

**National Type Evaluation Technical Committee
Measuring Sector Annual Meeting
Agenda
October 20-21, 2006, Annapolis, MD**

National Type Evaluation Technical Committee	1
1. Recommendations to Update to NCWM Publication 14 to Reflect Changes to NIST Handbook 44	2
A. Checklist and Test Procedures (LMD – 11)	2
B. Philosophy for Sealing (LMD – 17- 20)	3
C. Checklist and Test Procedures for Retail Motor-Fuel Dispensers	5
Code Reference S.1.2. Units (LMD – 26)	5
D. Checklist and Test Procedures for Specific Criteria for Vehicle Tank Meters	5
Code Reference S.1.4.1. Display of Unit Price (LMD – 43)	6
Code Reference Measuring Element (LMD – 44)	6
E. Checklist for LPG Liquid Measuring Devices	6
F. Checklist for Mass Flow Meters	7
Carry-over Items:	8
2. Reorganize Publication 14 to clarify tests of ECRs for RMFDs	8
3. Add magnetic flowmeters to Product Family Table.	8
4. Value of the Smallest Unit for LMD Code	14
New Items:	15
5. Product Families for Meters	15
6. Table of Key Characteristics of Products in Family Products Table for Meters	15
7. NTEP Checklist for Water meters in sub-metering application	16
8. NTEP Checklist for LPG vapor meters in sub-metering applications	17
9. Testing Electronic Indicators Using Simulated Inputs	17
10. Next Meeting	18
Additional Items for Discussion if Time Permits	18
11. Display of Quantity and unit Price for Self Serve Aviation Dispensers	18
12. S.1.2.3. Value of the Smallest Unit for Aviation Turbine Fuel	19
13. Testing Meters Made of Different Metals	20
List of Appendices:	20
Appendix – A	20
Reorganized Publication 14 – LMD Checklist	20
Appendix – B	20
Reorganized Publication 14 – ECR Interfaced with RMFD Checklist	20
Appendix – C	20
Domestic Cold Water Meters	20
Appendix – D Hydrocarbon Gas Vapor Meters	20

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1. Recommendations to Update to NCWM Publication 14 to Reflect Changes to NIST Handbook 44

Source: NIST/WMD

Background: The 90th National Conference on Weights and Measures (NCWM) adopted the following items that will be reflected in the 2006 Edition of NIST Handbook 44 and NCWM Publication 14. These items are part of the agenda to inform the Measuring Sector of the NCWM actions and recommend changes to NCWM Publication 14.

Recommendation: The Sector will review and, if acceptable, recommend to the NTEP Committee adoption of the following changes to Publication 14 based on changes to NIST Handbook 44:

A. Checklist and Test Procedures (LMD – 11)

Code Reference G-S.1. (e-g). Effective January 1, 2003 (LMD – 13)

- 1.1.5. The NTEP Certificate of Conformance (CC) Number or a corresponding CC addendum number for devices that have a CC. Yes No N/A
 The number shall be prefaced by the terms "NTEP CC", "CC", or "Approval". These terms may be followed by the word "Number" or an abbreviation for the Word "Number". The abbreviation shall as a minimum begin with the letter "N" (e.g., No or No.).

The device must have an area, either on the identification plate or on the device itself, suitable for the application of the Certificate of Conformance Number. If the area for the CC Number is not part of an identification plate, note its intended location and how it will be applied.

Location of CC Number if not located with the identification:

Code Reference: G-S.1.1. Location of Marking Information for Not Built-for-Purpose Devices, Software-Based (LMD – 13)

- 1.2. For not built-for-purpose, software-based devices the following shall apply:
 - 1.2.1. The required information in G-S.1 Identification. (a), (b), (d), and (e) shall be permanently marked or continuously displayed on the device; or Yes No N/A
~~the manufacturer or distributor and the model designation shall be continuously displayed or marked on the device (see note below);~~
~~or~~

1.2.2. The Certificate of Conformance (CC) Number shall be: Yes No N/A

- 1 permanently marked on the device;
- 2 continuously displayed; or
- 3 accessible through an easily recognized menu and, if necessary, a submenu. Examples of menu and submenu identification include, but are not limited to "Help," "System Identification," "G-S.1. Identification," or "Weights and Measures Identification."

~~the Certificate of Conformance (CC) Number shall be continuously displayed or marked on the device (see note below); or~~

~~1.2.3. all required information in G-S.1. Identification. (a), (b), (c), (e), and (h) shall be continuously displayed. Alternatively, a clearly identified view only System Identification, G-S.1. Identification, or Weights and Measures Identification shall be accessible through the "Help" menu. Required information includes that information necessary to identify that the software in the device is the same type that was evaluated.~~ Yes No N/A

Note: For (b), clear instructions for accessing the information required in G-S.1. (a), (b), and (d) shall be listed on the CC, including information necessary to identify that the software in the device is the same type that was evaluated. ~~Clear instructions for accessing the remaining required G-S.1. information shall be listed on the CC. Required information includes that information necessary to identify that the software in the device is the same type that was evaluated.~~

1.3. The identification badge must be visible after installation. Yes No N/A

1.4. The identification badge must be permanent. Yes No N/A

B. Philosophy for Sealing (LMD – 17- 20)

Category 1 Devices (Devices with No Remote Configuration Capability):

- The device is sealed with a physical seal or it has an audit trail with two event counters (one for calibration, the second for configuration). Yes No N/A
- A physical seal must be applied without exposing electronics. Yes No N/A
- Event counters are non-resettable and have a capacity of at least 000 to 999. Yes No N/A
- Event counters increment appropriately. Yes No N/A
- The audit trail information must be capable of being retained in memory for at least 30 days while the device is without power, or must be retained in nonvolatile memory. Yes No N/A
- Accessing the audit trail information for review shall be separate from the calibration mode. Yes No N/A
- Accessing the audit trail information must not affect the normal operation of the device. Yes No N/A
- Accessing the audit trail information shall not require removal of any additional parts other than normal requirements to inspect the integrity of a physical security seal. (e.g., a key to open a locked panel may be required). Yes No N/A

