

# Grain Analyzer Sector Agenda

July 20, 2018

## INTRODUCTION

The charge of the NTETC Grain Analyzer Sector is important in providing appropriate type evaluation criteria based on specifications, tolerances and technical requirements of *NIST Handbook 44* Sections 1.10. General Code, 5.56. Grain Moisture Meters and 5.57. Near-Infrared Grain Analyzers. The sector’s recommendations are presented to the National Type Evaluation Program (NTEP) Committee each January for approval and inclusion in *NCWM Publication 14 Technical Policy, Checklists, and Test Procedures* for national type evaluation.

The sector is also called upon occasionally for technical expertise in addressing difficult *NIST Handbook 44* issues on the agenda of National Conference on Weights and Measures (NCWM) Specifications and Tolerances (S&T) Committee. Sector membership includes industry, NTEP laboratory representatives, technical advisors, and the NTEP Administrator. Meetings are held annually, or as needed and are open to all NCWM members and other registered parties.

Suggested revisions are shown in **bold face print** by ~~striking out~~ information to be deleted and underlining information to be added. Requirements that are proposed to be nonretroactive are printed in *bold faced italics*.

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**Table B**  
**Glossary of Acronyms and Terms**

Acronym	Term	Acronym	Term
BIML	International Bureau of Legal Metrology	NTETC	National Type Evaluation Technical Committee

CD	Committee Draft	OCP	Ongoing Calibration Program
CIML	International Committee of Legal Metrology	OIML	International Organization of Legal Metrology
CIPM	International Committee of Weights and Measures	OWM	Office of Weights and Measures
D	Document	R	Recommendation
EMRP	European Metrology Research Program	S&T	Specifications and Tolerances
FGIS	Federal Grain Inspection Service	SC	Subcommittee
GA	Grain Analyzer	SD	Secure Digital
GIPSA	Grain Inspection, Packers and Stockyards Administration	TC	Technical Committee
GMM	Grain Moisture Meter	TW	Test Weight
MRA	Mutual Recognition Agreement	UGMA	Unified Grain Moisture Algorithm
NCWM	National Conference on Weights and Measures	USB	Universal Serial Bus
NIR	Near Infrared Grain Analyzer	USDA	United States Department of Agriculture
NIST	National Institute of Standards and Technology	USNWG	United States National Working Group
NTEP	National Type Evaluation Program		

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**Details of All Items**  
(In order by Reference Key)

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### 1. Report on the 2018 NCWM Interim and Annual Meetings

The 2018 NCWM Interim Meeting was held January 21 – 24, 2018 in St. Pete Beach, Florida and the 2017 NCWM Annual Meeting was held July 15-19, 2018 in Tulsa, Oklahoma. At these meetings, there were no Grain Analyzer Sector recommended changes to NCWM Publication 14 or NIST Handbook (HB) 44. The Grain Analyzer Sector originally submitted an item on the S&T agenda, which was subsequently reassigned to NIST, OWM for development. See Grain Analyzer Agenda Item 4 “Address Devices and Systems Adjusted Using a Removable Digital Storage Device.”

Mr. Jim Truex, NTEP Administrator and Ms. Diane Lee NIST, Technical Advisor will provide an update on the NCWM Interim and Annual Meetings.

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

Mr. Jason Jordan, Grain Inspection, Packers and Stockyards Administration (GIPSA), the NTEP Participating Laboratory for grain analyzers, provided a list of grain analyzers that were enrolled in the 2018 Ongoing Calibration Program (OCP); there are 8 grain analyzer models enrolled.

The 8 models:

1. Dickey-john Corp. – GAC2500-UGMA
2. Dickey-john Corp. – GAC2000, GAC2100, GAC2100a and GAC2100b
3. Perten Instruments Inc. - AM5200 and AM5200-A (UGMA)
4. Perten Instruments Inc. – IM9500 and IM9500 HLW/TW
5. Foss North America – Infratec 1241
6. Foss North America – Infratec Nova

7. The Steinlite Corp. – SL95
8. MTC Moisture Analyzers – MTC 999 ES

Mr. Jordan will provide the sector with an update on the NTEP Phase I evaluations and reported on the collection and analysis of the OCP (Phase II) data from the 2018 crop year and any changes to NTEP meters in the ongoing calibration program. See the 2015 Grain Analyzer Sector summary for the NTEP On-going Calibration Program (Phase II) 2015-2019 Fee Schedule.

