Appendix B

National Type Evaluation Technical Committee (NTETC) Measuring Sector Annual Meeting

October 1 - 2, 2010
Columbia, South Carolina

Meeting Summary

Carry-over Items:

1. Table of Key Characteristics of Products in Product Families for Meters Table

Source: Carryover Item from 2006 - 2009 Measuring Sector Agendas

Purpose: For the past several years, the Measuring Sector (Sector) has been working to revise the "Product Family" tables in National Conference on Weights and Measures (NCWM) Publication 14 (Pub 14) with the goal of clarifying the tests to be conducted and products to be referenced on a National Type Evaluation Progam (NTEP) Certificate of Conformance (CC) based on NTEP testing. This item is included on the agenda to allow for review of a recent revision to the tables and to determine what additional work is needed.

Background: Since 2006, the Sector has been working to develop and agree upon revisions to the NTEP Technical Policy on Product Families for Meters. The Sector has considered multiple iterations of the table and various formats with the goal of providing NTEP laboratories and manufacturers with guidelines that will help to improve the clarity and consistency of application of product family criteria. Please see the 2006 - 2009 Measuring Sector Meeting Summaries for details.

At the end of its 2009 meeting, the Sector reached the following conclusion:

> Of three alternative versions of the table presented to the Sector during its 2009 meeting, the approach in which technologies are addressed in separate tables was viewed as a more appropriate approach. (**Note:** An example of this format is illustrated in Appendix C to the Sector's 2009 Meeting Summary in a draft table prepared by Mr. Henry Oppermann, W&M Consulting, and further revised and reformatted by Mr. Michael Keilty, Endress and Hauser.)
>
> Mr. Keilty agreed to continue to shepherd this work, coordinating with those who have expressed interest in this issue and welcoming additional input from other Sector members. Work was to be done to integrate the separated technology proposal with that presented at the 2009 Sector meeting. This newly edited version will be circulated among Sector members and discussed with those members who are able to attend the January 2010 NCWM Interim Meeting. Based on any comments received, additional revisions may be made prior to presenting a revised draft to the Sector at the 2010 Sector meeting. The goal is to develop a version for inclusion in Pub 14, in which it is easy to understand which tests and procedures must be followed for type evaluation testing.

Since the 2009 Sector meeting, Mr. Keilty has continued working with members of the Sector to refine the table. Mr. Keilty reported receiving suggestions at the January 2010 NCWM Interim Meeting to:

(1) align the products in each horizontal row; and
(2) insert a column for conductivity to the magnetic flow meter column.

Based on suggestions received and discussions at the last Sector meeting, Mr. Keilty made revisions to the proposed table as outlined in Appendix A to the agenda. The revisions also include the addition of product conductivity characteristics based on data received from Mr. Dmitri Karimov, Liquid Controls. Mr. Keilty noted that the first request to align product rows could not be easily accomplished and would significantly increase the page length of the table to make it unwieldy.

Discussion: The Sector was asked to review and comment on proposed changes to NTEP Technical Policy Section C. as shown in Appendix A to the Sector's 2010 Agenda. Sector Chairman, Mr. Keilty, indicated that there has been a lot of work done since the Sector's 2009 meeting. He proposed that the Sector consider adoption of the table included in the appendix and asked the Sector members present for comment on the latest draft.

Mr. Marc Buttler, Emerson Process Management - Micro Motion Inc., commented that the terminology used in the text of Policy C and the associated table may need to be examined more closely to ensure consistent use and understanding. In particular, it would be helpful to have a clear definition for family and category, and to have a

clear understanding of the difference between subgroups, families, and other terms. Such clarifications would help to ensure uniform understanding and application of the technical policy in the future. As an example of how the criteria could be misinterpreted, Mr. Buttler noted that the Test B definition refers to the CC covering "all products and categories" listed in the table within the specific gravity range listed. Interpreted literally, this would mean that even product categories included under Test D would be included on the CC, and he believes this interpretation is incorrect. Further, under the mass flow meter column, Test B refers to families and there is a similar reference under Test D. These tests are intended to provide coverage within families of products, which are still not completely defined. Likewise, if you consider Test F under magnetic flow meters, there is a reference to families. However, there is no definition or reference to that term elsewhere. Modifying the table by adding definitions for the terminology would help clarify the use of the table. Mr. Buttler noted that, if we can agree on the meaning of the terms, the text in the table and associated policy could be modified rather easily.

Some questions regarding specific values referenced for given products were raised and some modifications were made to the table during the course of the discussions. Additionally, Mr. Dennis Beattie, Measurement Canada (MC), noted that there are some products for which no values are listed. Mr. Keilty acknowledged that, for some products, we don't have the data available, just like we don't have information for conductivity in some instances. The Sector acknowledged that values for specific product characteristics can be added as that information becomes available, and noted that additional products can also be added over time. However, this is a start in providing the NTEP laboratories and manufacturers with additional data and guidance in assessing where particular products would fall in the families table.

Mr. Buttler questioned whether it is necessary to specify the type of viscosity being referenced under positive displacement meters. He also noted that it is necessary to consider the product characteristic relative to the metrology of the specific meter type. Mr. Beattie commented that one of Measurement Canada's engineers preferred the use of the term kinematic throughout the table. He also noted that they normally rate meters in centistokes as a more common term.

Sector Technical Advisor, Ms. Tina Butcher, National Institute of Standards and Technology (NIST) Weights and Measures Division (WMD), suggested that consideration be given to using the same format for all meter technologies to make it easier to see the demarcation between product categories. For example, mass flow meters and magnetic flow meters include columns with "typical products," "specific gravity," and "product category" whereas, positive displacement meters and turbine meters list "product category" in rows at various points in the table. Recognizing that page space might be an issue, consideration might be given to using the same format for all technologies.

At the conclusion of discussions on this item during the first day of the meeting, the Sector agreed that additional work might be done to the table, including assessing the use of the term kinematic (viscosity) throughout the document, considering deleting the term kinematic at the heading of the turbine meter column, and/or modifying footnote 5 to clarify its application. Mr. Buttler and Mr. Keilty volunteered to work on the additional changes to the table and present them for review by the Sector the following day.

One the second day of the 2010 Sector meeting, there was additional discussion of the table as modified overnight by Mr. Keilty and Mr. Buttler. The Sector further modified the table during the meeting and more discussion ensued. The Sector also agreed to modify the denominator of the equation defining kinematic viscosity as shown in Appendix A, to this meeting summary. Mr. Keilty summarized how the table was developed over the past couple of years, noting that the content extracted from the original tables has not changed much in the sense that ranges of products can be covered with a specific test(s); however, we have identified groupings with regard to specific products. He proposed that the Sector at least come to agreement on the reformatted structure, as shown in the table, with revisions during the meeting and asked the Sector for a vote.

Decision: After making revisions to the version of the table distributed with the Sector's agenda and lengthy discussion, the Sector agreed by a formal vote to recommend inclusion of the revised table (shown in Appendix A to this meeting summary) in the next edition of Pub 14. The results of the vote are as follows:

Yes	**13**
No	**1**
Abstain	**0**

The Sector also agreed to move the heated products to a single section in the final version of the table.

NTEP Director, Mr. Jim Truex noted that the table does not address brine used as a de-icing solution for roads. The NTEP Measuring Labs discussed this during their meeting on October 1, 2010, and agreed that this product is to be considered in the category of clear liquid fertilizers. However, Mr. Truex noted that the product won't be added to the table at this time, pending NTEP obtaining additional information about the specific characteristics of the product.

2. Testing Meters Made of Different Materials

Source: California NTEP Laboratory – Carryover from 2007-2009 Measuring Sector Agendas

Purpose: For the past several years, the Sector has been discussing the issue of how to assess variations in meter materials in conjunction with type evaluation testing. A key point of contention in these discussions revolves around changes to meter materials from that used in the meter evaluated during type evaluation. The NTEP laboratories would like more definitive criteria to help them assess when changes to meter materials are metrologically significant to the extent that additional testing should be required in order for the new material to be covered on the NTEP CC. Meter manufacturers generally believe that changes in materials should be left to the judgment of the manufacturer, since they must ensure continued meter performance for their customers, and as the designers of the meter, they well understand and take into consideration product and environmental applications and adjust materials accordingly to meet the needs of the end application. The issue is further complicated by the lack of definitive criteria that would guide the NTEP laboratories in making a decision about which meter materials should be selected for testing to be representative of a range of materials.

Background: In 2006, the Sector considered the following proposal for adding a new section to the Technical Policy Section of Publication 14 to address meters made of different materials within the same family.

U. Meters Made of Different Materials within the Same Family

When multiple meters made of different materials within a meter family are submitted for evaluation all meters will be tested with at least one product from each product family to be included on the CC, and at least one meter will be tested with the range of products required in the Product Family Table for the meter type (e.g., positive displacement, turbine, mass meter, etc.) submitted for evaluation.

The Sector was unable to reach an agreement at its 2006 meeting and again reviewed this issue at its 2007, 2008, and 2009 meetings, but was again unable to reach a consensus on the item.

After discussing this issue at great length at its 2009 meeting, the Sector concluded that it would not reach a resolution on this issue by continuing to discuss it at the Sector meetings alone. Consequently, the Sector agreed to form a work group (WG), the "Metrologically Significant Characteristics of Technologies WG," to arrive at a uniform, appropriate, and clear approach for initial, subsequent, and additional tests for the performance of a device technology. The following people agreed to serve on the WG:

Metrologically Significant Characteristics of Technologies Work Group		
Organization	**Name**	
Actaris	Mr. Rodney Cooper	Chair
FMC	Mr. Rich Miller	Co-Chair
Emerson Process Management - Micro Motion Inc.	Mr. Marc Buttler	
Murray Equipment	Mr. Paul Glowacki	
Tuthill Transfer Systems	Mr. Mike Guidry	
Gilbarco	Mr. Gordon Johnson	
Liquid Controls	Mr. Dmitri Karimov	

The WG was tasked to:

(1) Create a short list of features/options affecting the metrological characteristics of each device technology by December 15, 2009;

(2) Prepare a 1 page analysis that briefly documents and provides the rationale for including each metrological characteristic in the list (referenced in task 1) by December 15, 2009;

(3) Review the first draft list of "significant constituents" and condense that list to only relevant characteristics; and

(4) Prepare a final list for a WG meeting during the NCWM Interim Meeting by January 15, 2010.

Discussion: At the 2010 Sector Meeting, Sector Chairman, Mr. Keilty, Endress and Hauser, asked for an update from any members of the WG on the progress of this work. Mr. Rodney Cooper, Tuthill Transfer Systems, noted that when he was asked to serve as Chairman of this WG, he worked for Actaris; he has since switched jobs and, with the need to focus on making this transition, he has been unable to devote time to this activity. While he would be willing to try to continue in the capacity of Chair and possibly prepare something by the next Sector meeting, he does not believe his current assignments would allow him adequate time to work on the project. He also noted that his Co-chair, Mr. Rich Miller, FMC, has indicated that he, too, is very busy.

Mr. Keilty noted that he had previously proposed that the Sector drop this item; however, the Sector indicated that the item is important. He asked for input on the idea of dropping the item from the Sector's agenda. Mr. Cooper indicated that, while he believes the issue is still an important one, he believes that the revised product families table may address many of the concerns.

Mr. Jerry Butler, North Carolina NTEP Laboratory, indicated that the key issue was that manufacturers were responsible enough to monitor the materials on the meters. He also noted that a 20 day permanence test really isn't adequate to assess the effect of a given material on meter performance in a given application. He suggested that, perhaps, a large part of the burden needs to be placed on the device purchaser to ensure that the meter purchased is suitable for the application. Mr. Dan Reiswig, CA NTEP Laboratory indicated that he had raised this issue noting inconsistencies with alloys and materials and the way in which they were listed on CCs. He suggested that the laboratories could continue to work with individual manufacturers and, if an alloy is to be referenced on a CC, then testing needs to be conducted with that alloy.

Sector Technical Advisor, Ms. Butcher, NIST WMD, commented that a key part of this issue was the question of what was and was not covered by a given CC; one manufacturer might test a particular material and list it on the CC, but if another manufacturer doesn't list the material, there was a question of whether or not that material was covered. Without additional guidance in the NTEP policy, laboratories have to rely on individual manufacturers to provide guidance on the "worst case" scenarios to select for testing. Manufacturers who aren't candid may be permitted to get by with doing less stringent testing, putting those manufacturers who are more forthright at a competitive disadvantage. NTEP Director, Mr. Truex, added that NTEP does not want to have to test with lots of

different materials; however, if an inspector calls and asks about a material that isn't listed on the CC, then he would have to indicate that the meter made with that material is not covered. Mr. Truex indicated that he has serious reservations on hearing that there are still unresolved concerns on this issue (including that the material of the meter sold for a given application makes a metrologically significant difference), but that manufacturers will take care of this themselves. While most manufacturers such as those present at the table will probably do this reliably, NTEP deals with many, many companies and some companies are not so responsible. He further commented that in discussing this issue, the Sector is asking manufacturers to identify the "worst case" scenarios, otherwise NTEP will have to do it for them.

Mr. Keilty observed that the Sector's discussion on this issue seems to have evolved from the original discussion of meter materials into one of metrologically significant characteristics that are of importance to specific meter technologies. Mr. Wade Mattar, Invensys/Foxboro, commented that there is a fundamental difference between the metrologically significant features for a particular technology. Others noted that for some technologies, certain materials and products are metrologically significant and for other technologies those same variables make no difference.

Ms. Butcher reiterated that the NTEP Laboratories want to do the fewest tests possible and give manufacturers the most coverage based on those tests. Without guidelines, each laboratory will interpret this differently. The laboratories are asking for guidance on what is and is not metrologically significant with respect to meter materials, to help ensure that they are making consistent decisions regarding what can or cannot be covered on a CC, and so that it is clear to the inspector in the field whether or not a given meter is covered by a CC.

Mr. Cooper questioned whether we will come back to the Sector meeting next year and once again argue about the issue without resolution if we head in the direction of defining metrologically significant criteria for materials. He indicated he does not see any benefit to doing this. Mr. Buttler, Emerson Process Management - Micro Motion Inc., questioned why we are singling out materials. He noted that there are many other aspects of design that could be considered metrologically significant. If it is likely that material will make a significant difference, then it may be worthwhile to purse development of this issue; if not, then it's not worthwhile to continue with this issue. Mr. Truex commented that, if there is data that the manufacturer can provide, that would prove to NTEP that a particular attribute is not metrologically significant, then he believes this would be acceptable.

