participate. 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.

At the 2019 GA Sector Meeting, Mr. Cunningham provided an update of the proficiency testing activities and data collected. Mr. Cunningham reported that the government shutdown caused a delay in obtaining sample references from the AMS, FGIS. Mr. Cunningham reported that he hopes to have samples this year for the round robin.

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 protein. 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 Mr. 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 Jason 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.

2018 Grain Analyzer Sector Meeting:

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 for review during the 2018 Grain Analyzer Sector. 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 refererence 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

The Grain Analyzer 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.

2019 Grain Analyzer Sector Meeting:
During the 2019 Grain Analyzer Sector Meeting, Ms. Cathy Brenner (USDA, AMS, FGIS) provided for discussion a table that summarizes slope and bias errors for discussion and a proposal for changes to Publications 14:

> Previous Discussions by the Sector for a proposed Phase II or Ongoing Calibration Program for Near Infrared Grain analyzers focused on the estimated cost of a program but did not incude proposed tolerances and criteria for the calibration performance.
>
> The guidelines of the American Association of Cereal Chemist International (AACC) Method 39-01.01 Evaluation of NIR Intrument Calibration and Statistical Process Control were applied to a commom set of data obtained from at Iowa State University (ISU) as part of the 2016 FGIS NIR Equivalency Study. AACC Method 39-01 evaluates the slope and bias of a calibration compared to the reference method at the 95% confidence level. In addition, statistical process control (SPC) and assessment of measurement uncertainty for the combined reference method, repeatability and reproducibility were applied to this data set (Uc)and expanded uncertainty (U).

The FGIS NIR Equivalency Study included the three NTEP approved NIR models and calibrations. Five units of each model were used to collect three replicates per sample of barley, corn, soubean, and wheat. The data included reference results of each sample. The data was analyzed in groups of up to 50 samples to represent a single year of the NIR Phase II program.

For discussion purposes, the following table summarizes the **slope errors** of each method that indicated when the slope exceeded a statistical tolerance. It also includes the ISU guidelines and previous guidelines used by FGIS.

Grain/Constituent	AACC Method		SPC	FGIS	ISU
Barley/Protein	-0.092	0.048	±0.05	n/a	n/a
Corn Oil	-0.014	0.026	±0.094	±0.03	±0.05
Corn Protein	-0.021	0.023	±0.06	±0.03	±0.05
Soybean Oil	-0.026	n/a	±0.032	±0.03	±0.05
Soybean Protein	-0.034	0.042	±0.036	±0.03	±0.05
Wheat Protein	-0.021	0.018	±0.022	±0.02	n/a

For discussion purposes, the following table summarizes the **bias errors** for each method that indicated when the bias exceeded a statistical tolerance. FGIS typically does not adjust for biases within ±0.10% as these differences can easily vary year to year.

Grain/Constituent	AACC Method		SPC	Uc	U
Barley/Protein	n/a	n/a	±0.11	0.23	0.47
Corn Oil	-0.09	0.12	±0.34	0.19	0.38
Corn Protein	-0.07	0.06	±0.26	0.21	0.42
Soybean Oil	-0.06	0.02	±0.20	0.17	0.34
Soybean Protein	-0.03	0.01	±0.38	0.34	0.38
Wheat Protein	-0.04	0.10	±0.10	0.23	0.45

Listed below are the proposed changes to the NIR Section of NCWM Publication 14 Grain Moisture Meters and Near Infrared Grain Analyzers:

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 for corn oil and protein; durum wheat protein, hard white wheat protein; hard red spring wheat protein; hard red winter wheat protein; six row barley protein; soft red winter wheat protein; soft white wheat protein; soybeans protein and oil; and two row barley protein (acuarcy test discussed earlier).**
3. **Review of ongoing calibration data collected as part of the national calibration program (Phase II).**

In order for a calibration to remain on the certificate of conformance, the calibration must continue to meet tolerances for the initial evaluation's Accuracy Standard Error of Performance (SEP) test. 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 protein and/or oil values using the three most recent years of available raw data collected by the Type Evaluation Laboratory.