### **3. Review of OCP (Phase II) Performance Data for Moisture and Test Weight per Bushel**

At the Sector's August 2005 meeting it was agreed that comparative OCP data identifying the Official Meter and listing the average bias for each NTEP meter type should be available for annual review by the sector. Accordingly, Mr. Jordan, GIPSA, the NTEP Participating Laboratory for grain analyzers provided data for inclusion in the 2018 Grain Analyzer Sector Meeting Agenda showing the performance of NTEP meters compared to the air oven. This data is based on the last three crop years (2015–2017) using calibrations updated for use during the 2017 harvest season.

The 2015-2017 Grain Moisture Meter (GMM) Phase II comparison graphs are available for view or can be downloaded for printing at the following web address:

<http://www.ncwm.net/resources/dyn/files/75601146zc793ed4d/fn/2015-2017+NCWM+Sector+GMM+Biases.pdf>

At the Sector's August 2012 meeting, it was agreed that TW comparison and correlation charts should be prepared for the 3 grains which are most likely to be subject to discounts on the basis of TW: Corn and two wheat classes and limited to Air Oven reference values less than 20% moisture. The wheat classes selected were: Hard Red Winter and Soft Red Winter. Accordingly, Mr. Jordan, GIPSA, the NTEP Participating Laboratory for Grain analyzers prepared data showing the performance of NTEP meters compared to the GIPSA reference Quart Kettle Test Weight Apparatus. Mr. Jordan will provide an update of this information for the Grain Analyzer Sector meeting agenda. This data is based on the last three crop years (2015 – 2017) using calibrations updated for use during the 2017 harvest season.

The 2015-2017 TW comparison and correlation charts and TW Phase II data are available for view or can be downloaded for printing at the following web address:

<http://www.ncwm.net/resources/dyn/files/75601147zb094dddb/fn/2015-2017+NCWM+Sector+TW+plots.pdf>

### **4. Address Devices and Systems Adjusted Using a Removable Digital Storage Device (S&T Developing Item B7: GEN-2 and B7: GMM-2)**

**Source:**

Originally proposed by the Grain Analyzer Sector but because NIST, OWM recognized that this item would affect other device types it was reassigned to NIST, OWM for further development.

**Purpose:**

Table S.2.5. *Categories of Device and Methods of Sealing* that appears in §5.56. (a) of *NIST Handbook 44* lists acceptable methods of sealing for various categories of GMMs. When the sector first recommended adding the table to *NIST Handbook 44* at their September 1996 meeting, the concept of making a change to a GMM from a remote site involved information sent by to the device by modem (or computer). In 2011 this concept expanded to include the

ability of the measuring device to accept new or revised sealable parameters from a memory chip (e.g., an SD Memory Card that may or may not itself be necessary to the operation of the device, external computer, network, or other device plugged into a mating port (e.g., Universal Serial Bus (USB) port) on the measuring device or connected wirelessly to the measuring device. The original changes proposed by the GA Sector included changes to the definition for “remote configuration” to cover instances where the “other device” may be necessary to the operation of the weighing or measuring device or which may be considered a permanent part of that device. NIST OWM revised the original proposal put forward by the GA Sector and developed a proposed General Code requirement G-S.8.2 to address all devices using a removable digital storage device.

**Item Under Consideration:**

Modify the General Code by adding the following paragraph to address security for systems adjusted using removable media:

**G-S.8.2. Devices and Systems Adjusted Using Removable Digital Storage Device. - For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device\*, such as a secure digital (SD) card, USB flash drive, etc., security shall be provided for those parameters using either (1) an event logger in the device; or (2) a physical seal, that must be broken in order to remove the digital storage device from the device (or system). If security is provided using an event logger, the event logger shall include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available on demand through the device or through another on-site device. In addition to providing a printed copy of the information, the information may be made available electronically. The event logger shall have a capacity to retain records equal to 10 times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)**

**\*Applies only to removable digital storage devices that must remain in the device or system for it to be operational.**

**(Added 20XX)**

and added language to the current sealing requirements for devices and systems adjusted using a removable digital storage device by proposing changes to the sealing requirements in the following HB 44 code sections: 2.20., 2.21., 2.22., 2.24., 3.30., 3.31., 3.32., 3.33., 3.34., 3.35., 3.36., 3.37., 3.38., 3.39, 3.40., 5.55., 5.56. (a), and 5.58. because the General Code paragraph will address the sealing of all device types and systems.