After further discussion on this issue without any apparent resolution, Mr. Keilty proposed dropping the item from the Sector's agenda.

Decision: After extended discussion of this issue once again, the Sector appeared no closer to resolving the concerns regarding meter materials than it had in the past. Since no one could suggest or support any course of action that would enable the Sector to reach a resolution, the Sector agreed to drop this item from its agenda.

3. Add Testing Criteria to NTEP Policy U "Evaluating Electronic Indicators Submitted Separate from a Measuring Element"

Source: California NTEP Lab

Background: At its 2007 meeting, the Sector heard that Section U. of the NTEP Policy in Pub 14 allows for testing an indicator separate from a measuring element. However, specific test criteria had not been developed for this section. The Sector heard a recommendation to develop and add specific criteria for testing an indicator separate from a measuring element for this section. From 2007 to 2009, the CA NTEP laboratory worked to develop a checklist, but had received limited input on the drafts. At the 2009 Sector meeting, Mr. Reiswig, CA Division of Measurement Standards (DMS), provided an update to the Sector on progress to develop criteria for separate electronic indicators. He reported that the draft checklist provided to the Sector follows the general format of Pub 14, and the main test procedures are at the end of the document. Questions were raised about the readiness of the checklist for inclusion in NCWM Pub 14. The Sector agreed that some additional work is needed and suggested that a small WG be formed to further develop the checklist. One additional question to consider is whether or not the checklist would apply to indicators across all technologies and applications.

At the conclusion of its 2009 meeting, the Sector agreed to the following:

- A small WG comprised of the following individuals is to further review and discuss the checklist.

Electronic Indicators Checklist Development Work Group		
Organization	**Name**	
Actaris	Mr. Rodney Cooper	
Tuthill Transfer Systems	Mr. Maurice Forkert	
Liquid Controls	Mr. Dmitri Karimov	
FMC Technologies	Mr. Rich Miller	
Veeder-Root	Mr. Dave Rajala	
NIST WMD	Mr. Ralph Richter	
CA DMS	Mr. Dan Reiswig	Checklist Developer

- The WG will provide input to Mr. Reiswig at least one month prior to the March 2010 NTEP Laboratory Meeting. Mr. Reiswig will provide this input to the Measuring Laboratories. One additional question the WG will consider is whether or not the checklist would apply to indicators across all technologies and in all applications.

- Following the March 2010 NTEP Laboratory meeting, Mr. Reiswig will modify the draft checklist based on feedback from the NTEP Measuring Labs.

- Mr. Reiswig will provide a copy of the draft checklist to the NIST Technical Advisor by the end of August 2010 to allow for distribution to the Sector one month prior to the fall 2010 Sector Meeting.

- Following the fall 2010 Sector meeting, Mr. Reiswig will work with Sector Technical Advisor Ms. Butcher, NIST WMD, to update the draft checklist to reflect comments from the Sector.

- Assuming the checklist requires no further modification or review by the Sector, Ms. Butcher will submit the checklist to the NTEP Committee to consider for inclusion in the 2011 version of NCWM Pub 14.

Discussion: The Sector heard an update from Mr. Reiswig who indicated that he distributed the checklist with a request for comments; however, none were received other than from the other NTEP Laboratories. There were some members of the WG who indicated that they might discuss it at the January 2010 NCWM Interim Meeting, but he did not hear back from anyone regarding whether or not such a meeting took place. He has consulted with Measurement Canada and attempted to incorporate ideas from their procedures into the draft checklist. Mr. Reiswig believes the checklist still needs a lot of work before it is finalized. He noted that the key motivation for developing such a checklist is to help ensure that all of the NTEP Laboratories are conducting evaluations of indicators consistently. Thus, he felt that it is still important to pursue development of the checklist, but noted that he particularly needs help from industry.

NTEP Director, Mr. Truex, recognized the amount of work that Mr. Reiswig has put into the development of the draft and pointed out the importance of having industry review the checklist to determine if it is ready to be finalized.

Mr. Cooper, Tuthill Transfer Systems, who was the only other individual (besides Mr. Reiswig) from the original WG present, pointed out that when he initially agreed to participate on the WG he worked for Actaris, a company that made digital indicators, where he could have consulted with engineers responsible for designing indicators. Though Mr. Cooper would like to be able to help, he has changed companies and he doesn't feel he has the individual expertise needed to assist.

During discussions of this item on the first day of the Sector meeting, the Sector concluded that it would be helpful for Mr. Reiswig and the other NTEP Laboratory representatives to identify a list of specific areas where work is needed in order to finalize the checklist. This list would also assist the Sector in identifying people in the industry who would best be able to assist as subject matter experts in those areas.

On the second day of the Sector's meeting, Mr. Reiswig presented a list of five areas of the checklist that need specific attention and review. The Sector reviewed these items and added some additional comments.

Decision: The Sector agreed that Mr. Reiswig, CA Division of Measurement Standards (DMS), should continue developing the Checklist for Electronic Indicators Submitted Separate from a Measuring Element.

The Sector identified the following points that require further development and input from industry in order to finalize the checklist.

1. **It is recommended to run a minimum of 10,000 pulses when verifying pulses captured. Should we consider specifying a minimum number of pulses/division? For example, 100 pulses = 1 indication division or 10 pulses = 1 indication division.**

2. **Would a limit of "plus or minus 1 pulse in 10,000" be an appropriate tolerance?**

3. **Test with low, medium, and high temperature inputs to the indicator to verify a temperature compensation function, if available. Test with a minimum of two API Gravity values through the temperature test ranges tested. Identify and specify reference tables.**

4. **Develop a test to verify multi point calibration using pulses.**
   Include frequencies for switchover of linearizations. For example, specify a certain number of pulses per liters.

5. **The tests listed above are based on an indicator receiving pulses from a measuring element. Therefore, it would seem logical to also develop tests for an indicator to verify other process signal output from other elements in the system that is sent to indicators such as frequencies at 4-20 milliamps, or other process signals.**

The Sector also identified the following people who might be able to provide additional input and asked that Mr. Reiswig also contact them to request their assistance.

Possible Industry Contacts to Assist in Review of Draft Electronic Indicators Checklist			
Organization	**Name**	**Organization**	**Name**
Contrec	Mr. Jef Gaskil	Itron	Mr. Mike McGhee
Dresser Wayne	Mr. Phil Katselnik	Kraus Global	Mr. Gord Wedel
Emerson (Daniel)	Mr. Andrew MacAllister	Liquid Controls	Mr. Dmitri Karimov
Emerson Process Management - Micro Motion Inc.,	Mr. Marc Buttler	Measurement Canada	Mr. Dennis Beattie
Endress and Hauser	Mr. Michael Keilty	Midwest Meter	Mr. Rick Salvesen
FMC	Mr. Rich Miller	Toptech	Mr. Jim Xander
Gilbarco	Mr. Gordon Johnson	VeederRoot	Mr. Kevin Jensen
Invensys	Mr. Wade Mattar		

The Sector agreed that Mr. Reiswig should forward the latest draft of the checklist along with the five areas requiring specific attention to the people listed in the original WG and to the list of possible contacts above. Mr. Reiswig should ask for their assistance in reviewing and commenting on the checklist, noting that input on the five areas would be of particular help.

4. Policy C - Product Family Table – Change in Upper Limit for Oxygenated Blends – Note 4

Source: Mr. Gordon Johnson, Gilbarco, Inc.

Background: At its 2009 meeting, the Sector was asked to review Pub 14, Technical Policy C. Product families for meters, Note 4 in the product families table, which currently states:

"Gasoline includes oxygenated fuel blends with up to 15% oxygenate"

The Sector was asked to consider changing the oxygenated fuel blends from 15 % to 25 %. The new Note 4 would read:

"Gasoline includes oxygenated fuel blends with up to 25% oxygenate"

At that time, Mr. Johnson, Gilbarco, Inc., advised the Sector that UL recently issued UL87A Edition 5, which details the tests and specifications needed to list dispensers for Ethanol and Ethanol blends. Mr. Johnson also outlined the history of this issue, noting that UL has made several significant changes to UL 87 (to include an alternative fuel standard) as a result of a push by EPA to coincide with a federal mandate to increase the levels of ethanol in vehicle fuel. He proposed changing the current reference in Pub 14 from 15 % standard to 25 %, noting that he has no data to illustrate the impact of the change. He indicated that both Gilbarco and Wayne are completing tests for E85, but no tests have been conducted for 25 %. He also noted that there was not enough ethanol in production and he anticipated a gradual increase in the amount of 25 % fuels. He expressed concerns that weights and measures officials will tag devices out of service if equipment is used to deliver product above 15 % without a corresponding increase on the application section of NTEP CCs.

At the 2009 Sector meeting, the NTEP Measuring Laboratories agreed additional data is needed to support increasing the limit. After discussing this issue at that meeting, the Sector was unable to reach agreement on the proposed change to policy C. The Sector expressed its appreciation to Mr. Johnson for information on changes to the fuel standard and agreed that this should remain an information item on the Sector's agenda. See the 2009 Measuring Sector summary for details.

Discussion: As agreed to at the last Sector meeting, this item was included on the agenda to allow Sector members to provide any updates they might have on this issue.

At its 2010 meeting, the Sector discussed the history of this item and the meaning of the clause in Note 4 of the Product Family table. Summarizing from last year's discussion, Technical Advisor, Ms. Butcher, NIST WMD, noted that the footnote does not preclude someone from submitting and testing for product with up to 25 % oxygenates; the footnote would simply not permit the higher (than 15 %) percentages to be covered without additional testing. When the Sector discussed this item last year, there was no available data on 25 % oxygenate blends, and that, because there was no UL approval on the units used to dispense the higher blends, it was not possible to conduct testing to demonstrate compliance. Several NTEP Lab representatives expressed the desire for additional data before extending the range to cover a larger percentage of oxygenate. Consequently, there was not support for making the proposed modification to Note 4 of the table.

Decision: The Sector did not support increasing the upper limit referenced in Note 4 of Policy C - Product Family Table from 15 % to 25 % and decided to drop the item from its agenda. The Sector notes that the submitter can resubmit the item; however, the NTEP Laboratories have advised that they would want to see data supporting the proposed change before they would consider expanding the upper limit. In the meantime, this decision does not preclude a company from submitting a meter for use with a higher percentage of oxygenate; it simply means that additional testing would be required in order to cover the higher percentage.

5. Electronic Linearization for Positive Displacement Meters

Source: Mr. Maurice Forkert, Tuthill Transfer Systems

Background: At its 2009 meeting, the Sector was asked to add criteria into Pub 14 for electronic linearization for positive displacement meters. Mr. Forkert suggested considering, if permissible, Measurement Canada's "Approval Procedure for Linearization Functions Incorporated in Measuring Systems" (Document Number VO-AP-037) as the basis for the criteria. Mr. Forkert noted that there apparently is no regulation for electronic linearization internal to a positive displacement meter. He also suggested some additional revisions to the Measurement Canada document (see 2009 Sector Summary for details).

In discussing this issue, reference was made to Pub 14 Policy G. Range of Data Points, which addresses the use of "multi-point calibration." This policy specifies that "multi-point calibration" must be "blind and integral" which, according to the policy, is intended to mean it is programmed during the manufacture of the device and is not accessible in the field. The policy also prohibits multi-point calibration from being used as a means to establish the minimum turn down ratios of 5:1 or 10:1; however, it does allow the feature to be used to extend the measuring range beyond the minimum ratios. In discussing how this policy is to be applied in conjunction with Mr. Forkert's example, there were questions regarding the use of the term "blind and integral." Several members noted that a better definition of the term is needed in order to ensure consistent understanding of the term and its use in the application of requirements.

Mr. Forkert explained that his company had introduced a meter into the market with a linearization board and was advised by the weights and measures authority that there were no regulations to address that component. He recommended including the feature as allowable in the register, and to not require a separate evaluation of this component. He explained that the part could not be removed or modified without breaking a seal. He also requested that the e-linearization feature be considered as part of the meter just as the pulse output component is looked at as part of the meter.

Mr. Oppermann, Weights and Measures Consulting, commented that industry wants to be able to use e-linearization as a means to improve the performance of a meter and noted that this has been done for years with scales and load cells. Provided the performance is within acceptable levels, it should not matter how this is accomplished.

Mr. Forkert noted a distinction in his scenario is that they want the e-linearization feature to be considered a part of the meter, much as one would consider other components of the device. Understanding that the e-linearization feature is used to individually program each meter at the factory, some NTEP laboratory representatives expressed concerns about the possibility of interchanging parts in the field and the impact on meter performance, and questioned what means would be provided to deter field replacements. Some manufacturers noted that this should be viewed no differently than replacing other metrologically significant parts in the field; for example, meters are not shipped back to the factory for replacement of a rotor and replacement of the e-linearization board should be viewed in the same light. It is up to the user/installer to ensure continued compliance with accuracy and other requirements.

There were also questions during the discussion regarding whether or not the e-linearization feature should be listed as a feature on the CC. Some pointed out that other device types use metrologically significant components that can be replaced in the field when problems are encountered. Repairs, adjustments, or changes to these features are generally obvious or detectable. Mr. Steve Patoray, Consultants on Certification, gave several examples of weighing device applications such as load cells (which are not repairable in the field), junction boxes (which can be protected by a security seal), and electronic boards (which are completely replaced when they fail).

The Sector discussed developing language to clarify the application of Policy G., but was unable to reach a conclusion at the meeting. While they did not identify a specific alternative, there was general agreement that the electronic linearization that is programmed during the manufacture of a device should not be readily accessible in the field without breaking an approved seal. The NTEP Labs expressed concern regarding the unique nature of the programming and how interchange of the e-linearization board would be controlled in the field to prevent the

facilitation of fraud. The Sector agreed that this issue requires additional work that would best be accomplished by a small WG.

At its 2009 meeting, the Sector agreed that a small WG comprised of the following individuals be established to further develop this issue for the Sector's review.

Developing Electronic Linearization Criteria Work Group		
Organization	**Name**	
Consultants on Certification	Mr. Steve Patoray	Work Group Chairman
Tuthill Transfer Systems	Mr. Maurice Forkert	
Maryland NTEP Laboratory	Mr. Mike Frailer	
Tuthill Transfer Systems	Mr. Mike Guidry	
Liquid Controls Corporation	Mr. Dmitri Karimov	
FMC	Mr. Rich Miller	
Meggitt/Whittaker Controls	Mr. Ken Smith	

The WG was tasked with the following:

1) Clarify Policy G. Range of Data Points by bouncing ideas off of Mr. Mike Frailer for:
   a. Defining what is meant by multi-point calibration shall be "blind and integral" to the measuring element.
   b. Clarifying what is meant by multi-point calibration shall be not "accessible" in the field.