Updated calibrations will be approved based upon the re-predicted protein and/or oil values. Tolerances will be the accuracy tolerance found in Table 2

Additionally, all calibrations must meet the following requirements for up to three years of available data:

a. **The difference between the average bias to applicable FGIS reference methods for all samples calculated using the most recent calibration and all available raw data collected within the last 3 years shall not exceed: 0.20 for barley protein, corn oil, soybeans oil, and wheat protein; 0.25 for corn protein; and 0.34 for soybeans protein.**
b. **The slope errors (e.g. slope-1) calculated using the most recent calibration and all available raw data collected within the last 3 years shall not exceed: 0.05 for barley protein and corn protein; 0.03 for corn oil; 0.32 for soybeans oil; 0.036 for soubeans protein; and 0.022 for wheat protein.**

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.

Until calibrations for NTEP grains and constituents 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."

V. Criteria for NTEP Near Infrared Grain Analyzer Calibration Review

The following criteria are to be applied along with criteria listed in Part IV above to verify calibration performance.

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 adjustment, 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.

Mr. Andy Gell (Foss North America) and Mr. Larry Speaks (Perten Instruments) expressed concerns about the slope because it is dependant on sample set and range. Ms. Cathy Brenner (AMS, FGIS) requested feedback from the Sector on an annual time frame for testing, sample size, SEP and bias. Mr. Gell and Mr. Speaks expressed agreement with an annual time frame, cost, sample size and SEP and bias. Mr. Gell and Mr. Speaks requested

additional time to get feedback on the proposed tolerances. Mr. Karl Cunningham (IL) suggested that after getting additional feedback that a final summery be provided to the Sector. Ms. Brenner agreed to provide a table of tolerances that the manufacturers can review and a summary of feedback on the tolernaces from the manufactuers for the 2020 GA Sector meeting. The earliest the requirements could be added to NCWM Publication 14 would be the 2021 publication.

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:

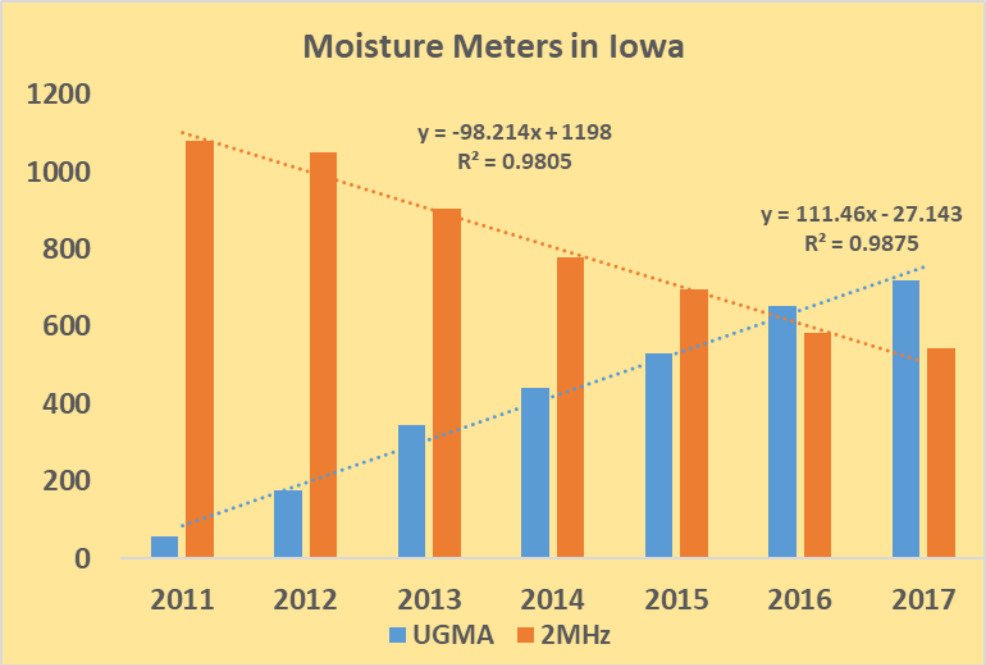
Karl Cunningham – IL
Randy Burns – AR
Tom Hughes - MO

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					



At the 2018 GA Sector meeting 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 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

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)
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 for All Grains and Oil Seeds