The following is the proposed changes to the Grain Moisture Meter HB 44, Section 5.56(a):

**Item Under Consideration:**

Modify 5.56.(a) Grain Moisture Meters Code as follows:

S.2.5. Provision for Sealing. – **For devices and systems in which the configuration or calibration parameters can be changed by use of a removable digital storage device, security shall be provided for those parameters as specified in G-S.8.2. For parameters adjusted using other means, the following applies:**

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)**

**(NOTE: The paragraphs below are currently being discussed by the GA Sector. See discussion of these proposed changes in Agenda Item 5)**

**S.2.5.3. *An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter (for calibration changes consisting of multiple constants, the calibration version number may be used rather than the calibration constants.)***

*A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to 25 times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)*  
[Nonretroactive as of January 1, 20XX]

**(Amended 20XX)**

**Background / Discussion:**

Two common types of removable data storage devices are the USB flash drive and the Secure Digital (SD) memory card. A USB flash drive is a data storage device that includes flash memory with an integrated USB interface. USB flash drives are typically removable and rewritable, and physically much smaller than a floppy disk. A SD card is a non-volatile memory card format originally designed for use in portable devices. The SD standard is maintained by the SD Card Association.

Removable digital storage devices can be used in GMMs as either “data transfer” devices which are not necessary to the operation of the GMM or as “data storage devices” which are necessary to the operation of the GMM.

A USB flash drive is most likely to be used as a “data transfer” device. In a typical “data transfer” application, the USB flash drive is first connected to a computer with access to the web. The computer visits the GMM manufacturer’s web site and downloads the latest grain calibrations that are then stored in the USB flash drive. The USB flash drive is removed from the computer and plugged into a USB port on the GMM. The GMM is put into “remote configuration” mode to copy the new grain calibration data into the GMM’s internal memory. When the GMM has been returned to normal operating (measuring) mode the USB flash drive can be removed from the GMM.

Although an SD memory card could also be used as a “data transfer device” it is more likely to be used as a “data storage device”. In a typical “data storage device” application, the SD memory card stores the grain calibrations used on the GMM. The SD memory card must be plugged into an SD memory card connector on a GMM circuit card for the GMM to operate in measuring mode. To install new grain calibrations the GMM must be turned “off” or put into a mode in which the SD memory card can be safely removed. The SD memory card can either be replaced with an SD memory card that has been programmed with the new grain calibrations or the original SD memory card can be re-programmed with the new grain calibrations in much the same way as that described in the preceding paragraph to copy new grain calibrations into a USB flash drive. In either case, the SD memory card containing the new calibrations must be installed in the GMM for the GMM to operate in measuring mode. In that regard, the SD memory card can be considered a “permanent part” of the GMM in that the GMM cannot operate without it.

**Note:** In the above example “SD memory card” could be any removable flash memory card such as the Secure Digital Standard-Capacity, the Secure Digital High-Capacity, the Secure Digital Extended-Capacity, and the Secure Digital Input/Output, which combines input/output functions with data storage. These come in three form factors: the original size, the “mini” size, and the “micro” size. “Memory Stick” is a removable flash memory card format, launched by Sony in 1998, and is also used in general to describe the whole family of Memory Sticks. In addition to the original Memory Stick, this family includes the Memory Stick PRO, the Memory Stick Duo, the Memory Stick PRO Duo, the Memory Stick Micro, and the Memory Stick PRO-HG.

See the NCWM S&T Committee 2013-2016 Final Reports and the Grain Analyzer Sector 2013-2016 summaries for additional background information and to review the different proposals considered by the NCWM S&T committee and Grain Analyzer Sectors.