Category 2 Devices (Devices with Remote Configuration Capability but Controlled by Hardware):

- ~~Category 2 applies only to devices manufactured prior to January 1, 2005. Devices with remote configuration capability manufactured after that date must meet the sealing requirements outlined in Category 3. Devices without remote configuration capability manufactured after that date will be required to meet the minimum criteria outlined in Category 1.~~ Yes No N/A

- **The physical hardware enabling access for remote communication must be on- site.** Yes No N/A
- **The physical hardware must be sealable with a security seal or** Yes No N/A
- **The device must be equipped with at least two event counters: one for calibration, the second for configuration parameters** Yes No N/A
 - **calibration parameters event counter**
 - **configuration parameters event counter**

- **Adequate provision must be made to apply a physical seal without exposing electronics.** Yes No N/A
- **Event counters are non-resettable and have a capacity of at least 000 to 999.** Yes No N/A
- **Event counters increment appropriately.** Yes No N/A
- **Event counters may be located either:** Yes No N/A
 - **at the individual measuring device or**
 - **at the system controller**
- **If the counters are located at the system controller rather than at the individual device, means must be provided to generate a hard copy of the information through an on-site device.** Yes No N/A
- **An adequate number (see table below) of event counters must be available to monitor the calibration and configuration parameters of each individual device.** Yes No N/A
- **The device must either:** Yes No N/A
 - **clearly indicate when it is in the remote configuration mode or**
 - **the device shall not operate while in the remote configuration mode.**
- **If capable of printing in the calibration mode, it must print a message that it is in the calibration mode.** Yes No N/A
- **The audit trail information must be capable of being retained in memory for at least 30 days while the device is without power.** Yes No N/A
- **The audit trail information must be readily accessible and easily read.** Yes No N/A

Minimum Number of Counters Required		
	Minimum Counters Required for Devices Equipped with Event Counters	Minimum Event Counter(s) at System Controller
Only one type of parameter accessible (calibration or configuration)	One (1) event counter	One (1) event counter for each separately controlled device, or one (1) event counter, if changes are made simultaneously.
Both calibration and configuration parameters accessible	Two (2) event counters	Two (2) event counters for each separately controlled device, or two (2) or more event counters if changes are made to all controlled devices simultaneously.

Category 3 Devices (Devices with Unlimited Remote Configuration Capability):

Category 3 devices have virtually unlimited access to sealable parameters or access is controlled through a password.

- For devices manufactured after January 1, 2001, the device must either: Yes No N/A
 - clearly indicate when it is in the remote configuration mode, or

- the device shall not operate while in the remote configuration mode
- The device is equipped with an event logger Yes No N/A
- The event logger automatically retains the identification of the parameter changed, the date and time of the change, and the new value of the parameter. Yes No N/A
- Event counters are nonresettable and have a capacity of at least 000 to 999. Yes No N/A
- The system is designed to attach a printer, which can print the contents of the audit trail. Yes No N/A
- The audit trail information must be capable of being retained in memory for at least 30 days while the device is without power or must be retained in nonvolatile memory. Yes No N/A
- The event logger must have a capacity to retain records equal to ten times the number of sealable parameters in the device, but not more than 1000 records are required. Yes No N/A
- The event logger drops the oldest event when the memory capacity is full and a new entry is saved. Yes No N/A
- Describe the method used to seal the device or access the audit trail information. Yes No N/A

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- ~~Note: All devices with remote communication that are manufactured after January 1, 2005 must meet the requirements outlined for Category 3.~~

C. Checklist and Test Procedures for Retail Motor-Fuel Dispensers

Code Reference S.1.2. Units (LMD – 26)

S.1.2. Units. – A liquid-measuring device shall indicate, and record if the device is equipped to record, its deliveries in liters, gallons, quarts, pints, fluid ounces, or binary-submultiples or decimal subdivisions of the liter or gallon.

Code Reference: S.1.2. Units

- 7.23. A liquid-measuring device shall indicate, and record if the device is equipped to record, its deliveries in liters, gallons, quarts, pints, fluid ounces, or binary-submultiples or decimal subdivisions of the liter or gallon. Yes No N/A

D. Checklist and Test Procedures for Specific Criteria for Vehicle Tank Meters

Code Reference: S.1.1.3. Value of Smallest Unit

If the meter is equipped to record, the value of the smallest unit of indicated delivery and recorded delivery shall not exceed the equivalent of:

- 24.4. 0.5 L (0.1 gal) or 0.5 kg (1 lb) on milk-metering systems and on meters with a rated maximum flow rate of ~~500~~ 700 L/min (~~400~~ 200 gal/min) or less used for ~~retail~~ deliveries of ~~liquid fuel~~, or Yes No N/A

- 24.5. 5 L (1 gal) on meters with a rated maximum flow of 575 L/min (150 gal/min) or more used for jet fuel aviation refueling systems, Yes No N/A
2006

- 24.6** 5 L (1 gal) on other meters Yes No N/A
 (Renumber succeeding paragraphs)

Code Reference S.1.4.1. Display of Unit Price (LMD – 43)

Code Reference: S.1.4.1. Display of Unit Price

- 25.1. Means must be provided to display the unit price at which the device is set to compute in proximity to the total computed price display. (In a device of the computing type, means shall be provided for displaying, in a manner clear to the operator and an observer, the unit price at which the device is set to compute. The unit price is not required to be displayed continuously.) **Yes No N/A**

- 25.2. The unit price shall be expressed in dollars and decimals of dollars using a dollar sign. A common fraction shall not appear in the unit price (e.g., \$1.299 not \$1.29 9/10). **Yes No N/A**

Code Reference Measuring Element (LMD – 44)

Code Reference: S.2.2. Provision for Sealing

Measuring elements shall be designed with a provision for sealing such that an adjustment to the measuring element or the flow rate control (if the flow rate affects the accuracy of deliveries) cannot be made without breaking the security seal. These provisions can be an approved means of security (e.g., data change audit trail) or physically applying a security seal which must be broken before adjustments can be made. ~~Milk meters are exempt from this requirement.~~ When applicable, tThe adjusting mechanism shall be readily accessible for the purposes of affixing a security seal.