2) Develop language in Policy G. Range of Data Points to allow for uniform interpretation and application of the criteria by the United States and Canadian stakeholders by February 2010, including:
   a. Where necessary to clarify the intent of the criteria:
      i. Modify language
      ii. Define terminology

3) Review and Discuss Modifications to Policy G. at the March 2010 NTEP Measuring Lab Meeting

Discussion: The Sector asked for an update of the WG's progress.

Mr. Frailer, Maryland NTEP Laboratory, indicated that he has had no contact from any members of the WG on this issue.

Mr. Cooper, Tuthill Transfer Systems, reported that he visited with Mr. Maurice Forkert, Tuthill Transfer Systems, on this issue. He noted that they are attempting to clarify that it is necessary to break a seal to access meter adjustments, and he proposed the following alternative language for the Sector to consider:

> "Multi-point calibrations shall be blind and integral (programmed during manufacture and not accessible in the field without breaking a physical seal)."

Mr. Butler, North Carolina, NTEP Laboratory, questioned whether the term "blind and integral" is referring to something that is part of the meter that cannot be replaced or if it is referring to something else. Other Sector members asked for clarification on various aspects of how Tuthill's meter works.

Mr. Cooper clarified that, in Tuthill's instance, the meter does all calculations within the meter; it does not rely on a separate device such as a controller for those adjustments. He noted that their meter has a programmable chip that is inside of the mother board of the device. The programmable chip is accessible by removing a cover and several screws. By using the program in the chip, it is possible to get a very flat curve, thus, taking a really good meter and making it even more accurate. Their product uses the same mother board for all meters across the product lines. The small, programmable chip has different pulses per gallon for different meters. If the mother board on a given meter were damaged, they would send a new mother board with a new chip with the exact same profile as the

original one for that individual meter. The mother board has all of the electronics in the meter; no matter which indicator is used with the meter, it will always provide the same output.

Technical Advisor, Ms. Butcher, NIST WMD, asked for clarification that the meter cannot be adjusted at multiple points along its calibration curve in the field. You can break a seal and change the chip; you can replace the chip with a chip with another profile, but you can't selectively calibrate the meter at different points. This is unlike a meter that is interfaced with an indicator in which you can adjust the meter factor at different flow rates along its curve. Mr. Cooper indicated that this is correct.

Mr. Reiswig, California NTEP Laboratory, expressed concern over the possibility of being able to interchange a reprogrammed mother board in the field. The Sector discussed at length how the term "blind and integral" is being used in Tuthill's scenario as well as in other instances and also discussed whether or not these various approaches would facilitate fraud. The Sector also discussed the importance of a meter being able to meet the basic 5:1 (or 10:1 in the case of a mass flow meter) turndown ratio without being calibrated at multiple points. The Sector also discussed whether or not there is justification for prohibiting multiple point calibration from being used to meet the minimum turn down ratio; however, there was not a clear consensus on this point. Some members also cited concerns about various types of adjustments being used to compensate for worn or poorly designed meters.

Mr. Beattie, Measurement Canada, commented that it appears we are giving two different features the same name. He associates the term "multipoint calibration" with something that is accessible in a register and that can be programmed in the field. He suggested that the Sector consider using the following International Organization of Legal Metrology (OIML) definition for "correction device:"

> OIML Definition for Correction Device:
>
> > "Device connected to or incorporated in the meter for automatically correcting the measured quantity at the time of measurement, by taking into account the flowrate and/or the characteristics of the liquid to be measured (viscosity, temperature, pressure, etc.) and the pre-established calibration curves.
> >
> > The characteristics of the liquid shall either be measured using associated measuring devices, or stored in the memory of the instrument."

Mr. Cooper commented that OIML refers to the meter as a complete system. He suggested that the OIML terminology might make this issue overly complex and that we should strive to keep this issue simple. Mr. Cooper also noted that the multi-point calibration is not a correction device in this instance. If you can program this inside the meter and, after it leaves the factory you can't change it, then it is "blind and integral to the meter." We want to simply say that you can't change it after it leaves the factory.

Following discussions on this issue the first day of the meeting, Mr. Cooper drafted alternative language for the Sector to consider. After further discussions on the issue, the Sector finally agreed on recommended changes to Policy G.

Decision: The Sector agreed to recommend that the second paragraph of Technical Policy G be replaced with the following:

> **A measuring element may use factory-established linearization curves to establish the minimum flow range (5:1, 10:1, or as required), providing the linearization programming is installed during manufacturing and the programming cannot be altered after leaving the manufacturer.**
>
> **Auxiliary equipment (e.g., indicator or register) with programmable multi-point calibration that alters the output signal from the measuring element to extend the flow range of the system beyond the measuring element's required minimum flow range may be used and the auxiliary device's multi-point calibration will be noted on the CC and must be marked on the meter.**

New Items:

6. Code Reference S.1.6.1. Indication of Delivery – Reference to Indicator Reset

Source: Mr. Dmitri Karimov, Liquid Controls

Background: The Sector was asked to consider modifying Pub 14 LMD Checklist Code Reference S.1.6.1. Indication of Delivery (see page LMD-29) by adding a "Note" to Step 5, as follows:

Code Reference: S.1.6.1. Indication of Delivery

7.25. Retail devices shall automatically show their initial zero condition and amount delivered up to the nominal capacity of the device. For electronic devices manufactured on or after January 1, 2006….to ensure delivery starts at zero.

7.26 For electronic devices manufactured prior to January 1, 2006….need not be indicated.

Test Method Steps:

Step 1: Set unit price on dispenser.
Step 5: Activate the dispenser and let the system reset to 8s, blanks then 0s.

Note: Display segment check instead of "8s and blanks" is allowed.

Putting aside the fact that there is no code reference that specifies an indicator must initially displays "8's and blanks," this requirement might be applicable only to the old-style cathode tube-based displays. This requirement is not applicable to LED displays, which perform a segment check of the display.

In addition to the above reference to the NTEP LMD checklist, the submitter provided the following reference to OIML R 117-1, Page 55:

From R 117-1 (page 55)

a) For fuel dispenser

- displaying all the elements ("eights" test if appropriate); and
- blanking all the elements ("blank" test), and displaying "zeros" for quantity, and, if applicable, displaying the valid unit price and "zeros" for price, just before a new delivery starts. Each step of the sequence shall last at least 0.5 second.

b) For all other interruptible and non-interruptible measuring systems, the test sequence shall be as described under (a) (above) or any other automatic test cycle which indicates all possible states for each element of the display.

Discussion: Mr. Beattie, Measurement Canada, asked whether or not there is a specific reference to the reset display in NIST Handbook 44 (HB 44). Sector Technical Advisor, Ms. Butcher, NIST WMD, noted that there is not a specific reference in the Liquid-Measuring Devices code; however, there are General Code requirements specifying that a device must be in proper operating condition. Additionally, she noted that this checklist item is addressing a return to zero, not the segments. It might be appropriate to have something specific to address unlit segments. Sector Chairman, Mr. Keilty, Endress and Hauser, and NTEP Director, Mr. Truex, also cited references in the General Code, paragraphs G-S.5.1. Indicating and Recording Elements, General and G-S.6. Marking Operational Controls and Features that could be used to address malfunctioning displays.

The NTEP Measuring Labs reported meeting prior to the Sector meeting and suggested a proposed alternative (outlined in the Decision below) to address the issue. The Sector reviewed the proposed alternative and agreed that it appears to address the concern raised by the submitter.

Decision: The Sector agreed to recommend modifying Step 5 as follows to recognize other methods for resetting the indications:

Step 5: ~~Activate the dispenser and let the system reset to 8s, blanks then 0s.~~ Activate the dispenser and let the system reset to zero (for example, showing "8's" and then zero; running through a segment check, or using another method of resetting the system).

7. Development of Water Meters Checklist

Source: Mr. Andre Noel, Neptune Technology Group, Inc.

Background: Utility type water meter manufacturers are receiving state requests for a NTEP Certificate of Approval. Utility type water meters under HB 44, Section 3.36. are evaluated under the California Type Evaluation Program (CTEP). Currently there is no NTEP for utility type water meters. The Sector was asked to consider adding a checklist for utility type water meters to Pub 14. Mr. Andre Noel, Neptune Technology Group, distributed (via e-mail) a draft checklist to the Sector Chairman, NTEP Director, and Technical Advisor the night before the Sector meeting; he also offered copies to those interested at the Sector meeting.

Discussion: At the Sector meeting, Mr. Noel provided an overview of this item. He noted that he and representatives from other water meter manufacturers have been working quite a bit with CA DMS, which does most of the testing of water meters in the United States for those water meters regulated by weights and measures jurisdictions. Presently Certificates are issued under the California Type Evaluation Program, and, if a checklist and test procedures were developed for inclusion in Pub 14, then the scope of water meter testing could be expanded to include NTEP testing. Mr. Noel proposed establishing a small WG to work on the development of a checklist and present it to the Sector for consideration.

The Sector was amenable to establishing a WG to work on the development of a checklist. Mr. Beattie, Measurement Canada, asked that Mr. Jim Welsh, Measurement Canada, be included in any mailings and correspondence since MC is currently working on its water meter criteria (Mr. Beattie confirmed this with Mr. Truex via e-mail during the Sector meeting). Sector Technical Advisor, Ms. Butcher, NIST WMD, asked that Mr. Ralph Richter, NIST WMD, be copied on any WG correspondence since he is the U.S. technical point of contact for OIML R49 (Water Meters). NTEP Director, Mr. Truex, noted that this draft should be circulated to as many people in the community as possible.

Mr. Reiswig, California DMS, advised the Sector that he put together a draft checklist a few years ago, and circulated the document. He noted that, in the draft presented to the Sector, Mr. Noel has made some changes to the original document, and for some of the changes, California DMS is not in agreement with the proposed changes. For example, with regard to the number of meters to be tested, California tests three meters of the same model. This is a bit different from what NTEP does in testing other meter types; however, the testing process is different for water meters in that three meters can be tested at one time on a water meter test bench. Additionally, conducting only nine tests on a water meter still provides an extremely limited data set for a meter that is used so widely in apartment buildings. An additional area of discussion is the flow rates at which the meters are to be tested. Mr. Reiswig noted that California DMS is in closer agreement to the proposed procedures now than previously, and anticipates continued work will allow these differences to be resolved. Mr. Reiswig noted that his comments are reflected using track changes in the document that Mr. Noel has submitted.

Mr. Keilty, Endress and Hauser, questioned the inclusion of criteria for remote communication in the draft checklist and asked whether event counters would be required. Mr. Reiswig explained that the criteria were included because California anticipates seeing this type of feature on meters in the future. Ms. Juana Williams, NIST WMD, also suggested that the HB 44 Water Meters Code be examined with regard to any proposed audit trail criteria to be sure that the proposed criteria is supported by the code; if not supported, a proposed change to the code might need to be considered. Likewise, the WG might be alert to other proposed changes to the code which would update the code to reflect current technology. Ms. Butcher, suggested that as the group reviews the code and develops the checklist, that it examine American Water Works Association standards and consider proposed changes to the code and/or

checklist. Manufacturers have criticized the HB 44 Code for divergence from AWWA standards, and this might be an opportune time to propose changes to either HB 44 or to AWWA to harmonize standards where appropriate. In some instances differences may make sense since the focus of HB 44 and AWWA are somewhat different; however, if there are areas where the standards can be better aligned, we should consider taking steps to do so. Additionally, it would be helpful to make the NCWM Specifications and Tolerances (S&T) Committee aware of needed changes to HB 44.

Mr. Keilty asked whether or not the draft checklist might be ready for circulation to the Sector by the 2011 NCWM Interim Meeting, with the ultimate goal of readying the checklist over the next year for publishing in the 2012 edition of NCWM Pub 14. Mr. Noel and Mr. Reiswig indicated that this could be accomplished.

Decision: The Sector agreed to establish a WG to further develop the draft checklist presented to the Sector at its October 2010 meeting. The WG consists of:

Water Meters Checklist Development Work Group	
Member	**Company/Organization**
Mr. Andre Noel	Neptune Technology Group
Mr. Dan Reiswig	California Division of Measurement Standards
Mr. Jim Welsh	Measurement Canada (MC) (pending confirmation by Mr. Dennis Beattie)

Mr. Noel will forward the draft checklist to other companies such as those who hold CA type approval certificates to ensure that it gets wide distribution. Mr. Beattie, MC, will contact Mr. Welsh, MC, and confirm that it is acceptable for Mr. Noel to forward the document to Mr. Welsh for input from MC.

In developing the checklist, the group is asked to:

(1) Identify areas in HB 44 Section 3.36. Water Meters Code where changes might be appropriate to update the criteria to reflect current technology and practices. For example, more specific audit trail criteria may need to be added to the Water Meters Code.

(2) Forward any proposed changes to HB 44 to the NCWM S&T Committee via the established NCWM process by preparing and submitting NCWM Form 15 to the regional weights and measures associations and NTETC Measuring Sector.

(3) Consider any differences between AWWA standards and NIST HB 44 and consider recommendations for aligning the two documents where that makes sense.

(4) Copy the Measuring Sector Chairman, Mr. Keilty and Technical Advisor, Ms. Butcher on communications to the group.

(5) Copy Mr. Richter, NIST WMD, who is the U.S. point of contact for OIML R49 with any proposed drafts.

(6) Distribute a subsequent draft for review by the Sector by the January 2011 NCWM Interim Meeting.

(7) Distribute a final draft for review by the Sector at least a month prior to the fall 2011 Sector meeting.

This item will be maintained as a Carryover Item on the Sector's agenda.

8. Development of Hydrogen Gas-Measuring Devices Checklist

Source: NIST Weights & Measures Division

Background: At the July 2010 NCWM Annual Meeting, NCWM members voted to add a tentative code for commercial hydrogen gas-measuring devices to HB 44. Since the majority of states require NTEP CCs for commercial weighing and measuring devices, offering NTEP CCs for these devices would facilitate the acceptance of these devices in the commercial marketplace and assist states in their assessment of these devices.

The Sector was asked to discuss and consider the following:

(1) Propose that the NTEP Committee consider expanding the scope of NTEP evaluations to include hydrogen gas-measuring devices.

(2) In anticipation that the NTEP Committee will support this proposal, establish a small work group tasked with the development of a checklist for hydrogen gas-measuring devices.