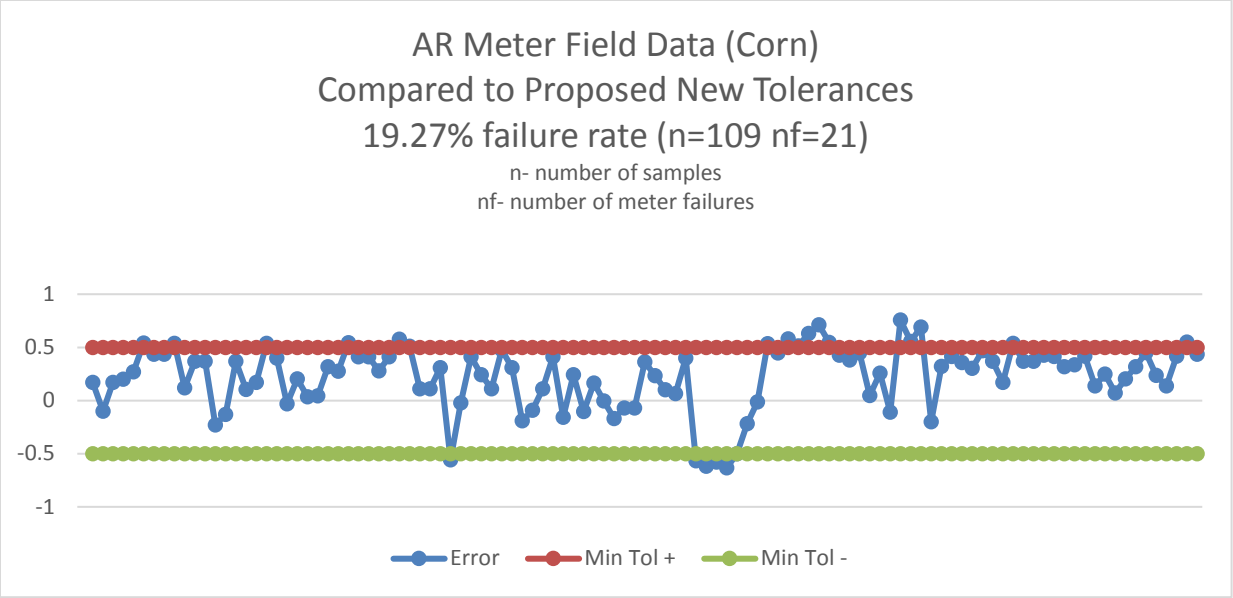
~~Type of Grain, Class, or Seed~~	Tolerance	Minimum Tolerance
~~Corn, oats, rice, sorghum, sunflower~~ ~~All other cereal grains and oil seeds~~	0.~~05~~03 of the percent moisture content ~~0.04 of the percent moisture content~~	0.~~8~~5 % in moisture content ~~0.7 % in moisture content~~

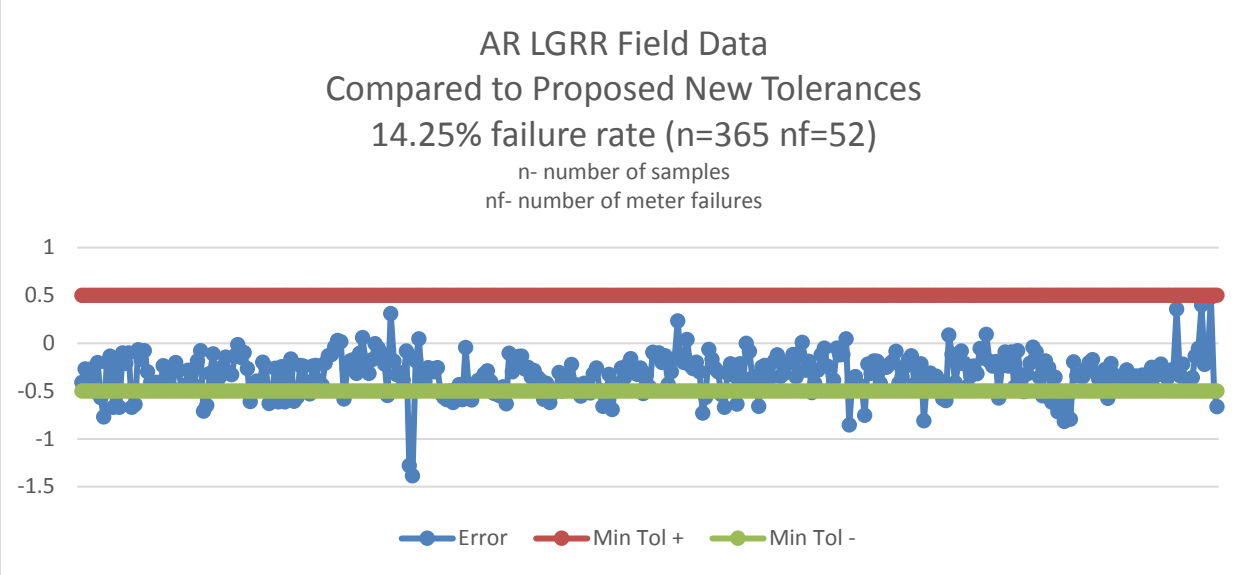
(Amended ~~2001~~20xx)