- 26.1. A measuring element shall have provision for sealing its adjustable components. **Yes No N/A**
- 26.2. Any adjustable element controlling the delivery rate shall provide for sealing if the flow rate affects the accuracy of deliveries. **Yes No N/A**
- 26.3. The adjusting mechanism shall be readily accessible to affix a security seal. **Yes No N/A**

E. Checklist for LPG Liquid Measuring Devices

31. Measuring Element (LMD – 49)

Code Reference: S.2.2. Provision for Sealing

Measuring elements shall be designed with a provision for sealing such that an adjustment to the measuring element or the flow rate control (if the flow rate affects the accuracy of deliveries) cannot be made without breaking the security seal. These provisions can be an approved means of security (e.g., data change audit trail) or physically applying a security seal which must be broken before adjustments can be made. When applicable, tThe adjusting mechanism shall be readily accessible for the purposes of affixing a security seal.

- 31.1. A measuring element shall provide for sealing its adjustable components. **Yes No N/A**
- 31.2. Any adjustable element controlling the delivery rate shall provide for sealing if the flow rate affects the accuracy of deliveries. **Yes No N/A**
- 31.3. The adjusting mechanism shall be readily accessible to affix a security seal. **Yes No N/A**

33. Marking

Code Reference: S.4. Marking Requirements

Code Reference: S.4.3. Location of Marking Information; Retail Motor-Fuel

Dispenser

33.4. The marking information required in the General Code, Paragraph G-S.1. Identification shall appear as follows: Yes No N/A

(a) within 60 cm (24 in) to 150 cm (60 in) from the base of the dispenser;

(b) either internally and/or externally provided the information is permanent and easily read; and

(c) on a portion of the device that cannot be readily removed or interchanged (i.e., not on a service access panel).

Note: The use of a dispenser key or tool to access internal marking information is permitted for retail liquid-measuring devices. [Nonretroactive as of January 1, 2003] (Added 2006)

Code Reference: S.4.3. Temperature Compensation

33.45. If a device is equipped with an automatic temperature compensator, the primary indicating elements, recording elements, and recorded representations shall be clearly and conspicuously marked to show that the volume delivered has been adjusted to the volume at 15 °C (60 °F). Yes No N/A

F. Checklist for Mass Flow Meters

38. Marking (LMD – 57)

Code Reference: S.5. Marking Requirements

- 38.1. The dispenser shall have the following information on the identification plate:
- a. pattern approval mark (i.e., type approval number); Yes No N/A
 - b. name and address of the manufacturer or his trademark and, required by the weights and measures authority, the manufacturer's identification mark in addition to the trademark; Yes No N/A
 - c. model designation or product name selected by the manufacturer; Yes No N/A
 - d. non-repetitive serial number; Yes No N/A
 - e. accuracy class of the meter as specified by the manufacturer consistent with Table T.2; Yes No N/A
 - f. maximum and minimum flow rates in pounds per unit of time; Yes No N/A
 - g. maximum working pressure; Yes No N/A
 - h. applicable temperature range if other than - 10 °C to +50 °C; Yes No N/A
 - i. minimum measured quantity (MMQ); Yes No N/A
 - j. product limitations if applicable. Yes No N/A

Code Reference: S.5.1. Location of Marking Information; Retail Motor-Fuel Dispensers.

38.2. The marking information required in General Code, Paragraph G-S.1. Identification shall appear as follows: Yes No N/A

- (a) within 60 cm (24 in) to 150 cm (60 in) from the base of the dispenser;
- (b) either internally and/or externally provided the information is permanent and easily read; and
- (c) on a portion of the device that cannot be readily removed or interchanged (i.e., not on a service access panel).

Note: The use of a dispenser key or tool to access internal marking information is permitted for retail liquid-measuring devices.
[Nonretroactive as of January 1, 2003]
(Added 2006)

Code Reference: S.5.12. Marking of Gasoline Volume Equivalent Conversion Factor

A device dispensing compressed natural gas shall have either the statement "1 Gasoline Liter Equivalent (GLE) is Equal to 0.678 kg of Natural Gas" or "1 Gasoline Gallon Equivalent (GGE) is Equal to 5.660 lb of Natural Gas" permanently and conspicuously marked on the face of the dispenser according to the method of sale used.

Carry-over Items:

2. Reorganize Publication 14 to clarify tests of ECRs for RMFDs

Source: NTEP Laboratories

Background: At the 2005 NTEP Laboratory Meeting, one of the Measuring Labs stated that the LMD section of Publication 14 was not well organized. During an NTEP evaluation the evaluator must continuously flip from on section of the publication to another to find all the requirements applicable to the device under test. The lab also stated that the evaluation of an ECR interfaced with a RMFD required the use of both the ECR Checklist and the LMD Checklist in order to find all the applicable requirements. The California Laboratory volunteered to provide a draft reorganization of LMD Checklist and a draft of a revised ECR checklist with the applicable requirements added from the LMD checklist. The drafts of the reorganized LMD checklist and the revised ECR checklist are in Appendix – A and B respectively. At the 2005 Sector Meeting the Sector supported the concept provided all NTEP Laboratories and other interested parties conducted a thorough review of the proposed changes before they are incorporated into NCWM Publication 14.

Recommendation: The Sector will review the drafts submitted, receive input from the NTEP Laboratories, and, if agreed, will forward them to the NTEP Committee for approval as revisions to the 2007 version of Publication 14.

3. Add magnetic flowmeters to Product Family Table.

Source: Magnetic meters work group

Background: At the 2002 Sector Meeting a working group was formed to address the issue of product family criteria. Prior to the 2003 Sector Meeting the technical advisor was informed that this work group was not ready to present a recommendation; however the work group requested that the item remain on the agenda for further development.

