

National Type Evaluation Program (NTEP) Software Sector Meeting Summary

September 16-17, 2015 / Denver, CO

INTRODUCTION

The charge of the National Type Evaluation Program (NTEP) Software Sector is important in providing appropriate type evaluation criteria for software-based weighing or measuring device based on specifications, tolerances and technical requirements of *NIST Handbook 44* Section 1.10 General Code, Section 2 for weighing devices, Section 3 for liquid and vapor measuring devices, and Section 5 for taximeters, grain analyzers, and multiple dimension measuring devices. The sector's recommendations are presented to the National Type Evaluation Program (NTEP) Committee each January for approval and inclusion in *NCWM Publication 14 Technical Policy, Checklists, and Test Procedures* for national type evaluation.

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

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

Table A
Table of Contents

Title of Content	Page
INTRODUCTION	1
WELCOME / INTRODUCTIONS	2
STATUS REPORTS – RELATED NCWM AND INTERNATIONAL ACTIVITY	2
JOINT SESSION PROGRESS REPORT, ACTIVE ITEMS OF MUTUAL INTEREST	2
SOFTWARE SECTOR PRESENTATION	2
CARRY-OVER ITEMS	3
1. Software Identification / Markings	3
2. Identification of Certified Software	5
3. Software Protection / Security	9
4. Software Maintenance and Reconfiguration	12
5. NTEP Application for Software and Software-based Devices	15
6. Training of Field Inspectors	17
NEW ITEMS	19
7. Retrieval of Audit Log information	19
8. Next Meeting	20
9. 2015 NCWM Interim Meeting Report	20
10. 2015 International Report	21
APPENDIX A: ACCEPTABLE MENU TEXT/ICONS FOR WEIGHTS & MEASURES INFORMATION ..	22
APPENDIX B: FINAL ATTENDEE LIST	23

Table B
Glossary of Acronyms and Terms

Acronym	Term	Acronym	Term
BIML	International Bureau of Legal Metrology	OIML	International Organization of Legal Metrology
CC	Certificate of Conformance	OWM	Office of Weights and Measures
EPO	Examination Procedure Outline	PDC	Professional Development Committee
GMMs	Grain Moisture Meters	PDC	Professional Development Committee
NCWM	National Conference on Weights and Measures	S&T	Specifications and Tolerances Committee
NTEP	National Type Evaluation Program	SMA	Scale Manufacturers Association
NTEP	National Type Evaluation Technical Committee	WELMEC	European Cooperation in Legal Metrology

Details of All Items
(In order by Reference Key)

WELCOME / INTRODUCTIONS

Since the first day of this year’s Sector meeting is a joint meeting with the Measuring Sector, there will be some time set aside to meet and greet both new and familiar faces. In addition, the Software Sector would like to give a brief presentation outlining the problems they've been asked to consider and some of the consensus that has been reached.

STATUS REPORTS – RELATED NCWM AND INTERNATIONAL ACTIVITY

Attendees of the 2015 NCWM Interim Meeting will be asked to share any relevant comments or discussion that took place during the open hearings or NCWM Standards and Tolerances (S&T) committee working sessions.

Dr. Ambler Thompson, NIST, Office of Weights and Measures (OWM), will provide a synopsis of international activity that relates to the work of the sector.

JOINT SESSION PROGRESS REPORT, ACTIVE ITEMS OF MUTUAL INTEREST

Since this is the first joint meeting of the Sectors, it is expected that some time will be required to review the agenda items of the Sectors that require collaboration, so all participants have a solid foundation for discussion. As part of this review, items of particular importance or interest should be allocated more time during the joint session day.

SOFTWARE SECTOR PRESENTATION

Doug Bliss, Sector Technical Advisor delivered our state-of-the-sector presentation to the joint meeting attendees.

CARRY-OVER ITEMS

1. Software Identification / Markings

Source:

NTEP Software Sector

Background / Discussion:

See the 2014 Software Sector Meeting Summary and the 2015 Interim Meeting S&T Agenda Item 310-1 for more background on this item.

Since its inception the sector has wrestled with the issue of software identification and marking requirements. At the 2014 meeting, significant work was done to make the recommendation to modify GS-1 more palatable to the Conference. The new approach was a less invasive modification with effective dates set in the future for compliance to new requirements.

Darrell Flocken reported on the discussions during the 2015 Interim meeting S&T Committee sessions. The item was left as a Developing item and was not officially commented upon during the session; the Committee indicated that they were waiting for the outcome from the joint meetings with the other sectors, especially this one, to move forward.

In 2015, in conjunction with the Measuring Sector, some additional fine tuning was done. The current recommendation is below.