During the 2017 GA Sector meeting, the Sector members reviewed the proposed changes and by consensus agreed with the proposed changes to NIST Handbook 44, Section 5.56(a) and the General Code. The Sector recognized that the proposed paragraph S.2.5.3 included in the item for consideration as changes to NIST HB44 Section 5.56(a) is still under discussion (See agenda Item 5 in this agenda) and is not currently being proposed for consideration.

**Recommendation:**

Ms. Diane lee will update the sector on changes to S&T Item B7: Gen-2 and B7: GMM-2 since the 2018 NCWM Annual Meeting.

**5. Adding a Nonretroactive Requirement to NIST HB 44 Grain Moisture Meter Code 5.56(a) that Grain Moisture Meters meet Category 3 Sealing Requirements**

**Source:**

Grain Analyzer Sector

**Purpose:**

At the 2016 Grain Analyzer Sector Meeting during its discussion of Agenda Item 4 Address Devices and Systems Adjusted Using a Removable Digital Storage Device (S&T Developing Item B7: Gen-2 and B7: GMM-2) previously titled “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:

<i>Table S.2.5.</i>	
<i>Categories of Device</i>	<i>Methods of Sealing</i>
<b>Category 1<sup>1</sup>:</b> <i>No remote configuration capability.</i>	<i>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.</i>

<p><b>Category 2<sup>1</sup>:</b> <i>Remote configuration capability, but access is controlled by physical hardware.</i></p> <p><i>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</i></p>	<p><i>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.</i></p>
<p><b>Category 3<sup>2</sup>:</b> <i>Remote <u>and/or no remote</u> configuration capability access. Access may be unlimited or controlled through a software switch (e.g., password).</i></p> <p><i>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.</i></p>	<p><i>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.)</i></p>
<p><b>Category 3a:</b> <del><i>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.</i></del></p> <p><del><i>*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</i></del></p>	<p><del><i>Same as Category 3</i></del></p>
<p><b>Category 3b:</b> <del><i>No remote capability, but access to metrological parameters is controlled through a software switch (e.g., password).</i></del></p> <p><del><i>*When accessed for modifying sealable parameters, the device shall clearly indicate that it is in the</i></del></p>	<p><del><i>Same as Category 3</i></del></p>
<p><sup>1</sup> <u>Not allowed for devices manufactured on or after January 1, 2019</u></p> <p><sup>2</sup> <u>Required for all devices manufactured on or after January 1, 2019</u></p>	

[Nonretroactive as of January 1, 1999]  
 [\*Nonretroactive as of January 1, 2014]  
 (Amended 1998 and 2013 and XXXX)

**Background / Discussion:**

During discussion of Agenda Item 4 above during the 2016 GA Sector meeting, it was suggested that the Grain Moisture Meter Code requirements for sealing be changed such that all grain moisture meters are required to meet

category 3 sealing requirements as of a specific date; e.g. all grain moisture meters must have an event logger. With the increase in ease of switching out removable SD cards and making changes to metrological components it may be time to require a form of sealing that provides information on what was changed and the date of the change to the device. Category 3 sealing is currently required in NIST HB 44, Section 5.57, NIR Code. Manufacturers that were present at the meeting did not object to the proposal, but it was noted that all manufacturers were not represented at the meeting. During the 2016 GA sector meeting, Jim Truex also noted that we may need to consider State laws that require that a commercial device have a lead and wire seal. It was also mentioned that the proposed NIST, LMDP language for the general code would be redundant for the devices manufactured on or after the non-retroactive date because these meters will also require an event logger.

The current status for sealing methods of grain moisture meters are as follows:

Inactive Certificates of Conformance (CC):

- 9 inactive certificates; an inactive status for grain analyzers means that a CC was previously active for a device, but now the device is no longer being manufactured or remanufactured. Existing devices may be used, sold, or repaired and resold under inactive certificates. As such, these devices are likely still in use.
  - 3 inactive devices are *not* sealed using an event logger.

Active CC

- 9 active certificates
  - 1 active device is *not* sealed using an event logger.