At the 2003 Sector Meeting the Sector agreed that a new work group should be formed to develop family product tables, for Mag Meters, for consideration by the Sector at its next meeting. The members of the new work group are; Charlene Numrych (Liquid Controls) Chair, Richard Miller (FMC), Joe Buxton (Daniel Measurement & Control), Randy Byrtus (Measurement Canada). Charlene volunteered to contact other manufacturers to invite them to participate in the work group.

The work group formed at the 2003 Sector Meeting identified four Turbine Meter manufacturers that could provide data on a variety of products measured using this type of meter. For the 2004 Measuring Sector Meeting only one Mag Meter manufacturer of three manufacturers was identified as having a certificate for products other than milk. No information had been gathered regarding manufacturers of Ultrasonic Meters. The work group did not have a proposal to present at that time, but planned to continue its work. A new Chair was needed for the work group because Charlene Numrych (Liquid Controls) was no longer available to perform that function. The work group had nothing to provide for the 2005 Measuring Sector Meeting.

The work group is submitting a proposal to add Magnetic Meters to the Family Products Table with additional background information, for discussion at the 2006 Sector Meeting.

The proposed Product Family Table adding magnetic flowmeters has been reviewed by manufacturer representatives holding magnetic flowmeter NTEP Certificates of Conformance. Those comments were included in the organization of this proposal.

Operation:

Magnetic flowmeters determine the velocity of an electrically conductive liquid in a known diameter tube section of the piping. The gross volumetric flow rate of the liquid is calculated in the electronic transmitter. The delivered volumetric quantity is displayed on the transmitter and/or scaled pulses are transmitted to a compatible register.

Influence factors:

The magnetic flowmeter determines the gross volume. The magnetic flowmeter is not influenced by the density of the liquid.

The magnetic flowmeter has no moving mechanical components that would rely on close tolerances and capillary fluid action. The magnetic flowmeter is not influenced by the viscosity of the liquid.

Magnetic flowmeters determine the velocity of electrically conductive liquids. The conductivity of the liquid must be above a minimum threshold value determined in the engineered design of the flowmeter and specified by the manufacturer. The value of the conductivity is not significant to the determination of the volumetric flow rate.

The Product Family Table:

The table has been edited to add a column for magnetic flowmeters.

The Water Mixes of Alcohol & Glycols and Water categories have been combined for magnetic flowmeters. Juices and Beverages have been added to this category.

The Agricultural Chemical Liquids and Chemicals categories have been combined for magnetic flowmeters.

Test D is required for Agricultural Chemical Liquids, Chemicals, Water, Beverages and Juices. The conductivity of the liquids in these

categories is not significant to the performance of the magnetic flowmeter.

A new Test F has been added that is specific to magnetic flowmeters. Test F is required for liquids in product categories where the liquids commonly have low conductivity. The manufacturer submits the flowmeter to be tested at a specified conductivity. The specified conductivity is listed on the certificate. All liquids in the same category with conductivity above the conductivity of the liquid tested will be included.

The following copyrighted documents can be referenced for as supporting documentation:

ASME Draft MFC-16M: Measurement of Fluid Flow in Closed Conduits, with Electromagnetic Flowmeters.

AWWA Draft Committee Report: Magnetic Inductive Flowmeters

Recommendation: The Sector will review the following proposal for possible forwarding to the NTEP Committee for approval and addition to the 2007 Edition of Publication 14.

Add magnetic flowmeters to the Product Family Table as follows.

<u>Tests to be Conducted</u>						
<u>Test A – Products must be individually tested and noted on the Certificate of Conformance.</u>						
<u>Test B - To obtain coverage for a range of products within a family: Test with one product having a low specific gravity; test with a second product having a high specific gravity. The Certificate of Conformance will cover all products in the family within the specific gravity range tested.</u>						
<u>Test C - To obtain coverage for a range of products within a family: Test with one product having a low viscosity; test with a second product having a high viscosity. The Certificate of Conformance will cover all products in the family within the viscosity range tested.</u>						
<u>Test D – To obtain coverage for a product family: Test with one product in the product family.</u>						
<u>Test E – To obtain coverage for a range of products within a family: Test with one product having a low kinematic viscosity; test with a second product having a high kinematic viscosity. The Certificate of Conformance will note coverage for all products in the family within the kinematic viscosity range tested.</u>						
<u>Test F – To obtain coverage for a range of products within a family: Test with one product having a specified conductivity. The Certificate of Conformance will note coverage for all products in the family with conductivity equal to or above the conductivity of the tested liquid.</u>						
<u>Mass Meter Product Family & Test Requirements (Test B unless otherwise noted)</u>	<u>Magnetic Flow Meter Product Family & Test Requirements (Test D unless otherwise noted)</u>	<u>PD Product Family & Test Requirements (Test C unless otherwise noted)</u>	<u>Turbine Product Family & Test Requirements (Test A unless otherwise noted)</u>	<u>Typical Products¹</u>	<u>Viscosity⁵ (Centipoise) (Centistokes)</u>	<u>Specific Gravity²</u>