Discussion: NTEP Director Mr. Truex noted the importance of developing a checklist for hydrogen gas-measuring devices in a timely manner. Now that a tentative code has been adopted, manufacturers of this equipment will begin seeking type evaluation on these devices. Particularly since this equipment is already in use, Mr. Truex commented that we are already behind in the development of a checklist. He cited a similar situation with Multiple Dimension Measuring Devices and noted the importance of involving all parties affected by the code, including manufacturers, users, regulatory officials, and NTEP laboratories. Mr. Truex also noted that, since alternative fuels are highly visible, some jurisdictions may get political pressure to accept devices in advance of finalizing the HB 44 code and NTEP checklists. Mr. Truex also cited the paragraph included in the application section of the tentative code which states that NTEP will only accept for type evaluation those devices which comply with the provisions of the code.

Sector Chairman, Mr. Keilty, Endress and Hauser, suggested establishing a small WG of Sector members to develop a draft for consideration by the Sector. Technical Advisor, Ms. Butcher, NIST WMD, recommended including Sector members who have served on the U.S. National Work Group (USNWG) for hydrogen, since they would be familiar with the criteria included in the draft code and represent many of the interest groups noted by Mr. Truex. Sector members present were amenable to the idea of establishing a WG to work on a draft checklist.

Several members noted that California DMS had developed a draft checklist in 2008 and NIST WMD provided comments on the checklist; however, the work had been set aside pending further development of the HB 44 code. Now that the code has been adopted as a tentative code, this checklist could be resurrected and updated to reflect the provisions of the tentative code. Ms. Butcher noted that the USNWG is continuing to work on developing recommended test procedures for hydrogen gas-measuring devices; she suggested that work could move ahead in developing the portions of the checklist other than the test procedures section, including updating the draft developed by California DMS to the current tentative code requirements; once the USNWG has completed its work on recommended test procedures, the WG would have information that could be used as the basis for developing more detailed type evaluation test procedures. Ms. Williams, NIST WMD and Technical Advisor to the USNWG on Hydrogen Measuring Devices, advised the Sector that last year Ms. Diane Lee, NIST WMD, developed and circulated a draft EPO and associated Excel spreadsheet for use in testing hydrogen-gas measuring devices; while the draft is not final, this information might also be of use to the WG. She also noted that the USNWG members provide links to the broader hydrogen measurement community, and many, including herself, are involved in international standards development such as OIML R139 (which addresses compressed gas motor fuels) and OIML R81 (which addresses liquid hydrogen). Ms. Butcher commented the test procedure developed by NIST WMD is based on other NIST examination procedure outlines (EPOs) for gravimetric testing, and NIST has questions about the uncertainties associated with gravimetric testing for these devices given the relatively small net quantities involved and the availability of appropriate equipment in field environments. Consequently, the USNWG is actively exploring other alternatives to find the best solution for field testing. Mr. Reiswig, California DMS, noted that California DMS has contracted with the California Energy Commission for the development of field test equipment and procedures and, while there have been delays as a result of the contracting process, he anticipates this work will provide input for the WG to use.

Decision: The Sector established a small WG to develop a draft Pub 14 Hydrogen Measuring Devices Checklist for the Sector to consider at its next meeting. The WG consists of the following:

Work Group on Hydrogen Gas-Measuring Devices NTEP Checklist	
Member	**Company/Organization**
Mr. Michael Keilty (Work Group Chair)	Endress and Hauser
Mr. Dennis Beattie	Measurement Canada (to link to expert MC's compressed gases area)
Mr. Marc Buttler	Emerson Process Management - Micro Motion Inc.
Mr. Mike Gallo	CLEANFUEL USA
Mr. Dan Reiswig	California Division of Measurement Standards
Ms. Juana Williams	National Institute of Standards and Technology

The WG will begin by reviewing a draft checklist prepared in 2008 by Mr. Norman Ingram, California Division of Measurement Standards. Ms. Williams will contact Mr. Ingram to ask that he send a copy of the checklist to the members of this WG to ensure that everyone is working on the same version of the checklist. The WG will:

(1) Update the checklist to correspond to the 2010 version of the Hydrogen Gas-Measuring Devices Code (adopted by the NCWM in July 2010);

(2) Review the checklist and provide comments to Sub Group Chairman, Mr. Keilty;

(3) Schedule web conference call(s) to discuss needed changes; and

(4) Finalize the draft and present it to the Sector for consideration at its next meeting.

The Sector also acknowledged that the USNWG on hydrogen is presently exploring multiple options for performance tests of hydrogen measuring instruments. Once the USNWG makes its final recommendations for field test procedures for these devices, the WG will proceed to work on the development of test procedures for type evaluation. Ms. Williams will also update the USNWG on the Sector's efforts so that they are aware of the work.

9. Next Meeting

The Sector was asked to develop a proposed date and location for the next meeting. The Sector discussed whether to recommend that the meeting continue to be held in conjunction with the Southern Weights and Measures Association (SWMA) meeting or to recommend that it be held with another regional association or as a separate meeting. The Sector discussed some alternate ideas; however, there were no strong feelings to either maintain the current arrangements or to consider an alternative.

Recommendation: The Sector agreed to recommend that its next meeting be held in conjunction with the SWMA once again. However, because the Sector must be mindful of meeting publication deadlines for the NCWM Interim Meeting Agenda, the Sector noted that this decision may need to be revisited once a date and location has been selected for the next SWMA meeting.

Additional Items as Time Allows:

The Measuring Sector was asked to provide input to the NCWM S&T Committee on the following measuring related issues on its agenda if time permitted during the Sector Meeting. In the interest of brevity, the narrative for

each item is abbreviated to the extent practical. Full descriptions of the items can be found in the S&T Committee's list of carryover items and its 2009 Interim and Final Reports.

10. General Code, Section 1.10, Paragraph G-S.1. Marking (Software) (S&T Carryover Agenda Item)

Sources: 2009 and 2010 NTETC Software Sector Agenda Items and 2010 S&T Item 310-3 G-S.1. Identification. (Software)

See also:

2010 Software Sector summary:
(http://ncwm.net/sites/default/files/meetings/software/2010/10_Software_Summary.pdf)

2010 Interim Report of the S&T Committee:
(http://ts.nist.gov/WeightsAndMeasures/Publications/10-Pub16.cfm)

Background: Weights and Measures inspectors need a means to determine whether equipment discovered in the field has been evaluated by NTEP. If so, the inspector needs to know at a minimum the CC number. From this starting point, other required information can be ascertained. Currently HB 44 Paragraph G-S.1. includes three options for marking of the CC:

1. Permanent marking;

2. Continuous display; or

3. Recall using a special operation.

Manufacturers of Purpose-built (known internationally as "Type P") equipment often choose permanent marking. For Type Approved software executing on a Universal computer (internationally known as "Type U"), permanent making is not very practical. The second option of continuous display is also undesirable as the permanent display because it occupies valuable operator/customer screen area. As a result most makers of software for Type U equipment opt for the special recall option. Unfortunately, Paragraph G-S.1. is somewhat vague about the specific means of recall. According to the Software Sector, software makers can be quite creative, leaving the field inspector guesswork, frustration, and wasted time. If the inspector complains about how difficult it is to locate required information, the maker notes that the recall procedure is documented in the CC. But this is precisely the information that cannot be retrieved in the field, leading to a circular argument.

Compounding the problem, makers of sophisticated built-for-purpose equipment would also like the same flexibility currently afforded to makers of software for Type U equipment. The recall method is not available to the Type P maker today.

In response to comments heard during the 2010 NCWM Interim meeting, the Software Sector (at its March 2010 meeting) proposed changes to the language shown in the NCWM S&T Committee's 2010 Interim Report Item 310-3. These revisions removed the differentiation between types of software (Type P and Type U) while still managing to achieve the Sector's objective of simplifying the process of locating required marking information. That revised proposal can be seen in the 2010 Software Sector Summary and is not included here for the sake of brevity.

In summary, for S&T Item 310-3 the Software Sector now suggests amending the current item under the S&T Committee's consideration. The Software Sector also initiated discussion on two new concepts, which may eventually result in additional recommendations to amend G-S.1. It should be noted that these new ideas are in the developmental stage, and are included here by request of the Software Sector, since its members would appreciate comments from the regions and other interested parties.

First, the Software Sector sees merit to requiring some connection between the software identifier (i.e., version/revision) and the software itself. The proposal was as follows (with the expectation that examples of acceptable means of implementing such a link would be included in Pub 14).

Add a new sub-subparagraph *(3)* to G-S.1.*(d)* to read as follows:

> ***"The version or revision identifier shall be directly and inseparably linked to the software itself. The version or revision identifier may consist of more than one part, but at least one part shall be dedicated to the metrologically significant software."***

Second, it seems that at each meeting of the Software Sector, the state officials reiterate the problems they have in the field when attempting to locate the basic information required when the CC number is marked via the rather general current HB 44 requirement of 'accessible through an easily recognizable menu, and if necessary a sub-menu' [G-S.1.1. (b)(3)]. The states have indicated that this is too vague and field inspectors often cannot find the certificate number on unfamiliar devices.

The Software Sector would like feedback on the proposal to specify a limited number of menu items/icons for accessing the CC number (it is not hard-marked or continuously displayed) in proposed G-S.1.1. subparagraph (b) as follows:

(b) The CC Number shall be:

(3) accessible through ***<u>one or, at most, two levels of access.</u>***

(i) <u>For menu-based systems, "Metrology", "System Identification", or "Help".</u>

(ii) <u>For systems using icons, a metrology symbol ("M" or "SI"), or a help symbol ("?," "I," or an "i" within a magnifying glass).</u>

Note that this is not suggested to be the final list of valid options for locating the point of access for the CC number; the Software Sector would like to have feedback specifically on other acceptable menu text/icon images that identify how to access the CC number on software-based systems. The Software Sector agreed that a reasonable list of acceptable options is not as much of an issue as the fact that the list is finite. The sector realizes this may affect manufacturers so feedback from associate members and representative groups is also appreciated.

<u>A Possible Compromise Solution:</u>

The Software Sector is asking if the restrictions for marking Type P equipment (which allow the same options as for Type U) be relaxed in exchange for limiting the number of optional means for recalling the CC number when a recall sequence is required.

The proposed limitations on CC recall sequence are:

1. Recall shall not require more than two levels of operations. The CC recall method (trigger, command, etc.) may be present either on the main screen or one sub-menu/sub-screen down.

2. A limited number of menu text strings or icon shape choices are permitted for both the CC recall methods and the optional top level. (There is actually some validity to the argument that this requirement is currently already implied by the term 'readily identifiable menu' currently used in HB 44 paragraph G-S.1. to describe the allowable means of recalling the CC.)

Of course, to affect this compromise, a finite list of acceptable menu text/button icon options will have to be agreed upon and documented. Note that the states didn't express much concern about the actual number of allowable selections included (although they agreed it should be reasonable); they are more concerned that there is simply a

finite list of options which the NTEP labs can reference to validate the device's implementation and that using that same list inspectors can locate the required information in the field.

Thus, the Software Sector developed the following brief initial list of ideas of allowable/acceptable menu text and icons as a starting point for developing the complete list of acceptable options for the readily identifiable menu. Comments and additional suggestions for entries in the list are welcome.

Permitted Menu Text examples	***Permitted Icon shape examples***	***Essential characteristics***
Information Info		Top level menu text or icon • Icon text is a lower case "i" with block serifs • Text color may be light or dark but must contrast with the background color • Icon may have a circular border • Activation of this menu text/icon may invoke a second level menu text/icon that recalls metrology information.
Help **?**		Top level menu text or icon • Icon text is a question mark • Text color may be light or dark but must contrast with the background color • Icon may have a circular border • Activation of this menu text/icon may invoke a second level menu text/icon that recalls metrology information.
Metrology Metrological Information		Top or second level menu text or icon • Icon text is an upper case "M" • Text color may be light or dark but must contrast with the background color • Icon may have a rectangle or rounded rectangle border • If present, the activation of this menu text/icon must recall at a minimum the NTEP CC number. Other metrology information may optionally be displayed.
SI S.I.		Top or second level menu text or icon • Icon text is upper case "SI" • Text color may be light or dark but must contrast with the background color • Icon may have a rectangle or rounded rectangle border • If present, the activation of this menu item/icon must recall at a minimum the NTEP CC number. Other metrology information may optionally be displayed.
NTEP Data N.T.E.P. Certificate		This one is debatable – what if the certificate is revoked? Does NTEP grant holders of CCs the right to display the logo on the device, or just in documentation?

Acceptable examples of where the text or icon may be displayed:

1. The "M" icon is available on the home screen. Activation of the icon displays a new screen containing the CC number and some additional metrology information including the software version/revision number(s).

2. The "SI" icon is available on the home screen. Touch screen activation of the icon displays a pop-up containing the CC number. Releasing the icon erases the pop-up.

3. The main screen contains the "i" icon (information). Activating this icon displays a screen of other icons including the "M" icon. Activating the "M" icon displays the NTEP CC.

4. The main menu includes a "Help" selection which in turn contains a "Metrology" selection. Activation of the Metrology selection displays a pop-up screen containing all global metrological approvals, including the NTEP CC number. The user manually dismisses the pop-up screen by pressing the [X] button.

5. The main menu includes an "Info" selection which in turn contains a "SI" selection. Activation of the SI selection displays a pop-up screen containing all global metrological approvals, including the NTEP CC number. The user manually dismisses the pop-up screen by pressing the [OK] button.

Recommendation to the Measuring Sector: This item was included on the Measuring Sector's agenda as an information item to keep Sector members informed of the progress of this NCWM S&T Issue and to ask for input from Sector members on this issue.

The S&T Committee has been considering changes to G-S.1. to better address identification requirements for metrologically significant software in software-based systems. The Committee has considered multiple proposals under this item from the NTETC Software Sector and the weights and measures community. At the July 2010 NCWM Annual Meeting, the S&T Committee agreed to maintain this as an Information item on its agenda to allow for additional review and input. As noted above, the Software Sector is looking for specific feedback on proposed modifications to paragraph G-S.1. so that it can develop a revised proposal for consideration by the S&T Committee. Should time permit the Measuring Sector to discuss this item, the NCWM S&T Committee and the Software Sector would appreciate the Sector's input.