The Grain Analyzer Sector members reviewed the proposed changes and provide comments and discussion on the proposed language for changes to the sealing requirements in NIST HB 44, Section 5.56(a). During the discussion States participants noted that they would rather have an event logger as it provides more information than a lead and wire seal and noted that when seals are removed no information is available to determine what changes were made to the grain moisture meter and agreed that the Category 3 method of sealing provides much more information to determine the changes made to the device. Some discussion was held on implementation with some older meters still having Category 1 sealing while others new devices would have Category 3 devices. Karl Cunningham mentioned that IL has a similar situation with NTEP and Non-NTEP meters in use in their State. Since as noted above currently, one active meter is not sealed using an event logger, the Sector recommended that additional work is needed to talk about impact of this requirement on manufacturers and to get additional feedback on an appropriate non-retroactive date for this proposed change.

**Recommendation:**

At the 2018 GA Sector meeting, the sector will discuss the impact of this change to the sealing requirements on manufacturers and any State laws that require other types of sealing. The GA Sector members are asked to review this agenda item for further discussion and to provide feedback during the Sector meeting..

**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 51<sup>st</sup> CIML Meeting. OIML R 59 *Moisture Meters for Cereal Grains and Oilseeds* was approved at the 51<sup>st</sup> 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](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](mailto: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.

At the 2018 GA Sector meeting manufacturers are asked to report on any impact from the use of this international standard.

## **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 51<sup>st</sup> 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](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](mailto: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.

At the 2018 GA Sector meeting manufacturers are asked to report on any impact from the use of this international standard.

## **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](http://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 oversight 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.

<b>Air Oven Grain Moisture Proficiency Testing Schedule (Previous PTs 1995, 2001 and 2015)</b>					
<b>PT Test Date 4 yr. Cycle</b>	<b>Sample Collection Date</b>	<b>Samples for Testing 2 of each (corn, wheat, soybeans)</b>	<b>Sample Ship Date</b>	<b>Responsible for Sample Distribution w/ Instructions</b>	<b>Responsible for Data Collection and Analysis</b>
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.

**Recommendation:**

Mr. Karl Cunningham will report on the Grain Analyzer Sector's 2018 grain moisture proficiency testing activities.

**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. After which, 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 protein.

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?

At the August 2014 Grain Analyzer Sector meeting USDA, GIPSA representatives provided an update on the activities concerning a phase II program for wheat protein. The Sector was informed that USDA, GIPSA is discussing funding options for this program. It was noted that the frequency of calibration for wheat protein is being considered and that this will impact the cost of the program. The Sector was also informed that Dr. David Funk is writing a discussion paper that will address many of the issues concerning a Phase II program for wheat protein.

**2015 Grain Analyzer Sector Report Update:**

USDA, GIPSA representatives mentioned that they are not aware of a discussion paper from Dave Funk concerning the feasibility of a Phase II program for Near Infrared Grain Analyzers. The sector should continue to provide feedback on the four bullet items listed above and USDA, GIPSA should provide any updates on any internal discussions.

**2016 Grain Analyzer Sector Meeting Update**

Mr Jordan, GIPSA, the NTEP Participating Laboratory for grain analyzers provided information on some work involving applying data transforms to spectra of multiple instrument models and provided an update of these activities along with others involved in considering Phase II testing for Near Infrared Grain Analyzers.

During the 2016 Grain Analyzer Sector meeting, the sector agreed that a program is needed based on observations and some feedback from sector members that review calibration data for these instruments. As such, the sector “brain stormed” ideas on what would be needed to develop a phase II program to periodically verify the calibrations on Near Infrared devices. The sector members generated the following information based on its discussion:

**Near Infrared Phase II Program Needs:**

- Set of robust samples that can be used every year,
- A reference laboratory to perform the testing,
- 100 samples for all meters or less per grain type on each meter,
- The program should verify calibrations for basic grains where there is a commercially impact to included protein in wheat, soybeans, barley, and corn and oil in corn and soybeans (it was noted during discussion that there is a large economic impact in the area of wheat protein and that protein and oil in corn and soybeans are used in many non-trade applications).
- The program would currently include a total number of three instruments (There are three instruments that measure protein and oil in the NTEP program)
- Testing should include a slope bias test for each 2 point intervals and include a confidence interval.
- The current NCWM, Inc policies for participating in the grain moisture phase II testing can be used for the near infrared phase II program.
- An estimate of the cost of the program is needed. There was also a question as to whether or not the cost of the program would be distributed among the participating manufacturers, similar to the Phase II program for grain moisture.