<u>Normal Liquids</u>	<u>Test F</u>	<u>Fuels, Lubricants, Industrial and Food Grade Liquid Oils</u>	<u>Fuels, Lubricants, Industrial and Food Grade Liquid Oils (Test E permitted)</u>	<u>Diesel Fuel³, Distillate, Gasoline⁴, Fuel Oil, Kerosene, Light Oil, Spindle Oil, Lubricating Oils, SAE Grades, Bunker Oil, 6 Oil, Crude Oil, Asphalt, Vegetable Oil, Biodiesel above B20, Avgas, Jet A, Jet A-1, Jet B, JP4, JP5, JP7, JP8, Cooking Oils, Sunflower Oil, Soy Oil, Peanut Oil, Olive Oil, etc.</u>	<u>0.3 to 2500</u> <u>0.44 to 2270</u>	<u>0.68 to 1.1</u>
	<u>Test F</u>	<u>Solvents General</u>	<u>Solvents General (Test E permitted)</u>	<u>Acetates, Acetone, Esters, Ethylacetate, Hexane, MEK, Naphtha, Toluene, Xylene, etc.</u>	<u>0.3 to 7</u> <u>0.5 to 4.38</u>	<u>0.6 to 1.6</u>
	<u>Test F</u>	<u>Solvents Chlorinated</u>	<u>Solvents Chlorinated</u>	<u>Carbon Tetrachloride, Methylene Chloride, Perchloroethylene, Trichloroethylene, etc.</u>	<u>0.3 to 7</u> <u>0.5 to 4.38</u>	<u>0.6 to 1.6</u>
	<u>Pure Alcohols & Glycols, Water (De-mineralize)</u>	<u>Alcohols, Glycols, & Water Mixes Thereof</u>	<u>Alcohols, Glycols, & Water Mixes Thereof (Test E permitted)</u>	<u>Ethanol, Methanol, Butanol, Isopropyl, Isobutyl, Ethylene glycol, Propylene glycol, etc.</u>	<u>0.3 to 7</u> <u>0.5 to 4.38</u>	<u>0.6 to 1.6</u>

<p><u>d & de-ionized)</u> <u>Test F</u></p> <p><u>Water (Tap, Potable & Nonpotable), Water (Mixes of Alcohols & Glycols), Juices, Beverages, (Test D)</u></p>	<p><u>Water (Test D permitted)</u></p>	<p><u>Water (Test D permitted)</u></p>	<p><u>Tap Water, Deionized, Demineralized, Potable, Nonpotable</u></p>	<p><u>1.0</u></p>	<p><u>1.0</u></p>
<p><u>Clear Liquid Fertilizers, Crop Chemicals, Suspensions Fertilizers, Liquid Feeds, Chemicals Test D</u></p>	<p><u>Clear Liquid Fertilizers</u></p>	<p><u>Clear Liquid Fertilizers</u></p>	<p><u>Nitrogen Solution; 28%, 30% or 32%; 20% Aqua-Ammonia; Urea; Ammonia Nitrate; N-P-K solutions; 10-34-0; 4-10-10; 9-18-9; etc.</u></p>	<p><u>10 to 400</u> <u>10 to 275</u></p>	<p><u>1.0 to 1.45</u></p>
	<p><u>Crop Chemicals</u></p>	<p><u>Crop Chemicals</u></p>	<p><u>Herbicides: Round-up, Touchdown, Banvel, Treflan, Paraquat, Prowl, etc</u></p>	<p><u>4 to 400</u> <u>5.7 to 333</u></p>	<p><u>0.7 to 1.2</u></p>
	<p><u>Crop Chemicals</u></p>	<p><u>Crop Chemicals</u></p>	<p><u>Fungicides, Insecticides, Adjuvants, Fumigants</u></p>	<p><u>0.7 to 100</u> <u>1 to 83</u></p>	<p><u>0.7 to 1.2</u></p>
	<p><u>Flowables</u></p>	<p><u>Flowables</u></p>	<p><u>Dual, Bicep, Marksman, Broadstrike, Doubleplay, Topnotch, Guardsman, Harness, etc.</u></p>	<p><u>20 to 900</u> <u>20 to 750</u></p>	<p><u>1 to 1.2</u></p>
	<p><u>Crop Chemicals</u></p>	<p><u>Crop Chemicals</u></p>	<p><u>Fungicides</u></p>		
	<p><u>Crop Chemicals</u></p>	<p><u>Crop Chemicals</u></p>	<p><u>Micronutrients</u></p>		
	<p><u>Suspensions Fertilizers</u></p>	<p><u>Suspensions Fertilizers</u></p>	<p><u>3-10-30; 4-4-27, etc.</u></p>	<p><u>20 to 900</u> <u>20 to 560</u></p>	<p><u>1.0 to 1.6</u></p>
	<p><u>Liquid Feeds</u></p>	<p><u>Liquid Feeds</u></p>	<p><u>Liquid Molasses; Molasses plus Phos Acid and/or Urea; etc.</u></p>	<p><u>10 to 50 000</u> <u>8 to 33 000</u></p>	<p><u>1.2 to 1.5</u></p>

		<u>Chemicals</u>	<u>Chemicals</u>	<u>Sulfuric Acid, Hydrochloric Acid, Phosphoric Acid, etc</u>	<u>1.0 to 296</u> <u>0.9 to 160</u>	<u>1.1 to 1.85</u>
<u>Heated Products (above 50 °C)</u>	<u>Test F</u>	<u>Heated Products (above 50 °C)</u>	<u>Heated Products (above 50 °C)</u>	<u>Bunker C, Asphalt, etc.</u>		<u>0.8 to 1.2</u>
<u>Compressed Liquids – (Test D)</u>	<u>Not Applicable</u> <u>(conductivity too low)</u>	<u>Fuels and Refrigerants</u>	<u>Fuels and Refrigerants (Test E)</u>	<u>LPG, Propane, Butane, Ethane, Freon 11, Freon 12, Freon 22, etc.</u>	<u>0.1 to 0.5</u> <u>0.3 to 0.77</u>	<u>0.3 to 0.65</u>
		<u>NH³</u>	<u>NH³</u>	<u>Anhydrous Ammonia</u> <u>Note: If a meter is certified for anhydrous ammonia the same meter type may also be certified for LPG without further testing</u>	<u>0.1</u> <u>0.2</u>	<u>0.56 to 0.68</u>
<u>Compressed Gases – (Test D)</u>	<u>Note: CNG is only included in Section 3.37 Mass Flow Meters of Handbook 44</u>		<u>CNG</u>		<u>0.6 to 0.8</u>	
<u>Cryogenic Liquids and Liquefied Natural Gas – (Test D)</u>	<u>Not Applicable</u> <u>(conductivity too low)</u>	<u>Cryogenic Liquids and Liquefied Natural Gas – (Test A)</u>	<u>Cryogenic Liquids and Liquefied Natural Gas – (Test D)</u>	<u>Liquefied Oxygen, Nitrogen, etc.</u>	<u>0.07 to 1.4</u>	

¹NOTE: 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.