Discussion: NTEP Director and past Software Sector Chairman, Mr. Truex, provided a history of how this issue evolved. He noted that there were multiple attempts to address software in not-built-for purpose devices. The Software Sector has attempted to further simplify the identification requirements that apply to software-based systems and has made multiple suggestions that were not accepted. The Sector has taken a step back and is trying to get the point across that the marking requirements are not for the manufacturer, but to assist the inspector in the inspection process and in assessing whether or not a specific device, including software, is covered under an NTEP CC. The Sector realizes that this information is not going to be physically marked on the device, and is looking for alternatives in which this information can be provided electronically to inspectors in an easily accessible manner. It will likely be provided on the device's display screen and there is limited space for this information to be displayed. The SW Sector is looking for input on the general direction it should take in developing/updating HB 44 requirements. If the direction seems reasonable, the SW Sector will further develop the idea; if not, the Sector will consider an alternative direction.

The Sector discussed some of the symbols in the proposed list of icons and discussed differences between built-for-purpose and not-built-for-purpose devices. Some Sector members also acknowledged that sometimes changes to software will affect the metrological functions of the device, even though the change was not intended to have that effect, and was supposed to be a "non-metrologically significant" change. Some members, particularly the regulators, supported the idea of a "Weights and Measures" key that would be standardized and, thus, readily recognized by the field official. Mr. Truex acknowledged that the regulatory community has, in his opinion, indicated that the options need to be limited. Mr. Rich Tucker, RL Tucker Consulting LLC, and Mr. Keilty, Endress Hauser, Flowtec AG USA, expressed support for labeling the key that would enable display of the required information as "help."

Decision: The Sector had no additional technical guidance to offer to the S&T Committee on this issue. However, based on comments from Sector members present, the Sector expressed general support for trying to refine the marking requirements and limit the number of options for marking keys that enable the inspector to view the required marking information.

11. G-S.8.1. Provision for Sealing Electronic Adjustable Components, G-S.8.1. Adjustment Mode Indication, and Definitions for "Adjustment" and "Adjustment Mode" (HB 44 Section 1.10. General Code) *(S&T Agenda Carryover Item)*

Purpose: The purpose of the proposed changes is to clarify what is considered an effective method of sealing metrological features and what information is required to be indicated and recorded when a device is in a metrological adjustment mode.

Background: For several years, the NCWM S&T Committee has been considering proposed modifications to General Code paragraph G-S.8. that would help to ensure that the paragraph is being consistently interpreted during type evaluation and by the weights and measures community in field applications.

The Committee has heard opposition to making changes to G-S.8. from SMA and the NTETC Weighing Sector. NIST WMD suggested that the Committee consider withdrawing the item and proposing changes to align the NTETC weighing devices checklist with the measuring devices checklists.

The S&T Committee agreed that the current language in paragraph G-S.8. requires that a security seal be broken before a metrological change can be made to a device (or other approved means of security is provided, such as an audit trail). Thus, once a security seal is applied, it should not be possible to make a metrological change to the device without breaking that seal. Since this is the primary philosophy for protecting access to metrological adjustment, the philosophy should be applied consistently to all device types.

The Committee is concerned about a device which could be sealed in a mode that would allow access to calibration or configuration changes without breaking a seal. Since the NTEP tests and procedures are based on interpretations of HB 44, the Committee supports the efforts of the Weighing Sector and is recommending that this item remain informational until Publication 14 type evaluation procedures to verify compliance with G-S.8. provisions for sealing are consistent with the Committee's interpretation of G-S.8. stated in the previous paragraph.

The NCWM S&T Committee is looking to the Weighing Sector to develop type evaluation criteria consistent with the philosophy stated in the Publication 14 LMD checklist. Thus, no action was asked of the Measuring Sector. This item was included on the Measuring Sector's agenda as an information item to keep Sector members informed of the progress of this NCWM S&T issue and to acknowledge that the criteria in the LMD checklist is consistent with the intent of G-S.8.

See the 2008 and 2009 NCWM Annual Reports and the 2010 Interim and Annual Reports for additional background information.

Discussion: Sector Chairman, Mr. Keilty, and Sector Technical Advisor and NCWM S&T Committee Technical Advisor, Ms. Butcher, gave an overview of this item and noted that no action was required on the part of the Sector unless the Sector had comments it wishes to share with the S&T Committee.

Decision: The Sector had no additional technical guidance to offer to the S&T Committee on this issue.

12. G-A.6. Nonretroactive Requirements (Remanufactured Equipment) (HB 44 Section 1.10. General Code) *(S&T Agenda Carryover Item)*

Source: WWMA and SWMA, 2010 Carryover Item 310-4.

Purpose: Clarify the intent of the 2001 NCWM position on the application of nonretroactive requirements to devices which have been determined to have been "remanufactured."

Item Under Consideration: Amend HB 44 General Code paragraph G-A.6. Nonretroactive Requirements by amending subparagraphs (a) and (b) as follows:

G-A.6. Nonretroactive Requirements. – "Nonretroactive" requirements are enforceable after the effective date for:

(a) devices manufactured **and remanufactured** within a state after the effective date;

(b) both new**, ~~and~~** used**, and remanufactured** devices brought into a state after the effective date; and

(c) devices used in noncommercial applications which are placed into commercial use after the effective date.

Nonretroactive requirements are not enforceable with respect to devices that are in commercial service in the state as of the effective date or to new equipment in the stock of a manufacturer or a dealer in the state as of the effective date.
[*Nonretroactive requirements are printed in italic type.]*
(Amended 1989 **and 201X**)

Background: NIST WMD received an inquiry from a state Weights and Measures Director regarding whether a nonretroactive paragraph in the LMD Code of HB 44 would apply to a remanufactured device. In researching this inquiry, WMD discovered an unintended gap in the General Code requirements relative to remanufactured equipment.

- Paragraph G-S.1.2. Remanufactured Devices and Remanufactured Main Elements is a nonretroactive requirement for marking a device with the remanufacturer's information and became enforceable as of January 1, 2002. WMD believes that this paragraph was intended to apply to remanufactured devices and remanufactured main elements that have been placed into commercial service as of the effective date of the requirement, which was January 1, 2002.

- Paragraph G-A.6. Nonretroactive Requirements (which provides the various conditions in which nonretroactive requirements apply) does not include references to "remanufactured devices" or "remanufactured main elements." Subparagraph (a) (of G-A.6.) references and applies to "manufactured" devices within a state. Appendix D of HB 44 defines a "manufactured" device as any commercial weighing or measuring device shipped as new from the original equipment manufacturer (OEM). Subparagraph (b) could be applied to remanufactured devices that are brought into a state, but could not be applied to those devices installed by a remanufacturer or distributor operating within the state. Subparagraph (c) applies to devices placed into commercial service that had previously been used in noncommercial applications.

If paragraph G-A.6. does not apply to remanufactured devices, then paragraph G-S.1.2. cannot be applied to remanufactured devices as it is currently written. Additional details on this item were included in the Sector's 2010 Agenda and in the NCWM S&T Committee's 2010 Interim and Annual Reports.

The S&T Committee is considering a change to paragraph G-A.6. to clarify its application to "remanufactured" equipment. However, the Committee heard suggestions from two regional Weights and Measures associations, industry representatives, and remanufacturers requesting the item be made informational to give the device remanufacturers additional time to evaluate the impact of the proposed amendment to G-A.6.

This item was included on the Sector's agenda to keep Sector members informed of the issue and allow opportunity for input should time permit.

Discussion: Sector Chairman, Mr. Keilty, and Sector and NCWM S&T Committee Technical Advisor, Ms. Butcher, summarized the background information on this item. During discussions of this issue, some Sector members asked about definitions for the difference between "remanufactured" and "repaired." Ms. Butcher noted that, in proposing this item, NIST WMD is not attempting to redefine these terms or to suggest that the community change how it addresses these devices; the proposal is only attempting to correct a gap in the current HB 44 language. NTEP Director, Mr. Truex, who also served as the Chairman of the NCWM Task Force on

Remanufactured Equipment, also noted that the terms were already defined (see HB 44, Appendix D) by that Task Force and guidelines were already adopted by the NCWM to define how the terms apply.

Mr. Doug Long, RDM Electronics, noted that in remanufacturing, companies are not supposed to be changing designs, only bringing equipment back up to its original condition. These changes are more like repairs and eighty percent of these changes are of a cosmetic nature. Mr. Truex pointed out the additional caveat of G-A.6., which notes that if you bring such a device into another state, you would have to make that device like new and it would have to meet current requirements. While that might sound unfair, the requirement is already in HB 44.

Decision: The Sector did not have any specific technical guidance to offer on this issue. However, the Sector recognized the need for those affected by the proposed change to study it carefully.

13. Product Depletion Test Paragraph T.4. (HB 44 Section 3.31. Vehicle-Tank Meters) *(S&T Item – New Item)*

Source: Northeast Weights and Measures Association (NEWMA)

(**NOTE**: *Measuring Sector member Mr. Karimov, Liquid Controls, requested that this item be included on the Sector's agenda for discussion.*)

Purpose: Modify the VTM code to base the product depletion test tolerances on the meter's maximum flow rate (a required marking on all meters), rather than the meter size. This will enable more consistent application of the tolerances for older meters, which are not required to be marked with the meter size, and address an unintentional gap which allows an unreasonably large tolerance for smaller meters.

Background: The NCWM S&T Committee is considering the following changes to paragraph T.4. The proposed changes would base the tolerances for the product depletion test on the maximum flow rate of the meter rather than the meter size. This item previously appeared on the S&T Committee's Developing Items agenda and was elevated to a carryover item as a result of discussions at the July 2010 NCWM Annual Meeting. Additional background information can be found in the 2010 Final Report of the S&T Committee.

Item Under Consideration: Amend paragraph T.4. as follows:

> **T.4. Product Depletion Test.** – The difference between the test result for any normal test and the product depletion test shall not exceed **one-half (0.5 %) percent of the volume delivered in one minute at the maximum flow rate marked on the meter. Tolerances for typical meters are** ~~**tolerance**~~ shown in Table T.4. Test drafts shall be of the same size and run at approximately the same flow rate.
>
> Note: The result of the product depletion test may fall outside of the applicable test tolerance as specified in Table 1. Accuracy Classes and Tolerances for Vehicle-Tank Meters.

Table T.4. **Tolerances for Typical Vehicle-Tank Meters on Product Depletion Tests, Except Milk Meters** **Refer to T.4. for meters with maximum flow rates not listed.**	
Meter ~~Size~~ Maximum Flow Rate	**Maintenance and Acceptance Tolerances**
~~Up to, but not including, 50 mm (2 in)~~ **114 Lpm (30 gpm)**	**~~1.70 L (104 in^3)[1]~~** **0.57 L (0.15 gal) (34.6 in^3)[1]**
~~From 50 mm (2 in) up to, but not including, 75 mm (3 in)~~ **225 Lpm (60 gpm)**	**~~2.25 L (137 in^3)[1]~~** **1.1 L (0.30 gal) (69.3 in^3)[1]**
~~75 mm (3 in) or larger~~ **378 Lpm (100 gpm)**	**~~3.75 L (229 in^3)[1]~~** **1.9 L (0.5 gal) (115 in^3)[1]**
758 Lpm (200 gpm)	**3.8 L (1.0 gal) (231 in^3)[1]**
[1] Based on a test volume of at least the amount specified in N.3. Test Drafts.	

(Table Added 2005) **(Amended 201X)**

Alternatively, NEWMA proposed the following modifications to paragraph T.4., with larger tolerances for smaller meters.

T.4. Product Depletion Test. – The difference between the test result for any normal test and the product depletion test shall not exceed **one-half (0.5 %) percent of the volume delivered in one minute at the maximum flow rate marked on the meter for meters rated higher than 378 Lpm (100 gpm), or six-tenths (0.6 %) percent of the volume delivered in one minute at the maximum flow rate marked on the meter for meters rated 378 Lpm (100 gpm) or lower. Tolerances for typical meters are ~~tolerance~~** shown in Table T.4. Test drafts shall be of the same size and run at approximately the same flow rate.

Note: The result of the product depletion test may fall outside of the applicable test tolerance as specified in Table 1. Accuracy Classes and Tolerances for Vehicle-Tank Meters.

Table T.4. **Tolerances for Typical Vehicle-Tank Meters on Product Depletion Tests, Except Milk Meters** **Refer to T.4 for meters with flow rates not listed.**	
Meter ~~Size~~ Maximum Flow Rate	**Maintenance and Acceptance Tolerances**
~~Up to, but not including, 50 mm (2 in)~~ **114 Lpm (30 gpm)**	**~~1.70 L (104 in^3)[1]~~** **0.57 L (0.18 gal) (41.6 in^3)[1]**
~~From 50 mm (2 in) up to, but not including, 75 mm (3 in)~~ **225 Lpm (60 gpm)**	**~~2.25 L (137 in^3)[1]~~** **1.1 L (0.36 gal) (83.2 in^3)[1]**
~~75 mm (3 in) or larger~~ **378 Lpm (100 gpm)**	**~~3.75 L (229 in^3)[1]~~** **1.9 L (0.6 gal) (139 in^3)[1]**
758 Lpm (200 gpm)	**3.8 L (1.0 gal) (231 in^3)[1]**
[1] Based on a test volume of at least the amount specified in N.3. Test Drafts.	

(Table Added 2005) **(Amended 201X)**

***Editor's Note**: The metric and customary values in the proposed changes to the table are not equivalent. This point needs to be addressed in any final proposal.*

This item was included on the Measuring Sector's agenda to keep Sector members informed of the item and to allow for Sector comment, discussion, and input to the S&T Committee. See the S&T Committee's 2010 Final Report and 2011 Interim Agenda for details.

Discussion: Mr. Cooper, Tuthill Transfer Systems, commented that concerns may arise regarding whether or not meters with smaller maximum flow rates will be able to meet the proposed change in tolerances since the revised tolerances are much tighter for the smaller meter sizes. Sector Chairman, Mr. Keilty, Endress and Hauser, noted that data should be supplied to illustrate whether or not the smaller meters can meet the revised tolerances. Sector Technical Advisor, Ms. Butcher, NIST WMD, noted that the uncertainties in the test process should also be considered in the tests of smaller meters to ensure that the revised tolerances are appropriate, but also noted that the tolerance based on maximum flow rate seems logical. She also suggested that the Sector consider proposing that, if the revised tolerances are adopted, the marking requirement for meter size in paragraph S.5.7. Meter Size be eliminated from the code. This marking requirement was added to assist inspectors in applying the current product depletion tolerance, which is based on meter size.

Decision: The Sector did not have any specific technical guidance to offer on this issue. However, some members cited concerns regarding whether smaller meters can meet the tighter tolerances. Others suggested that the S&T Committee consider asking for data to support the proposed change and also consider the uncertainties in the test process relative to the tolerance to ensure that the proposed tolerances are appropriate.