The GA Sector's proposal for changes to Table T.2.1 were forwarded to the NCWM for inclusion on the 2019 S&T Interim Meeting agenda and this proposal was circulated to regional weights and measures associations for review and recommendations. Prior to the NCWM 2019 Interim meeting, Randy Burns (AR) provided data that showed that although data provided for corn and soybeens may not indicate a problem with changing the tolerance as proposed, other grains may be affected by the proposed tolerance. The GA Sector was informed of the impact that a change in tolerance may have on other grains. As such, the GA Sector was polled and they agreed that the original proposal be given a developing status so that the GA sector may review data at its 2019 GA NTETC Meeting.

2019 Grain Analyzer Sector Meeting

Ms. Diane Lee (NIST OWM) analyzed data provided by Mr. Randy Burns (AR) and provided the Sector copies of graphs and an overview of the results during the 2019 GA Sector Meeting. The data showed a meter failure rate for corn sample of 19.27% and a meter failure rate for long grain rice samples of 14.25% . See graphs below:





Mr. Randy Burns (AR) mentioned that each State may not see the same results. Mr. Burns further stated that samples are screened on laboratory meters to within +/- 0.3% and samples are used 10 times before they are rechecked. Mr. Gordan Elliot(The Steinlite Corporation) recommended national data over a longer period of time is needed to make a determination of whether or not the proposed tolerances are acceptable. Ms Lee agreed to develop a standard form so that the GA Sector can collect additional information from participating States. Mr. Elliot agreed to compile the data and also offered an alternative to create a program that sector members could run, if he had an example of the data format. Mr. Elliot also requested Phase 2 data to determine meter-air oven errors. Following the GA Sector meeting, meter manufactutrers were sent a request to share Phase II data with model identifiers removed, with Mr. Elliot as part of the statistical analysis. All of the manufacturers granted permission for the data to be shared.

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 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.

2018 Grain Analyzer Sector Meeting
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 master meters when calibrating their devices. 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.

2019 Grain Analyzer Sector Meeting
During discussion of this item at the Grain Analyzer Sector meeting it was reported there are a number of items on the 2019 NCWM S&T agenda that address the use of master meters for field testing that includes terms and definition for these statnadards. The NCWM has assigned a task group to discuss the issue of the use of master meters and terms and definitions for these standards. The GA technical advisor will follow the discussions of the task group and provide updates to the Sector on the task group discussions. Mr. Lorein Minnich (KS) noted that it may be good to have a representative from the GA sector because one of the items included in the Block is a grain moisture meter issue. Mr. Randy Burns (AR) volunteered to participate on the task group. It is suggested that before moving forward with additional efforts to address meter to like type meter testing for grain analyzers, that the GA sector observes the task group's actons. The task group actions may include guidelines for the use of master meters that may impact field test procedures for meter to like-type meter testing.

The Sector discussed tabling the discussion of meter to like-type meter testing until additional information is provided from the data collection on master meters and information is received from the NCWM task group concerning field standards and master meters terminology and definitions.

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.

2018 Grain Analyzer Sector Meeting
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:

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

2019 Grain Analyzer Sector Meeting
During the 2019 GA Sector Meeting Ms. Diane Lee provide an update on the status of the 2020-2024 interagency agreement. Ms. Lee provided background on the Ogoing Calibration Program (Phase II) and reported that NIST PML now has a dedicated person that monitors and assist with all Interagency agreements. Ms. Lee reported that the Interagency agreement is currently being rviewed by legal council.