²The 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/m³ (or 998 kg/m³)

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.

⁵ Kinematic viscosity is measured in centistokes.
$$\text{Centistokes} = \frac{\text{Centipoise}}{\text{Specific Gravity}}$$

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."

4. Value of the Smallest Unit for LMD Code

Source: NCWM S&T Committee

Background/Discussion: In 2004 the definition of a “retail device” in NIST Handbook 44 was modified to include all devices used to measure product for the purpose of sale to the end user. At that time the Committee believed all affected parties were aware of the proposal and there was no opposition to the change. The Committee had not considered applications where very large deliveries are made to the end user, typically at high flow rates. After the 2005 edition of the handbook was published and distributed, WMD received a comment from a weights and measures jurisdiction that routinely tests large meters used to deliver fuel to fishing fleets and other large ocean-going boats. The jurisdiction stated that the average delivery is approximately 300 000 gal and may be as much as 1 000 000 gal. Prior to the revision of the definition of “retail,” the value of the smallest unit of the indicated delivery for these devices was permitted to be 1 gal. Most of these devices have mechanical registers which make it impractical to have a smallest unit of 0.1 gal at the high flow rates used for such large deliveries. Because the fuel is being delivered to the end user, the jurisdiction believes this is a retail delivery. However, with the revisions to the definition of retail device, NIST Handbook 44 now requires a smallest unit of delivery of not more than 0.5 L (1 pint or 0.125 gal) for these devices.

At its October 2005 meeting, the NTETC Measuring Sector developed a proposal and agreed to forward it to the Committee for consideration. The Measuring Sector believed that, because the maximum flow rate for many applications has increased, 200 gal/min is an appropriate “break point” for determining what the smallest unit of measurement should be. At its October 2005 meeting, the SWMA agreed with the Measuring Sector’s proposal and recommended that the item move forward to the Committee.

At the 2006 NCWM Interim Meeting, it was suggested that the Committee should revisit the discussion on suitability of liquid-measuring devices that was discussed by the NCWM in 1991 through 1993. In these earlier discussions, the NCWM was unable to reach a consensus on any changes to NIST Handbook 44, and the item was withdrawn from the Committee agenda. The Committee was informed that there was interest expressed at the 2005 NTETC Measuring Sector Meeting in developing new criteria addressing suitability as it relates to flow rate, minimum measured quantity (MMQ), and the smallest unit of measure for applications using liquid-measuring devices. The Committee encourages the NTETC Measuring Sector to pursue development of suitability requirements for submission to the Committee for consideration. In the meantime, the Committee heard no opposition to Item 330-2 and agreed to present the item for a vote at the 2006 NCWM Annual Meeting.

At the 2006 NCWM Annual Meeting, the Committee received input from several manufacturers of aircraft refueling equipment that there is a safety concern with stationary refueling systems that are capable of delivering jet fuel through two different size hoses at different flow rates using two different meters. In this scenario, the operators of the refueling facility want both meters to have the same unit of indication; that is, 5 L or 1 gal. The Committee understood the concern, but was reluctant to modify the recommendation based on the limited information available at the meeting. The Committee believed that the aircraft refueling industry should propose a change during the next Conference cycle through the NTETC Measuring Sector and the regional associations. However, the Committee recognized that a legitimate problem may exist with existing jet aircraft refueling equipment and encouraged weights and measures jurisdictions to consider safety implications before taking official action on existing jet aircraft refueling devices that may not meet the requirements of paragraph S.1.2.3. During the voting session there appeared to be concern that that if this item was adopted weights and measures officials could be perceived as ignoring safety issues for aircraft refueling. There was an evident lack of support for the item without an exemption for jet aircraft refueling; therefore, the Committee changed the status of Item 330-2 to an information item to provide sufficient time for development of appropriate language to address the safety concerns with jet aircraft refueling equipment. The Committee requested that the Measuring Sector provide comments or changes to the proposal as appropriate.

Recommendation: The Sector will review the following proposal and provide comments or changes to the S&T Committee for consideration at the 2007 NCWM Interim Meeting.

Proposal: Modify Handbook 44, Section 3.30., S.1.2.3. Value of the smallest unit as follows:

S.1.2.3. Value of Smallest Unit. – The value of the smallest unit of indicated delivery, and recorded delivery if the device is equipped to record, shall not exceed the equivalent of:

- (a) 0.5 L (~~1-pt~~ 0.1 gal) on ~~retail~~ devices with a maximum rated flow rate of 750 L/min (200 gal/min) or less.
- (b) 5 L (1 gal) on ~~wholesale~~ devices with a maximum rated flow of more than 750 L/min (200 gal/min).

This requirement does not apply to manually operated devices equipped with stops or stroke-limiting means.

(Amended 1983, ~~and~~ 1986, and 200X)

See agenda item 11.

New Items:

5. Product Families for Meters

Source: NTEP Director

Background/Discussion: During several NTEP evaluations conducted since the last Sector meeting, there have been concerns that the family products tables for meters needs to be revised and updated to reflect changes in metering designs being submitted for evaluation and products currently found in the market place. One meter manufacturer wanted to know what testing was required to include “biodiesel” on a CC. Must the evaluation be conducted using biodiesel fuel with the highest specific gravity available or can testing be conducted using a product, with very similar characteristics, that is available in the manufacturer’s lab.

Recommendation: The Sector will review and discuss possible changes to clarify the Product Families Table for Positive Displacement Meters in the LMD Technical Policy of Publication 14 to be forwarded to the NTEP Committee for approval and addition to the 2007 Edition of Publication 14.

I will try to keep this very brief.