14. N.5.1. Verification of Master Meter Systems for Testing of Farm Milk Tanks (HB 44 Section 4.42 Farm Milk Tanks) *(S&T Item – New Item)*

Source: Central Weights and Measures Association (CWMA)

Purpose: Eliminate unnecessary verification testing for master meters capable of operating within a prescribed percent of the applicable tolerance.

Item Under Consideration: Amend paragraph N.5.1. as follows:

> **N.5.1. Verification of Master Metering Systems.** – A master metering system used to gauge a milk tank shall be verified before and after the gauging process. A master metering system used to calibrate a milk tank shall be verified before starting the calibration and re-verified every quarter of the tank capacity or every 2000 L (500 gal), whichever is greater. **A master metering system capable of operating within 25 % of the applicable tolerance in T.3. Basic Tolerance Values needs only be verified before and after the gauging process.**
>
> **(Added 201X)**

Background/Discussion: (2010 Developing Item Part 4.42, Farm Milk Tanks - Item 1: N.5.1. Verification of Master Metering Systems) The CWMA received a proposal at its fall 2008 Interim Meeting to modify paragraph N.5.1. Verification of Master Metering Systems in NIST HB 44 Section 4.42. Farm Milk Tanks. USDA provided data suggesting that mass flow meters currently used to test milk tanks would not have to be verified every quarter of the tank capacity, or every 2000 L (500 gal), whichever is greater. The CWMA does not have data that supports that all mass flow meters will perform to the same standard. Based on this information the CWMA recommends this proposal be Informational and is considering the proposal outlined in the recommendation above.

At its fall 2008 meeting, NEWMA recommended this proposal be Informational. NEWMA forwarded the following additional justification for the proposed change from Mr. Richard Koeberle, Federal Milk Market Administrator:

> The use of a mass flow meter has eliminated the variations seen in other types of meters used to calibrate or check farm bulk milk tanks. The reverification of the meter at every quarter of tank capacity adds time and potentially introduces errors by requiring the hose or valves to be moved before the tank is totally filled. This proposal originated by Mr. Tom MacNish, from the Cleveland Market Administrator, and was

presented to the CWMA in September (2008). Mass flow meters have been used extensively in their market with excellent results.

Data submitted with this item is posted on the S&T Committee's web page on the Members Only section of the NCWM website at:

http://www.ncwm.net/members/index.cfm?fuseaction=st

At the 2010 NCWM Annual Meeting, the Committee heard comments from Mr. Ross Andersen, New York, reiterating NEWMA's request to place this item on the NCWM S&T Committee's 2011 Interim Agenda.

The Committee agreed to NEWMA's request and included this item in the list of carryover items submitted to the fall 2010 regional weights and measures association meetings.

This item was included on the Measuring Sector's agenda to keep Sector members informed of the item and to allow for Sector comment, discussion, and input to the S&T Committee.

Discussion: Sector Chairman, Mr. Keilty, Endress and Hauser, provided background on this issue. Several Sector members commented that the proposal makes sense, particularly for large tanks where the testing process can be quite lengthy. Sector Technical Advisor, Ms. Butcher, NIST WMD, noted that NIST WMD's Laboratory Metrology Group has had multiple inquiries about developing a standard on master meters, but to date no one has agreed to take on this task. However, it is necessary to look at the uncertainties in the test process to be sure that the proposed tolerance is achievable.

Decision: The Sector did not have any specific technical guidance to offer on this issue. However, Sector members generally noted support of the proposal since it would eliminate unnecessary testing and, hopefully, eliminate some uncertainties in the test process.

15. S.2.6. Thermometer Well – Proposed New Paragraph for HB 44 Section 3.31. Vehicle-Tank Meters Code (S&T)

Source: Fall 2010 NCWM S&T Committee Proposal to 2010 Regional Weights and Measures Associations

(**NOTE:** *Measuring Sector member Mr. Karimov, Liquid Controls, also requested that this item be included on the Sector's agenda for discussion.*)

Purpose: To provide a means for inspectors and service personnel to determine the temperature of the product at the meter and, thus, enable them to apply paragraph N.5. Temperature Correction for Refined Petroleum Products.

Background: The NCWM S&T Committee announced at the July 2010 Annual Meeting that it intended to submit a proposal for consideration by the weights and measures community to nonretroactively require means (e.g., thermometer wells) for determining the temperature of the product at the meter during meter testing.

During discussions of proposed changes to the tolerances for VTMs (which were ultimately adopted in July 2010) equipped with automatic temperature compensating systems (paragraph T.2.1.), meter manufacturers expressed concerns about how to ensure that consistent and appropriate test procedures and equipment be used by weights and measures officials during inspections of VTMs. NIST WMD revised the Examination Procedure Outlines for VTMs and presented this information during a training seminar in April 2010. In the process of revising and presenting the procedures, WMD received comments indicating that many VTMs are not equipped with means for determining the temperature of the product at the meter. Thus, the inspector is unable to properly apply paragraph N.5. Temperature Correction for Refined Petroleum Products; paragraph N.5. requires the inspector to make corrections for any changes in volume resulting from differences in liquid temperatures between the time of passage through the meter and the time of volumetric determination in the prover.

In order for inspectors and service personnel to determine the difference between the temperature of the product at the meter and at the prover, some means is needed for determining the temperature of the product as it passes through the meter. Inspectors have reported that few VTMs are equipped with provisions such as a thermometer well at the meter that would enable them to determine the temperature of the product at the meter using a traceable thermometer. Consequently, the inspector is not able to make adjustments to the indications for changes due to temperature between the meter and the prover. Failing to account for differences in product temperature can, in some instances, introduce errors into the testing process, possibly resulting in the acceptance of a meter that is actually out of tolerance or the incorrect rejection of a meter that may actually be performing within applicable tolerance.

The S&T Committee submitted a proposal to several 2010 regional weights and measures associations to non-retroactively require a thermometer well for all VTMs.

This item was included on the Measuring Sector's agenda to keep Sector members informed of the item and to allow for Sector comment, discussion, and input to the S&T Committee. See the NCWM S&T Committee's 2011 Agenda for details.

Discussion: The Sector discussed possible locations where the thermometer well might be placed into the system, recognizing that similar paragraphs in other codes recognize more than one possible location for the well such as piping adjacent to the meter. Mr. Buttler, Emerson Process Management – Micro Motion Inc., noted that some aspects of the proposed paragraph appear to be more of a user requirement than a device specification. Mr. Tucker, RL Tucker Consulting LLC, pointed out that during discussions at the WWMA, questions were raised regarding why the threshold was 20 gpm rather than 30 gpm, which coincides with the requirement for marking minimum and maximum flow rate on the meter. Sector Technical Advisor and Technical Advisor to the NCWM S&T Committee, Ms. Butcher, commented that the Committee considered whether to use 20 gpm or 30 gpm as the threshold, noting both thresholds appear in various requirements within the code. The 20 gpm threshold was selected because inspectors frequently use provers with capacities of 25 gal and larger to test VTMs and the impact of the temperature difference on these sizes of test drafts can be significant relative to the applicable tolerance. Ms. Butcher pointed out the example cited in the S&T's proposal, in which a one-degree difference in temperature between the liquid at the meter and in the prover can result in a difference of about 16 in^3 gasoline and 11 in^3 on diesel on a 100 gal test draft. On a 100 gal test draft, the applicable acceptance tolerance is only 35 in^3. The impact on of a temperature difference on a 25 gal test draft would be a quarter of this, but the applicable tolerance is also less.

Mr. Beattie, Measurement Canada, noted that they have been making corrections to account for temperature for some time, but also noted that they may run additional runs to stabilize the temperature between the two systems. He also noted that they set a limit on the amount of variation in temperature between the two systems before starting an official test run. Mr. Mike Gallo, CLEANFUEL USA, expressed support for doing a "wet down" run for each meter as is done with liquefied petroleum gas systems. His experience indicates that the temperatures equalize after doing a "wet down" run.

Decision: The Sector did not have any specific technical guidance to offer on this issue. However, some members suggested that the S&T Committee consider requiring wet down runs on each meter test as an alternative to requiring a thermometer well. Another member suggested the Committee consider whether or not the threshold for requiring a thermometer well in a system should be meters marked with maximum flow rates of 20 gpm or 30 gpm.

Appendix A – NTEP Technical Policy C. Product Families for Meters
2010 Measuring Sector Meeting Summary

C. Product Categories and Families for Meters

When submitting a meter for evaluation, the manufacturer must specify the product categor(y)(ies) and/or famil(y)(ies) and critical parameters for which the meter is being submitted.

Product Category: A group of products that share similar characteristics.

Note: Under certain Test Requirements, product coverage is indicated by reference to the "Product Category," while under other Test Requirements, product coverage is indicated by "Product Family."

Product Family: A group of products, sometimes including multiple Product Categories, which share a common Test Requirement.

Note: Coverage of different products by a certificate may be indicated using references to either "Product Categories" or "Product Families," as indicated in the Test Requirement for that Product Family.

The product family and the specific product subgroup covered by the Certificate are to be identified on Page 1 of the Certificate of Conformance. More detailed information, including the typical product types found in the subgroup, is to be included in the application section of the Certificate.

Mass Meter Product Category & Test Requirements	Magnetic Flow Meter Product Category & Test Requirements	Positive Displacement Flow Meter Product Category & Test Requirements	Turbine Flow Meter Product Category & Test Requirements
Test B - To cover a range of the following products, test with one product having a low specific gravity and test with a second product having a high specific gravity. The Certificate of Conformance will cover all-products in all product categories listed in the table under Test B within the specific gravity range tested. (Test B does not apply to product categories of liquefied gases, compressed liquids, cryogenic liquids or heated products.) **Note:** Product categories under Test B were formerly referred to collectively as "Normal Liquids."	**Test F –** To cover a range of the following products, test with one product having a specified conductivity. The Certificate of Conformance will cover all products with conductivity equal to or above the conductivity of the tested liquid. (Test F does not apply to product categories of potable water, non-potable water and tap water; water mixes of alcohols and glycols; fertilizers; suspension fertilizers; liquid feeds; clear liquid fertilizers; chemicals or crop chemicals A, B, C, or D.) (Test F does not apply to product categories of liquefied gases, or compressed liquids.)	**Test C -** To cover a range of products within each product category, test with one product having a low viscosity and test with a second product having a high viscosity within each category. The Certificate of Conformance will cover all products in the product category within the viscosity range tested.	**Test E –** To cover a range of products within each product category, test with one product having a low kinematic viscosity and test with a second product having a high kinematic viscosity within each category. The Certificate of Conformance will cover all products in the product category within the kinematic viscosity range tested. **Note:** See note 5.

Mass Meter Product Category & Test Requirements			**Magnetic Flow Meter Product Category & Test Requirements**			**Positive Displacement Flow Meter Product Category & Test Requirements**		**Turbine Flow Meter Product Category & Test Requirements**	
Typical Products	**Specific Gravity (60 F)**	**Product Category**	**Typical Products**	**Conductivity (micro-Siemens/centimeter)**	**Product Category**	**<u>Product Category:</u>** Fuels, Lubricants, Industrial and Food Grade Liquid Oils (FL&O)		**<u>Product Category:</u>** Fuels, Lubricants, Industrial and Food Grade Liquid Oils (FL&O)	
Asphalt		FL&O	Gasoline		FL&O	**Typical Products**	**Reference Viscosity (60 F)**	**Typical Products**	**Reference Viscosity (60 F)**
Avgas		FL&O	JP4		FL&O		**Centipoise (cP)**		**Centipoise (cP)**
Jet A		FL&O	Jet A-1		FL&O	Gasoline	0.28	Gasoline	0.28
Jet B		FL&O	JP7 & JP8		FL&O	JP4	1.02	JP4	1.02
Spindle Oil		FL&O	Kerosene		FL&O	Jet A-1	1.36	Jet A-1	1.36
Adjuvants	0.7 - 1.2	CC	JP5		FL&O	JP7 & JP8	1.82	JP7 & JP8	1.82
Banvel	0.7 - 1.2	CC	Corn Oil		FL&O	Kerosene	1.94	Kerosene	1.94
Fumigants	0.7 - 1.2	CC	Cooking Oils		FL&O	JP5	1.94	JP5	1.94
Fungicides	0.7 - 1.2	CC	Diesel Fuel		FL&O	Corn Oil	4	Corn Oil	4
Herbicides	0.7 - 1.2	CC	Biodiesel above B20		FL&O	Cooking Oils	9.93	Cooking Oils	9.93
Insecticides	0.7 - 1.2	CC	Light Oil		FL&O	Diesel Fuel	10	Diesel Fuel	10
Paraquat	0.7 - 1.2	CC	Sunflower Oil		FL&O	Biodiesel above B20	10.12	Biodiesel above B20	10.12
Prowl	0.7 - 1.2	CC	Soy Oil	0	FL&O	Light Oil	13.47	Light Oil	13.47
Round-up	0.7 - 1.2	CC	Olive Oil		FL&O	Sunflower Oil	90.1	Sunflower Oil	90.1
Touchdown	0.7 - 1.2	CC	Vegetable Oil	0	FL&O	Soy Oil	90.6	Soy Oil	90.6
Treflan	0.7 - 1.2	CC	Bunker Oil		FL&O	Olive Oil	116.8	Olive Oil	116.8
Ammonia Nitrate	1.16-1.37	Fert	Avgas		FL&O	Vegetable Oil	133	Vegetable Oil	133
Crude Oil	0.79-0.97	FL&O	Jet A		FL&O	Bunker Oil	11,200	Bunker Oil	11,200
Lubricating Oils	0.80-0.90	FL&O	Jet B		FL&O	Avgas	1.5 to 6	Avgas	1.5 to 6
Peanut Oil	0.9-1.0	FL&O	Asphalt		FL&O	Jet A	1.5 to 6	Jet A	1.5 to 6