13. Number of Samples Required for Calibration Verification (Phase II Testing for Moisture and Test Weight)

Source:
FGIS/NTEP Grain Analyzer Testing Laboratory

Background/Discussion:

The NTEP Grain Lab follows a strict testing regimen for analyzing grain samples on participating instruments. This is necessary to ensure the integrity of the samples remain intact as they are tested across all instruments. In recent years, an issue has surfaced regarding instruments that, for any reason, are unable to collect measurements on a given sample during the specified regimen (typically due to malfunction). This issue, therefore, generates the question of what is the minimum number of samples necessary to ensure that a given instruments calibration is valid? In addition, since current NTEP requirements require two units of each instrument model to be included in testing, a second question to consider is whether limiting the testing to only one unit would significantly impact the evaluation of that instruments calibration.

To answer these questions, a statistical analysis was applied to instrument and air oven reference moisture data from the 2015-2017 survey years.

The analysis was performed for each instrument and each grain type separately.

To assess the need for multiple units and replicates of each sample, the variance of the differences between the meter and reference methods were calculated using a method by Bland-Altman (1999). This calculation takes into account the overall variation between the differences, as well as the variation within each method due to the repeatability of replicated sample measurements. The table below shows how changes in the number of sample replicates (m) affects the overall variance and standard deviation of the differences. The standard deviation does improve as the number of replicates increases, but the magnitude of the improvement is never more than 4%. The improvement from 1 to 4 replicates is only 2.7%. With such small changes, it is unlikely that the calibration integrity will be affected whether 1, 2, or 4 replicates are tested.

m	$Var(\bar{D})$	$SD(\bar{D})$	Magnitude of SD (%)
1	0.3235	0.5688	100
2	0.3121	0.5587	98.22
4	0.3064	0.5535	97.31
8	0.3036	0.551	96.87
16	0.3021	0.5497	96.64
32	0.3014	0.549	96.52

Sample size was determined using a method by Lu et al. (posted on the NCWM Website 2019 GA Sector Meeting documents) and was based on Bland-Altman agreement limits. Calculated sample sizes ranged from 8-11 for each grain type. Although this is significantly fewer samples than what is normally tested during a survey, it does not take into account the distribution of samples across the standard moisture ranges. The current NTEP standards outlined in Publication 14 state that calibrations will only be evaluated for each 2% moisture interval within the standard moisture range if that interval contains at least 5 samples. Therefore, it is recommended that each instrument model must have moisture and, if applicable, test weight data on at least one unit for at least 5 samples in each 2% moisture interval up to the maximum moisture limit. For intervals with fewer than 5 samples available for testing, data must be collected on all available samples.

Proposed language addition to Publication 14:

“For moisture and , if applicable, test weight calibrations to be evaluated for approval status, at least one unit of a given instrument model must have a minimum of 5 samples tested in each 2% moisture interval up to the maximum moisture limit for those intervals which have at least 5 samples available within a consecutive 3-year span. For intervals with fewer than 5 available samples, all available samples must be tested. For newer instrument models that have participated in the Phase 2 evaluation for fewer than 3 years, the same minimum sample requirements still apply.”

It should be noted that the purpose of this proposal is only to update the Publication 14 requirements and not to alter the current evaluation procedures. It is still recommended that two units of each model be tested to assess reproducibility. In addition, two replicates of each sample (for models that require it) is also recommended to assess repeatability and also to ensure that a model will still meet the requirements should one of the units become inoperable.

During the 2019 Grain Analyzer Sector meeting Mr. Jason Jordan (USDA, FGIS) provided sampling test procedures and discussed a proposal to change sample size requirements such that they may apply to one instrument. Mr. Jordan pointed out that only 8 to 12 samples per grain for 3 years is needed to have statisitical confidence in the approval of

the calibration. Mr. Jordan noted that he is not advocating changing to 1 replicate and 8 to 12 samples but just presenting the information to provide confidence in the approval process. Mr Andy Gell (Foss North America) asked if all meter models were included in the analysis? Mr. Jordan responded that he did not look at all meter models but presented data for worst case models. There were several questions on on moisture interval that typically have few samples and high moisture samples. Mr. Jordan responded that as long as one meter is operational and collects the data, then that data applies to the model. Mr. Jordan agreed to provide additional language for review by the sector. The Sector expressed agreement with the proposed language in the agenda.