- 1). The table as it currently exists is still very confusing
- 2). It is not clear which test are actually required
- 3). Instead of the "Tests" being listed in the header of the table, they should be listed with each product group
- 4). Typical products should be listed in ascending order (if possible) based on one of the key characteristics or have a method to ID key characteristics

6. Table of Key Characteristics of Products in Family Products Table for Meters

Source: NTEP Director

Background/Discussion: This is a developing item. Probably all of you reading this know more about this topic than I ever will. I have had discussions with several different people on this topic over the past several months. The Product table in NCWM Publication 14 has been improved over the past several years. Currently, Mass Flow Meters have key a characteristic of specific gravity. PD meters have a key

characteristic of viscosity. We list in the table numbers. However, these numbers are without reference. These are normally tied to some temperature. None is listed. Also, there is no cross reference for anyone to identify what products might fall within those ranges. I had a very difficult time finding specific information on even some very basic products that we normal use in evaluations. Several of the folks on the sector helped to locate various tables and charts to help ID these values. The information in these charts varies for the "same" product.

As an example of the potential confusion, there are both dynamic (absolute) and kinematic viscosity. The values for these are not the same for the same product, the unit for these respectively is CentiPois and CentiStokes.

Quoting from the Engineering Tool Box: The viscosity of a fluid is highly temperature dependent and for either dynamic or kinematic viscosity to be meaningful, the reference temperature must be quoted.

In the Table on page LMD-3 there are numbers for both Viscosity and Specific Gravity but no temperatures. While S.G. may not be as temperature dependant, some reference should still be sited.

To expand on this in the table in the Pub on page LMD-3, we have Test C which just states viscosity, while in Test E states specifically kinematic viscosity. This may be very important for the device that that uses these tests, but I would suggest that it be clarified and consistent. The use of just the term "viscosity" could be misinterpreted.

What I am proposing is that this group considers listing specific values for each of the typical products listed in this table. It may need to be a separate table. With this information, the NTEP evaluator would then be able to look to the chart and find the correct value for the critical characteristic. This could be listed on the CC and the range could clearly be identified. Additional products could be added as necessary when they used for an evaluation. The main point is that the same values will be used.

Also, there are four different product groups for crop chemicals. Without further information, this can lead to confusion.

Trying to follow all of the special notes is very difficult.

There still seems to be product families that are based on some other factor that is not specified, not just viscosity or specific gravity. (first page of table) many of the different product's values overlap.

This should be enough to get the discussion started. I hope that I have been clear in the fact that I would like to see this table continue to be revised and if possible condensed.

Recommendation: The Sector will discuss the NTEP Director's concern and explore the concept of having a table of product characteristics. The Sector may appoint a work group to develop this item for presentation and discussion at the next meeting.

7. NTEP Checklist for Water meters in sub-metering application

Source: NTEP Director

Background/Discussion: The NTEP Committee has asked the Measuring Sector to consider and develop a checklist for residential water meters. These devices will most likely be used for sub-metering. Several states have recently contacted NTEP regarding these devices. California already has evaluation and certification of these devices in their state. It is recommended that the Sector review the procedures used by CA and rework them into a format acceptable to NCWM Publication 14.

Comments from the California NTEP Laboratory:

I have found a word version and copied the specific section. This is used as an EPO for field enforcement but we follow the same guidelines in approval and do 3 tests at three flow rates and do check repeatability. It also has a basic form you can print and do water meter tests. This also does follow HB44 sections 1.10 and 3.36.

In Type Evaluation we have a procedure (not a checklist) but it is for the evaluator and starts with application review and other directives not pertaining to actual testing. We also have an electronic form but is specific for our provers. And as previously stated follow the testing criteria of the EPO. It probably would not take a whole lot of work (I'm guessing) to format it to the Pub 14 format?

The Sector members can review the CA checklist for Domestic Cold Water Meters in the attached Appendix – C.

Recommendation: The Sector will discuss the NTEP Director's concern and explore the concept of adding a checklist for evaluation of water meters in sub-metering applications to Publication 14. The Sector may appoint a work group to develop this item for presentation and discussion at the next meeting.

8. NTEP Checklist for LPG vapor meters in sub-metering applications

Source: NTEP Director

Background/Discussion: The NTEP Committee has asked the Measuring Sector to consider and develop a checklist for residential water meters. These devices will most likely be used for sub-metering. Several states have recently contacted NTEP regarding these devices. California already has evaluation and certification of these devices in their state. It is recommended that the Sector review the procedures used by CA and rework them into a format acceptable to NCWM Publication 14.

The Sector members can review the CA checklist for LPG vapor meters in the attached Appendix – D.

Recommendation: The Sector will discuss the NTEP Director's concern and explore the concept of adding a checklist for evaluation of LPG vapor meters in sub-metering applications to Publication 14. The Sector may appoint a work group to develop this item for presentation and discussion at the next meeting.

9. Testing Electronic Indicators Using Simulated Inputs.

Source: FMC

Background/Discussion: It was stated at the 2004 Measurement Sector meeting that the reason for allowing fixed indicators to use simulated inputs was the fact that durability testing was not required due to the limited vibration associated with their intended use, and vehicle mounted indicators could not be tested with simulated inputs for the same reason. The intended use was a sever environment, therefore testing in the field following the permanence requirements was needed to test the durability of the device. In other words to make sure the device would function in its intended environment with out failures due to its usage.

The rational of allowing simulated inputs for revisions to an existing CC regardless of installation type is the fact that the device has already undergone the durability phase of the testing. Software revisions will not affect the durability of a device; software changes do however affect the functionality of a device. Therefore testing with simulated inputs offers a sufficient test to verify software functionality.

Recommendation: The Sector will review the following proposal and if agreed forward it to the NTEP Committee for consideration at the 2007 NCWM Interim Meeting.