Mass Meter Product Category & Test Requirements			**Magnetic Flow Meter Product Category & Test Requirements**			**Positive Displacement Flow Meter Product Category & Test Requirements**		**Turbine Flow Meter Product Category & Test Requirements**	
Hexane	0.66	Sol Gen	Peanut Oil		FL&O	Jet B	1.5 to 6	Jet B	1.5 to 6
Diesel Fuel	0.84	FL&O	SAE Grades		FL&O	Asphalt	100 – 5000	Asphalt	100 – 5000
Gasoline	0.72	FL&O	Lubricating Oils		FL&O	Peanut Oil	11 to 110	Peanut Oil	11 to 110
Kerosene	0.75	FL&O	Crude Oil		FL&O	SAE Grades	192-3626	SAE Grades	192-3626
Jet A-1	0.76	FL&O	6 Oil (#5, #6)		FL&O	Lubricating Oils	20 to 1000	Lubricating Oils	20 to 1000
JP4	0.76	FL&O	Fuel Oil (#1, #2, #3, #4)	0	FL&O	Crude Oil	3-1783	Crude Oil	3-1783
JP5	0.76	FL&O	Spindle Oil		FL&O	6 Oil (#5, #6)	66-13,000	6 Oil (#5, #6)	66-13,000
JP7 JP8	0.76	FL&O	Acetone	.02	Sol Gen	Fuel Oil (#1, #2, #3, #4)	8 to 88	Fuel Oil (#1, #2, #3, #4)	8 to 88
Ethanol	0.79	Alc Gly	Hexane	0	Sol Gen	Spindle Oil		Spindle Oil	
Isopropyl	0.79	Alc Gly	Acetates		Sol Gen	**Test C** - **Product Category:** Solvents General (Sol Gen)		**Test E** - **Product Category:** Solvents General (Sol Gen)	
Acetone	0.8	Sol Gen	MEK	0.1	Sol Gen	**Typical Products**	**Reference Viscosity* (60 F)**	**Typical Products**	**Reference Viscosity* (60 F)**
Methanol	0.80	Alc Gly	Toluene	0	Sol Gen		**Centipoise (cP)**		**Centipoise (cP)**
Butanol	0.81	Alc Gly	Xylene	0	Sol Gen	Acetone	0.34	Acetone	0.34
Isobutyl	0.81	Alc Gly	Ethylacetate	0.00001	Sol Gen	Hexane	0.34	Hexane	0.34
MEK	0.81	Sol Gen	Methylene-Chloride		Sol Chl	Acetates	0.44	Acetates	0.44
Biodiesel above B20	0.86	FL&O	Trichloro-Ethylene		Sol Chl	MEK	0.45	MEK	0.45
Light Oil	0.86	FL&O	Carbon Tetra-Chloride		Sol Chl	Toluene	0.62	Toluene	0.62
Toluene	0.87	Sol Gen	Perchloro-Ethylene		Sol Chl	Xylene	0.86	Xylene	0.86
20% Aqua-	0.89	Fert	Methanol	0.44	Alc Gly	Ethylacetate	1.36	Ethylacetate	1.36

Mass Meter Product Category & Test Requirements			**Magnetic Flow Meter Product Category & Test Requirements**			**Positive Displacement Flow Meter Product Category & Test Requirements**		**Turbine Flow Meter Product Category & Test Requirements**	
Ammonia									
Xylene	0.89	Sol Gen	Ethanol	0.0013	Alc Gly	**Test C** - **Product Category:** Solvents Chlorinated (Sol Chl)		**Test E** - **Product Category:** Alcohols, Glycols & Water Mixes Thereof (Alc Gly)	
6 Oil (#5, #6)	0.9	FL&O	Isopropyl	3.5	Alc Gly	**Typical Products**	**Reference Viscosity* (60 F)**	**Typical Products**	**Reference Viscosity* (60 F)**
Fuel Oil (#1, #2, #3, #4)	0.9	FL&O	Butanol		Alc Gly		**Centipoise (cP)**		**Centipoise (cP)**
SAE Grades	0.9	FL&O	Isobutyl	0.02	Alc Gly	Methylene-Chloride	0.46	Methanol	0.64
Corn Oil	0.91	FL&O	Ethylene glycol		Alc Gly	Trichloro-Ethylene	0.6	Ethanol	1.29
Cooking Oils	0.92	FL&O	Propylene glycol		Alc Gly	Carbon Tetra-Chloride	0.99	Isopropyl	2.78
Olive Oil	0.92	FL&O	Demineralized		Water	Perchloro-Ethylene	1	Butanol	3.34
Vegetable Oil	0.92	FL&O	Deionized		Water	**Test C** - **Product Category:** Alcohols, Glycols & Water Mixes Thereof (Alc Gly)		Isobutyl	4.54
Acetates	0.93	Sol Gen	Asphalt		Heated	**Typical Products**	**Reference Viscosity* (60 F)**	Ethylene glycol	25.5
Soy Oil	0.93	FL&O	Bunker C		Heated		**Centipoise (cP)**	Propylene glycol	54
			Test D – To obtain coverage for a product category: Test with one product in the product category. The Certificate of Conformance will cover all products in the category.			Methanol	0.64	**Test E** - **Product Category:** Compressed liquids, Fuels and Refrigerants, NH_3	
Sunflower Oil	0.93	FL&O	(Test D does not apply to product categories of pure alcohols and pure glycol, pure water, solvents chlorinated, solvents general, and fuels, lubricants,					**Typical Products**	**Reference Viscosity* (60 F) Centipoise (cP)**

Mass Meter Product Category & Test Requirements			**Magnetic Flow Meter Product Category & Test Requirements**			**Positive Displacement Flow Meter Product Category & Test Requirements**		**Turbine Flow Meter Product Category & Test Requirements**	
Ethylacetate	0.96	Sol Gen	industrial and food grade liquid oils.) (Test D does not apply to product categories of liquefied gases, compressed liquids or heated products.)			Ethanol	1.29	Propane	0.098
								Anhydrous Ammonia	0.188
Bunker Oil	0.99	FL&O				Isopropyl	2.78	Butane	0.19
Beverages	1.0	Water				Butanol	3.34	Freon 11	0.313
Deionized	1.0	Water	Tap water	72**	Water	Isobutyl	4.54	Freon 12	0.359
Demineralized	1.0	Water	Potable	72**	Water	Ethylene glycol	25.5	Freon 22	1.99
Juices	1.0	Water	Nonpotable	72**	Water	Propylene glycol	54	Ethane	
Milk	1.0	Water	Juices		Water	**Test C** - **Product Category:** Clear Liquid Fertilizers (Liq Fert)		**Test A –** The following products must be individually tested and noted on the Certificate of Conformance.	
Nonpotable	1.0	Water	Beverages		Water	**Typical Products**	**Reference Viscosity* (60 F)**		
Potable	1.0	Water	Water mixes of alcohols & glycols		Alc Gly		**Centipoise (cP)**	**Typical Products**	**Product Category**
Tap Water	1.0	Water	Urea	5000	Fert	Urea	1	Methylene-Chloride	Sol Chl
Propylene glycol	1.04	Alc Gly	Ammonia Nitrate		Fert	Ammonia Nitrate	11.22	Trichloro-Ethylene	Sol Chl
Hydrochloric Acid	1.1	Chem	10-34-0		Fert	10-34-0	48	Carbon Tetra-Chloride	Sol Chl
Ethylene glycol	1.19	Alc Gly	20% Aqua-Ammonia		Fert	20% Aqua-Ammonia	1.1 – 1.3	Perchloro-Ethylene	Sol Chl
Liquid Molasses	1.25	Liq Feed	Clear Liquid Fert		Fert	Clear Liquid Fert	31 - 110	Urea	Liq Fert
9-18-9	1.32	Fert	Nitrogen Solution		Fert	Nitrogen Solution	31 - 110	Ammonia Nitrate	Liq Fert
Methylene-Chloride	1.34	Sol Chl	28%, 30% or 32%		Fert	28%, 30% or 32%	31 - 110	10-34-0	Liq Fert

Mass Meter Product Category & Test Requirements			**Magnetic Flow Meter Product Category & Test Requirements**			**Positive Displacement Flow Meter Product Category & Test Requirements**		**Turbine Flow Meter Product Category & Test Requirements**	
10-34-0	1.39	Fert	N-P-K solutions		Fert	N-P-K solutions		20% Aqua-Ammonia	Liq Fert
Trichloro-Ethylene	1.47	Sol Chl	9-18-0		Fert	9-18-0		Chlear Liquid Fert	Liq Fert
Carbon Tetra-Chloride	1.6	Sol Chl	4-4-27		Sus Fert	**Test C** - **Product Category:** Suspension Fertilizers (Sus Fert)		Nitrogen Solution	Liq Fert
Perchloro-Ethylene	1.6	Sol Chl	3-10-30		Sus Fert	**Typical Products**	**Reference Viscosity* (60 F)**	28%, 30% or 32%	Liq Fert
Sulfuric Acid	1.83	Chem	Molasses plus Phos Acid and/or Urea (TreaChle)		Liq Feed		**Centipoise (cP)**	N-P-K solutions	Liq Fert
Phosphoric Acid	1.87	Chem	Liquid Molasses	300	Liq Feed	4-4-27	20 – 215	9-18-0	Liq Fert
Urea	1.89	Fert	Sulfuric Acid	209000	Chem	3-10-30	100 – 1000	4-4-27	Sus Fert
Fungicides	1 – 1.2	CC	Phosphoric Acid	56600	Chem	**Test C** - **Product Category:** Liquid Feeds (Liq Feed)		3-10-30	Sus Fert
Micronutrients	1 – 1.2	CC	Hydrochloric Acid	395000	Chem	**Typical Products**	**Reference Viscosity* (60 F)**	Molasses plus Phos Acid and/or Urea (TreaChle)	Liq Feed
Molasses plus Phos Acid and/or Urea (TreaChle)	1.1 to 1.3	Liq Feed	Herbicides		CC-A		**Centipoise (cP)**	Liquid Molasses	Liq Feed
3-10-30	0.9 – 1.65	Liq Fert	Round-up		CC-A	Molasses plus Phos Acid and/or Urea (TreaChle)	2882	Asphalt	Heated
4-4-27	0.9 – 1.65	Liq Fert	Touchdown		CC-A	Liquid Molasses	8640	Bunker C	Heated

Mass Meter Product Category & Test Requirements			**Magnetic Flow Meter Product Category & Test Requirements**			**Positive Displacement Flow Meter Product Category & Test Requirements**		**Turbine Flow Meter Product Category & Test Requirements**	
Micronutrients	0.9 – 1.65	Liq Fert	Banvel		CC-A	**Test C** - **Product Category:** Heated Products (Heated)		Sulfuric Acid	Chem
28%, 30% or 32%	1.28 – 1.32	Fert	Treflan		CC-A	**Typical Products**	**Reference Viscosity* (60 F)**	Phosphoric Acid	Chem
N-P-K solutions	1.2 – 1.4	Fert	Paraquat		CC-A		**Centipoise (cP)**	Hydrochloric Acid	Chem
Clear Liquid Fert	1.17 – 1.44	Fert	Prowl		CC-A	Asphalt	100 – 5000	Herbicides	CC-A
Nitrogen Solution	1.17 – 1.44	Fert	Herbicides		CC-A	Bunker C	11,200	Round-up	CC-A
			Fungicides		CC-B	**Test C** - **Product Category:** Chemicals (Chem)		Touchdown	CC-A
			Insecticides		CC-B	**Typical Products**	**Reference Viscosity* (60 F)**	Treflan	CC-A
Test D – To obtain coverage for each of the following product categories, test with one product in each product category. The Certificate of Conformance will cover the products in the product category in which a product was tested.			Adjuvants		CC-B			Banvel	CC-A
			Fumigants		CC-B	Sulfuric Acid	1.49	Paraquat	CC-A
			Fungicides		CC-C	Phosphoric Acid	161	Prowl	CC-A
Product Category	**Typical Products**	**Specific Gravity[2] (60 F)**	Micronutrients		CC-D	Hydrochloric Acid	0.80 – 1. 0	Herbicides	CC-A
Comp gas	Compressed Natural Gas (CNG)	0.6 to 0.8 (1=Air)				**Test C** - **Product Category:** Crop Chemicals (Type A) (CC-A)		Fungicides	CC-B

Mass Meter Product Category & Test Requirements			**Magnetic Flow Meter Product Category & Test Requirements**		**Positive Displacement Flow Meter Product Category & Test Requirements**		**Turbine Flow Meter Product Category & Test Requirements**	
Product Category	**Typical Products**	**Specific Gravity[2] (60 F)**			**Typical Products**	**Reference Viscosity* (60 F)**	Insecticides	CC-B
Comp liq	Anhydrous Ammonia	0.61				**Centipoise (cP)**	Adjuvants	CC-B
Comp liq	Butane	0.595			Herbicides	4 – 400	Fumigants	CC-B
Comp liq	Ethane				Round-up	4 – 400	Fungicides	CC-C
Comp liq	Freon 11	1.49			Touchdown	4 – 400	Micronutrients	CC-D
Comp liq	Freon 12	1.33			Banvel	4 – 400	Dual	Flow
Comp liq	Freon 22	1.37			Treflan	4 – 400	Bicep	Flow
					Paraquat	4 – 400	Marksman	Flow
Comp liq	Propane	0.504			Prowl	4 – 400	Broadstrike	Flow
Test D – To obtain coverage for each of the following product categories, test with one product in each product category. The Certificate of Conformance will cover the products in the product category in which a product was tested.								
Product Category	**Typical Products**	**Specific Gravity[2] (60 F)**			**Test C** - **Product Category:** Crop Chemicals (Type B) (CC-B)		Doubleplay	Flow
Cryo LNG	Liquefied Natural Gas				**Typical Products**	**Reference Viscosity* (60 F)**	Topnotch	Flow
Cryo LNG	Liquefied Oxygen	0.66				**Centipoise (cP)**	Guardsman	Flow
Cryo LNG	Nitrogen	0.31			Fungicides	0.7 – 100	Harness	Flow
					Insecticides	0.7 – 100	NH_3	

Mass Meter Product Category & Test Requirements			**Magnetic Flow Meter Product Category & Test Requirements**		**Positive Displacement Flow Meter Product Category & Test Requirements**		**Turbine Flow Meter Product Category & Test Requirements**	
					Adjuvants	0.7 – 100	**<u>Test D</u> –** To obtain coverage for a product category: Test with one product in the product category. The Certificate of Conformance will cover all products in the category.	
					Fumigants	0.7 – 100		
<u>Test D</u> – To obtain coverage for each of the following product categories, test with one product in each product category. The Certificate of Conformance will cover the products in the product category in which a product was tested.					**<u>Test C</u> -** **<u>Product Category:</u>** Crop Chemicals (Type C) (CC-C)			
Product Category	**Typical Products**	**Specific Gravity[2] (60 F)**			**Typical Products**	**Reference Viscosity* (60 F)**	Tap Water	Water
Heated Products	Asphalt					**Centipoise (cP)**	Deionized	Water
Heated Products	Bunker C	1.1			Fungicides	20 – 900	Demineralized	Water
					Test C **Product Category:** Crop Chemicals (Type D) (CC-D)		Potable	Water
					Typical Products	**Reference Viscosity* (60 F)**	Nonpotable	Water
						Centipoise (cP)	Juices	Water
					Micronutrients	20 – 1000	Beverages	Water
					<u>Test C</u> - **<u>Product Category:</u>** Flowables (Flow)		Milk	Water
					Typical Products	**Reference Viscosity* (60 F)**	Liquefied Oxygen	Cryo LNG
						Centipoise (cP)	Nitrogen	Cryo LNG
					Dual	20 – 900	Liquefied	Cryo LNG

Mass Meter Product Category & Test Requirements			Magnetic Flow Meter Product Category & Test Requirements		Positive Displacement Flow Meter Product Category & Test Requirements		Turbine Flow Meter Product Category & Test Requirements	
							Natural Gas	
					Bicep	20 – 900		
					Marksman	20 – 900		
					Broadstrike	20 – 900		
					Doubleplay	20 – 900		
					Topnotch	20 – 900		
					Guardsman	20 – 900		
					Harness	20 – 900		
					Test C - Product Category: Compressed Liquids: Fuels and Refrigerants (Comp liq)			
					Typical Products	**Reference Viscosity* (60 F)**		
						Centipoise (cP)		
					Propane	0.098		
					Anhydrous Ammonia	0.188		
					Butane	0.19		
					Freon 11	0.313		
					Freon 12	0.359		
					Freon 22	1.99		
					Ethane			
					Test D – To obtain coverage for a product category: Test with one product in the product category. The Certificate of Conformance will cover all products in the category.			