Following the Sector meeting Mr. Jordan provide an additional proposal for changes to Publication 14 which will be circulated to the Sector for review and approval:

Below is an excerpt from Publication 14, Section IV. Tolerances for Calibration Performance, Page GMM-5 to include the language regarding minimum sample requirements.

> Updated calibrations will be approved based upon the re-predicted moisture values. Tolerances will be one-half of the *NIST Handbook 44* acceptance tolerance and will be applied in 2% intervals over the Standard moisture range. Tolerances will include the application of a 95% confidence interval to the maximum tolerance for each 2% 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; 0.70 for wheat, soybeans, and barley.
b. The range of year-to-year differences in bias to air oven shall not exceed the *NIST Handbook 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% moisture, calculated using the most recent calibration and all available raw data collected within the last 3 years through the maximum moisture limit.
d. To ensure the integrity of the calibration is evaluated appropriately, at least one unit of each instrument model must have a minimum of 5 samples tested in each 2% moisture interval up to the maximum moisture limit. For intervals with fewer than 5 samples available, all available samples must be tested. For newer instrument models that have participated in the ongoing calibration program (Phase II) for fewer than 3 years, the same minimum sample requirements still apply.

Failure to meet the requirements in either a., b., c., or **d**. 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.

14. Standard Output Format for Automatic Data Collection by the NTEP Laboratory (Phase II Instrument Evaluation)

Source:
FGIS/NTEP Grain Analyzer Testing Laboratory

Background/Discussion:
Over the past few years, the NTEP Grain Laboratory has been researching ways to improve procedures for conducting Phase 2 instrument evaluations. One area that has been focused on regards data collection and organization. Currently, once grain samples have been tested on the meters, measurement data has to be pulled from each instrument individually (via flash drive) and then copied over to a common data file. Output formats vary for each instrument, requiring lab technicians to reorganize each data output to match a finalized common format before the results can be analyzed. These steps are very cumbersome, adding additional time to the overall process while also being more prone to errors.

To help increase efficiency, the NTEP lab has begun taking steps to remedy this problem by creating a centralized SQL database where all Phase 2 data (past and present) will be stored. In addition, the lab has been working with manufacturers to connect the database directly to each instrument, such that sample data will be uploaded automatically at the time of measurement. To date, only about half of the current instruments have been connected and are successfully operating. The biggest hurdles have been with connecting to the data stream and then reorganizing the output format. Since formats vary, each instrument must be programmed individually.

Proposal to add the following language to Publication 14 GMM Appendix D Standard Data Format:

Sample ID	Moisture	Model	S/N	Calibration	Grain Type	TW	Oil	Protein	Date/ Time	Manufacturer specific field(s)

The purpose of this proposal is to open a discussion about whether a standard output format can be put in place that will allow any new instruments to be easily connected to the system upon entering the Phase 2 program. There is a standard data format outlined in Appendix D of Publication 14 for manufacturers to follow when submitting re-predicted data.

This was presented as a discussion topic instead of a proposal. Mr. Jordan reviewed the information and asked manufacturers to discuss the proposed format with IT representatives within their estblishments before changes are made to Publication 14.

15. Next Sector Meeting

The NTEP Administrator will share confirmed dates and location for the 2020 NTETC Grain Analyzer Sector meeting. The GA sector meetings are typically held the second week in August, start on a Tuesday (8:00 am to 5:00 pm) and are held at the Hyatt Place at the Kansas City, MO Airport. During the 2019 sector meeting a tentative date of Tuesday, August 11, 2020 (8:00 am to 5:00 pm) was proposed for the next GA sector meeting

If you would like to submit an agenda item for the 2020 meeting, please contact any of the following persons by June 1, 2020:

Mr. Darrell Flocken, NTEP Administrator, at darrell.flocken@ncwm.com
Ms. Diane Lee, NIST Technical Advisor, at diane.lee@nist.gov