Proposal: Modify Publication 14 Technical Policy Section U. as follows: (LMD – 9)

U. Testing Electronic Indicators ~~for Stationary Installations~~ Utilizing Simulated Inputs.

- a. When evaluating electronic indicators for stationary installations, submitted separate from a measuring element, indicators may be evaluated using simulated inputs (i.e. meter pulse, temperature, pressure, density, communications, etc.).
- b. When evaluating electronic indicators (regardless of installation type) for revisions to an existing CC for metrological significant software revisions, indicators may be evaluated using simulated inputs (i.e. meter pulse, temperature, pressure, density, communications, etc.).

10. Next Meeting

Recommendation: The Sector will discuss the time and location for its next meeting.

Additional Items for Discussion if Time Permits

11. Display of Quantity and unit Price for Self Serve Aviation Dispensers

Source: Veeder-Root

Background/Discussion: The normal self-serve installation for Aviation fuels does not use an analog or digital “gasoline dispenser” that simultaneously displays money and volume. In most cases the self-serve user interface is a credit card consol/controller that handles the transaction. These devices are not set up for the simultaneous display.

Aviation self-serve dispensing systems use a base meter-register that is a PD meter with a mechanical register and pulser or an electronic register with pulse output, or an industrial dispenser with volume only and a pulse output. The meter-register part sends pulses to the credit card consol/controller. All three components including the consol/controller have NTEP certificates.

In June, the State of Alabama W&M reviewed a couple of planned installations and informed the installing company that the equipment was “Retail Motor Fuel”, and “simultaneous display of Quantity and Sale was required”. This started a series of exchanges of information between several parties including two consol/controller manufacturers, several equipment suppliers, and the State of Alabama.

The typical “retail gasoline dispenser” that has the display capability is not designed in terms of materials of construction for aviation gasoline or jet fuel, nor does it have the flow rate capacity. Higher capacity diesel dispensers have the materials of construction problem. And in jet fuel applications, the dispensers do not have the flow rate capacity required.

There is one small company that assembles dispensers that could today put together a unit to meet the materials of construction and minimum flow requirements. Their NTEP certificate currently is for Diesel and Gasoline on their simultaneous display dispenser. They could use the appropriate aviation approved materials of construction components for applications up to 50 gpm and simultaneously display price and currency. These units are however not now commonly used in the aviation industry, which means the experience is not there for wide acceptance, and would not be adequate for Jet fuel flow rates.

Recommendation: The Sector will review the following proposal for possible forwarding to the NCWM S&T Committee for consideration.

Proposal: Modify Handbook 44 Section 30. paragraph S.1.6.5.5. as follows:

S.1.6.5.5. Display of Quantity and Total Price.

(a) When a delivery is completed, the total price and quantity for that transaction shall be displayed on the face of the dispenser for at least 5 minutes or until the next transaction is initiated by using controls on the device or other customer-activated controls.

[Nonretroactive as of January 1, 1994]

(Added 1992)(Amended 1996)

(b) For Aviation fuel dispensing, the Quantity and Total Price need not be displayed simultaneously as-long-as the Total Price and Quantity delivered can be viewed by interacting with the display or controller, or the Total Price and Quantity is available on a printed receipt as specified in S.1.6.7.

12. S.1.2.3. Value of the Smallest Unit for Aviation Turbine Fuel

Source: Veeder-Root

Background/Discussion: At the NCWM Annual meeting in July, the VTM code Section 331-1, S.1.1.3 Value of Smallest Increment was upgraded to make the smallest increment 1 gal for Aviation Jet fuel metering. This item is a follow on to that item for recognizing the normal installations and operations of the Aviation industry for jet fuel. The aviation industry meters and registers Jet fuel in whole gallons in fixed applications as it does on aviation refueling vehicles (VTM code). Jet fuel consumers normally expect whole gallon increments.

In most applications, 2 inch or larger (150 gal/min or greater) PD meters are used. Retail sale of Jet fuel from a fixed fueling system is done in the industry, and there are Self Serve Jet A installations.

The minimum flow rate of 150 gal/min relates to a 2-inch meter that is not mounted in a dispenser housing. If a “self contained” dispenser were available and used for Jet fuel, it would use a smaller meter with less flow rate and the expected minimum increment would be 0.1 gallons.

The “exemption” requested for Jet fuel is not for “dispensers”, but for 2-inch and above meters.

See agenda item 4.

Recommendation: The Sector will review the following proposal for possible forwarding to the NCWM S&T Committee for consideration.

Proposal: Modify Handbook 44 Section 3.30. paragraph S.1.2.3. Value of the smallest unit as follows:

S.1.2.3. Value of Smallest Unit. - The value of the smallest unit of indicated delivery, and recorded delivery if the device is equipped to record, shall not exceed the equivalent of:

(a) 0.5 L (1 pt) on retail devices;

(b) 5 L (1 gal) on wholesale devices.

(c) 5L (1 gal) on meters with a rated maximum flow rate of 575L (150 gal/min) or more used for aviation turbine fuels.

This requirement does not apply to manually operated devices equipped with stops or stroke-limiting means.

(Amended 1983,1986 and 200X)

13. Testing Meters Made of Different Metals

Source: California NTEP Laboratory

Discussion/Background: The California NTEP Laboratory is conducting an NTEP evaluation of a family of meters using multiple products in different product families. The meter family includes meters made of aluminum and stainless steel. Because Publication 14 does not specifically address this scenario, the Laboratory is asking for input from the Sector before testing starts.

Recommendation: The Sector will discuss the scenario described above. The following proposal is offered as a possible solution. The Sector will review the proposal and if agreed forward it to the NTEP Committee for possible inclusion in Publication 14.

Proposal: Add a new Section F. to the Publication 14 Technical Policy as follows and Renumber Subsequent Sections:

U. Meters Within the Same Family Made of Different Materials

When multiple meters, within a meter family, made of different materials 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.

List of Appendices:

Appendix – A

Reorganized Publication 14 – LMD Checklist

Appendix – B

Reorganized Publication 14 – ECR Interfaced with RMFD Checklist

Appendix – C

Domestic Cold Water Meters

Appendix – D Hydrocarbon Gas Vapor Meters