Mass Meter Product Category & Test Requirements			Magnetic Flow Meter Product Category & Test Requirements		Positive Displacement Flow Meter Product Category & Test Requirements		Turbine Flow Meter Product Category & Test Requirements	
					Product Category: All Water (Water)			
					Typical Products	**Reference Viscosity* (60 F)**		
						Centipoise (cP)		
					Tap Water	1.0		
					Deionized	1.0		
					Demineralized	1.0		
					Potable	1.0		
					Nonpotable	1.0		
					Juices	1.0		
					Beverages	1.0		
					Milk	1.0		
					Test A – The following products must be individually tested and noted on the Certificate of Conformance.			
					Product Category: Cryogenic Liquids and Liquefied Natural Gas (Cryo LNG)			
					Typical Products	**Reference Viscosity* (60 F)**		
						Centipoise (cP)		
					Liquefied Oxygen	0.038		
					Nitrogen	1.07		
					Liquefied Natural Gas			

• **Product Category Table – Category Abbreviations**	
Abbreviation	**Product Categories**
FL&O	Fuels, Lubricants, Industrial and Food Grade Liquid Oils
Solv Gen	Solvents General
Solv Cl	Solvents Chlorinated
Alc Gly	Alcohols, Glycols & Water Mixes thereof
Water	Water
Fert	Fertilizers
CC-A	Crop Chemicals *(Type A)*
CC-B	Crop Chemicals *(Type B)*
CC-C	Crop Chemicals *(Type C)*
CC-D	Crop Chemicals *(Type D)*
Flow	Flowables
Sus Fert	Suspension Fertilizers
Liq Feed	Liquid Feeds
Chem	Chemicals
Heated	Heated Products
Comp liq	Compressed Liquids: Fuels and Refrigerants NH_3
Comp gas	Compressed Gases
Cryo LNG	Cryogenic Liquids and Liquefied Natural Gas

[1]***Note****: The Typical Products listed in this table are not limiting or all-inclusive; there may be other products and product trade names, which fall into a product family. Water and a product such as stoddard solvent or mineral spirits may be used as test products in the fuels, lubricants, industrial, and food- grade liquid oils product family.*

[2] The specific gravity of a liquid is the ratio of its density to that of water at standard conditions, usually 4 °C (or 40 °F) and 1 atm. The density of water at standard conditions is approximately 1000 kg/m^3 (or 998 kg/m^3)

[3] Diesel fuel blends (biodiesel) with up to 20 % vegetable or animal fat/oil.

[4] Gasoline includes oxygenated fuel blends with up to 15 % oxygenate.

$$\text{Centistokes } (m^2/s) = \frac{\text{Centipoise (kg/m s)}}{\text{density (kg / } m^3\text{)}}$$

[5] Kinematic viscosity is measured in centistokes.

Source for some of the viscosity value information is in the Industry Canada - Measurement Canada "Liquid Products Group, Bulletin V-16-E (rev. 1), August 3, 1999."

**** Editor Note:** This data point is suspected to be lower than that of normal tap water supplied for residential consumption.

Appendix B
Action Items Table
October 1 - 2, 2010, NTETC Measuring Sector Meeting

Agenda Item	Title	Task	Responsible Person(s)	Due Date
1	Table of Key Characteristics of Products in Product Families for Meters Table	Make final editorial changes, (including removing editorial marks, moving heated products, and making general editorial formatting changes) to the table and forward to Chair and NTEP Director for submission to the NCWM NTEP Committee.	Technical Advisor, Ms. Tina Butcher	12/1/10
3	**Add Testing Criteria to NTEP Policy U "Evaluating electronic indicators submitted separate from a measuring element"**	Continue development of checklist, including:	Mr. Dan Reiswig, California DMS	Ongoing
		Contact list of possible work group members (as identified by Sector).	Mr. Dan Reiswig, California DMS	1/1/11
		Forward latest draft of checklist AND five areas requiring special attention (identified by Sector) to original work group members and list of possible contacts identified by Sector.	Mr. Dan Reiswig, California DMS	1/1/11
		Apprise Chairman, NTEP Director, and Technical Advisor of progress via e-mails or periodic reports.	Mr. Dan Reiswig, California DMS	Ongoing
		Present updated checklist to Sector for review and acceptance.	Work Group	2011 Sector Mtg
4	**Policy C - Product Family Table – Change in Upper Limit for Oxygenated Blends – Note 4**	Advise original submitter of Sector's decision.	Technical Advisor, Ms. Tina Butcher	12/1/10
5	**Electronic Linearization for Positive Displacement Meters**	Submit recommendation to modify NCWM Publication 14 to NTEP Committee	Technical Advisor, Ms. Tina Butcher	12/1/10
6	**Code Reference S.1.6.1. Indication of Delivery – Reference to Indicator Reset**	Submit recommendation to modify NCWM Publication 14 to NTEP Committee	Technical Advisor, Ms. Tina Butcher	12/1/10
7	**Water Meters Checklist**	(8) Forward current draft checklist to other companies who hold California Type Evaluation Program Certificates for Water Meters.	Mr. Andre Noel	12/1/10
		(9) Identify areas in NIST HB 44 Water Meters Code where updates are needed to reflect current technology and practices.	Water Meters Checklist Sub-Group: Mr. Andre Noel Mr. Dan Reiswig Mr. Jim Welsh (Others Identified)	7/1/11

Appendix B
Action Items Table
October 1 - 2, 2010, NTETC Measuring Sector Meeting

Agenda Item	Title	Task	Responsible Person(s)	Due Date
		(10) Forward any proposed changes to NIST HB 44 to the NCWM S&T Committee by developing and submitting an NCWM Form 15.	Water Meters Checklist Sub-Group	7/1/11
		(11) Identify differences between AWWA standards and NIST HB 44 and consider recommendations for aligning the two documents.	Water Meters Checklist Sub-Group	7/1/11
		(12) Copy the Chairman, Mr. Mike Keilty and Technical Advisor, Ms. Tina Butcher on communications to the group.	Water Meters Checklist Sub-Group	Ongoing
		(13) Copy Mr. Ralph Richter, NIST WMD, U.S. point of contact for OIML R49 with any proposed drafts.	Water Meters Checklist Sub-Group	Ongoing
		(14) Distribute an updated draft for review by the Sector by the 2011 NCWM Interim Meeting.	Water Meters Checklist Sub-Group	01/10/11
		(15) Distribute a final draft for review by the Sector at least one month prior to the 2011 Sector meeting.	Water Meters Checklist Sub-Group	8/15/11
8	**Hydrogen Gas-Measuring Devices Checklist**	(1) Contact Norm Ingram to request distribution of draft checklist.	Ms. Juana Williams, NIST WMD	11/15/10
		(2) Update USNWG on Sector's plans to develop checklist.	Ms. Juana Williams, NIST WMD	11/15/10
		(3) Update the checklist to correspond to the 2010 Hydrogen Measuring Devices Code.	Hydrogen Meters Checklist Sub-Group: Mr. Mike Keilty, Chairman Mr. Dennis Beattie, MC Mr. Marc Buttler, Micro Motion Mr. Dan Reiswig, California DMS Ms. Juana Williams, NIST	As assigned
		(4) Review the checklist and provide comments to Sub Group Chairman.	Hydrogen Meters Checklist Sub-Group	As assigned
		(5) Schedule web conference call(s) to discuss needed changes.	Sub-Group Chairman	Jan-July 2011
		(6) Finalize and present draft to the Sector for consideration.	Hydrogen Meters Checklist Sub-Group	8/15/11
		(7) Monitor USNWG progress on developing test procedures. Begin development of type evaluation test procedures when USNWG completes test procedures work.	Hydrogen Meters Checklist Sub-Group	Ongoing

Appendix B
Action Items Table
October 1 - 2, 2010, NTETC Measuring Sector Meeting

Agenda Item	Title	Task	Responsible Person(s)	Due Date
9	**Next Meeting**	Identify location and time of next SWMA Meeting and propose location to NTEP Committee	Chair, NTEP Director, Technical Advisor	2011 Interim Mtg
10	**G-S.1. Marking (Software) (S&T)**	Forward Sector comments to NCWM S&T Committee	Technical Advisor, Ms. Tina Butcher	2011 Interim Mtg
11	**G-S.8.1. Provision for Sealing (S&T)**	Forward Sector comments to NCWM S&T Committee	Technical Advisor, Ms. Tina Butcher	2011 Interim Mtg
12	**G-A.6. Nonretroactive Requirements (S&T)**	Forward Sector comments to NCWM S&T Committee	Technical Advisor, Ms. Tina Butcher	2011 Interim Mtg
13	**Product Depletion Test (S&T)**	Forward Sector comments to NCWM S&T Committee	Technical Advisor, Ms. Tina Butcher	2011 Interim Mtg
14	**N.5.1. Master Meter Systems- Farm Milk Tanks (S&T)**	Forward Sector comments to NCWM S&T Committee	Technical Advisor, Ms. Tina Butcher	2011 Interim Mtg
15	**S.2.6. Thermometer Well -VTMs (S&T)**	Forward Sector comments to NCWM S&T Committee	Technical Advisor, Ms. Tina Butcher	2011 Interim Mtg

Appendix C

National Conference on Weights and Measures / National Type Evaluation Program
Appendix C to 2010 Measuring Sector Summary

Measuring Sector Attendee List
October 1-2, 2010 / Columbia, SC

☐**Dennis Beattie**
Measurement Canada
400 St Mary Ave
Winnipeg, Manitoba R3C 4K5
P.(204)983-8910
E.dennis.beattie@ic.gc.ca

☐**Tina Butcher**
NIST Weights & Measures Division
100 Bureau Drive
Gaithersburg, MD 20899-2600
P.(301) 975-2196
E.tbutcher@nist.gov

☐**Jerry Butler**
North Carolina Department of Agriculture
105 Mail Service Center
Raleigh, NC 27699
P.(919) 733-3313
E.jerry.butler@ncagr.gov

☐**Marc Buttler**
Emerson Process Management - Micro Motion Inc.
7070 Winchester Circle
Boulder, CO 80301
P.(303) 530-8562
E.marc.buttler@emerson.com

☐**William Cooper**
Tuthill Transfer Systems
8825 Aviation Drive
Fort Wayne, IN 46809
P.(260) 747-7529 x1352
E.rcooper@tuthill.com

☐**Michael Frailer**
Maryland Department of Agriculture
50 Harry S. Truman Parkway
Annapolis, MD 21401
P.(410) 841-5790
E.frailerml@mda.state.md.us

☐**Mike Gallo**
CLEANFUEL USA
116 Halmar Cove
Georgetown, TX 78628
P.(512)789-8543
E.mikegallo@cleanfuelusa.com

☐**Paul Glowacki**
Murray Equipment Inc.
2515 Charleston Place
Fort Wayne, IN 46805
P.(260) 480-1352
E.pglowacki@murrayequipment.com

☐**Allen Katalinic**
North Carolina Department of Agriculture
105 Mail Service Center
Raleigh, NC 27699
P.(919) 733-3313
E.merleallen1234@aol.com

☐**Michael Keilty**
Endress + Hauser Flowtec AG USA
211 Pinewood Drive
Lyons, CO 80540
P.(303) 823-5796
E.michael.keilty@us.endress.com

☐**Doug Long**
RDM Electronics
850 Harmony Grove Rd
Nebo, NC 28761
P.(828)652-8346
E.doug@rdm.net

☐**Wade Mattar**
Invensys/Foxboro
33 Commercial Street
Foxboro, MA 02035
P.(508)549-2067
E.wade.mattar@ips.invensys.com

National Conference on Weights and Measures / National Type Evaluation Program
Appendix C to 2010 Measuring Sector Summary

Measuring Sector Attendee List
October 1-2, 2010 / Columbia, SC

☐**Marlin McAfee**
Independent Author
943 Katherwood Drive
Atlanta, GA 30310
P.(404)454-1052
E.memcafee3@gmail.com

☐**Andre Noel**
Neptune Technology Group Inc.
1600 Alabama Highway #229
Tallassee, AL 36078
P.(334) 283-7298
E.anoel@neptunetg.com

☐**Dan Reiswig**
California Division of Measurement Standards
6790 Florin Perkins Road
Sacramento, CA 95828
P.(916) 229-3023
E.dreiswig@cdfa.ca.gov

☐**Damon Thompson**
Meggitt Fueling Product
4308 Spindletree Lane
Fort Worth, TX 76137
P.(817)306-8189
E.damont.thompson@meggitt.com

☐**James Truex**
National Conference on Weights and Measures Inc.
88 Carryback Drive
Pataskala, OH 43062
P.(740) 919-4350
E.jim.truex@ncwm.net

☐**Richard Tucker**
RL Tucker Consulting LLC
605 Bittersweet Lane
Ossian, IN 46777
P.(260) 622-4243
E.rtucker83@comcast.net

☐**Juana Williams**
NIST Weights & Measures Division
100 Bureau Drive
Gaithersburg, MD 20899-2600
P.(301) 975-3989
E.juana.williams@nist.gov

THIS PAGE INTENTIONALLY LEFT BLANK