In addition to the discussion of program needs for Phase II testing for near infrared devices, it was noted that although States test near infrared devices for grain moisture measurements, not many States are evaluating these devices for protein or other grain constituents (oil or starch). The GA Sector also discussed the needs of State weights and measures jurisdictions in testing near infrared devices for protein, starch and oil. It was noted that State resources: staff and money are needed for testing and that currently, per the States that attended the Sector meeting, commercial transactions involving protein measurements are lower than for grain moisture measurements.

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 Hurburgh 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.

**Recommendation:**

During the 2018 GA Sector Meeting, Ms. Cathy Brenner and Dr. Charlie Hurburgh will share a cost analysis and discuss a proposed program for a Near Infrared Phase II testing program.

## **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 Moisture Meter Sector Meeting**

During the discussion of this item at the 2016 Grain Analyzer Sector meeting it was mentioned that this issue was raised when two states would not accept the new corn calibrations for grain moisture meters when they observed a difference in results for corn on different meter technologies. During the discussion, it was noted that the States that reported problems with the corn calibrations were States that have high ethanol production. It was explained that States with high ethanol production may have a high production of modified corn (corn modified to increase ethanol production). Since calibrations are based on a national sample set with grains collected from across the U.S., these modified samples may not have been included in the national sample set which could have contributed to the irregularities with the updated corn calibrations. It was suggested during the Sector meeting that modified corn samples be included in the national sample set and to monitor corn calibrations and modified corns for ethanol production. It was also noted that States should use the recommended procedures in NIST HB 44 when testing to ensure that errors are not introduced due to incorrect test procedures.

Following the discussion of this agenda item, Jeff McCluer, who had submitted an item to include on the 2016 sector agenda, that was ultimately not included on the agenda based on his request to change GIPSA tolerances, which is not in the scope of the GA Sector, presented information in reference to tolerance for UGMA meters. He explained that if the UGMA meter technology can make better measurements, he recommends that a reduction in the tolerances should be made. Charlie Hurburgh noted that the Sector has not conducted a study of the new technology and that a task force could be developed to look at the results of these meters. Charlie Hurburgh agreed to chair the task group to look at results from UGMA meters.

After some discussion with Dave Funk, Grain Quality Analytics, LLC and some research on the tolerances for UGMA meters. At the temperature extremes errors in measurement are increased so the tolerances were set to account for an average error in these meters. As such, the task group should include a review of the measurements at varying temperature ranges.

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.

### **Recommendation:**

During the 2018 GA Sector meeting, Dr. Charlie Hurburgh will provide an update on the task group activities.

## 11. Meter to Like-Type Meter Testing and Definition of Like-Type Meter

**Source:**

Grain Analyzer Sector

**Background/Discussion:**

Following the discussion of the Items included on the 2017 Grain Analyzer Sector's 2017 Agenda, the GA Sector members were asked if there were any additional topics for discussion. A discussion on Meter to like-type meter testing and the definition of a liker-type meter followed. During the discussion test procedures for meter to like-type meter testing were requested. It was noted that there may be only about two states using this type of test method and that it may be due to the cost of obtaining like-type meters to perform the test. A question was raised as to what is considered a like-type meter and it was explained that like-type meant that the make and model were the same. Suggestions were made to include a definition for like-type in NIST HB 44 and to consider documenting test procedures for meter to like-type meter testing.

**Recommendation:**

Ms. Diane Lee, NIST Technical advisor will review current State Weights and Measures procedures in use for meter to meter test methods.

## 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 ongoing 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.

**Recommendation:**

Ms. Cathy Brenner will provide an update of any anticipated changes in cost and operation for the 2020-2024 GMM Ongoing Calibration (Phase II) program.

## 13. Next Sector Meeting

The next meeting is confirmed for Tuesday, August 13, 2019 (8:00 am to 5:00 pm) at the Hyatt Place at the Kansas City, MO Airport.

If you would like to submit an agenda item for the 2019 meeting, please contact any of the following persons by June 1, 2019:

Mr. Jim Truex, NTEP Administrator at jim.truex@ncwm.net  
Ms. Diane Lee, NIST Technical Advisor, at diane.lee@nist.gov