Amend *NIST Handbook 44*: G-S.1. Identification as follows:

G-S.1. Identification. – All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect, shall be clearly and permanently marked for the purposes of identification with the following information:

- (a) the name, initials, or trademark of the manufacturer or distributor;
- (b) a model identifier that positively identifies the pattern or design of the device;
 - (1) *The model identifier shall be prefaced by the word “Model,” “Type,” or “Pattern.” These terms may be followed by the word “Number” or an abbreviation of that word. The abbreviation for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., No or No.). The abbreviation for the word “Model” shall be “Mod” or “Mod.” Prefix lettering may be initial capitals, all capitals, or all lowercase.*
 [Nonretroactive as of January 1, 2003]
 (Added 2000) (Amended 2001)
- (c) *a nonrepetitive serial number, except for equipment with no moving or electronic component parts and ~~not built for purpose software based software devices~~ software;*
 [Nonretroactive as of January 1, 1968]
 (Amended 2003)
 - (1) *The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.*
 [Nonretroactive as of January 1, 1986]
 - (2) *Abbreviations for the word “Serial” shall, as a minimum, begin with the letter “S,” and abbreviations for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., S/N, SN, Ser. No., and S. No.).*

[Nonretroactive as of January 1, 2001]

- (d) the current software version or revision identifier for not-built-for-purpose software-based devices; **manufactured as of January 1, 2004 and all software-based devices or equipment manufactured as of January 1, 2022;**

[Nonretroactive as of January 1, 2004]

(Added 2003) **(Amended 2017)**

(1) *The version or revision identifier shall be:*

- i. *prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision;*

[Nonretroactive as of January 1, 2007]

(Added 2006)

Note: If the equipment is capable of displaying the version or revision identifier but is unable to meet the formatting requirement, through the NTEP type evaluation process, other options may be deemed acceptable and described in the CC.

(Added 2017)

- ii. **continuously displayed or be accessible via the display. Instructions for displaying the version or revision identifier shall be described in the CC. As an alternative, permanently marking the version or revision identifier shall be acceptable providing the device does not always have an integral interface to communicate the version or revision identifier.**

[Nonretroactive as of January 1, 2022]

(Added 2017)

- (2) *Abbreviations for the word “Version” shall, as a minimum, begin with the letter “V” and may be followed by the word “Number.” Abbreviations for the word “Revision” shall, as a minimum, begin with the letter “R” and may be followed by the word “Number.” The abbreviation for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., No or No.). **Prefix lettering may be initial capitals, all capitals, or all lowercase.***

[Nonretroactive as of January 1, 2007]

(Added 2006) (Amended 2017)

- (e) *an National Type Evaluation Program (NTEP) Certificate of Conformance (CC) number or a corresponding CC Addendum Number for devices that have a CC.*

(1) The CC Number or a corresponding CC Addendum Number shall be prefaced by the terms “NTEP CC,” “CC,” or “Approval.” These terms may be followed by the word “Number” or an abbreviation of that word. The abbreviation for the word “Number” shall, as a minimum, begin with the letter “N” (e.g., No or No.)

[Nonretroactive as of January 1, 2003]

The required information shall be so located that it is readily observable without the necessity of the disassembly of a part requiring the use of any means separate from the device. (Amended 1985, 1991, 1999, 2000, 2001, 2003, ~~and~~, 2006 **and 2017**)

Concerns were raised regarding situations where a particular device can be ordered with or without a display. In those situations, the manufacturers would prefer to hard-mark the software version/revision in all cases, keeping the manufacturing process simple. In this case, the wording “as an exception” is problematic since it is only allowed as an exception if the device has no capability of displaying it. Marc Buttler and Michael Keilty suggested that “exception” be replaced by “alternative”, and “always” be added after “not” to address this concern, i.e.

- iii. continuously displayed or be accessible via the display. Instructions for displaying the version or revision identifier shall be described in the CC. As an ~~exception~~ alternative, permanently marking the version or revision identifier shall be acceptable providing the device does not always have an integral interface to communicate the version or revision identifier.

[Nonretroactive as of January 1, 2022]

(Added 2017)

The Software Sector Chair asked the members of the Measuring and Software Sector in attendance whether everyone agreed to this modification of the proposal. Since no one objected, this change was included in the recommendation to the S&T Committee (and is included in the version shown above).

We debated whether to leave the non-retroactive date as 2020. It is possible to use 20XX and explain the intent in the proposal, but it might be better to leave it as a hard target. Since time has passed since we selected 2020, we backed it off until 2022, anticipating adoption by 2017 which would provide the intended period of five years after adoption.

In last year's proposal, there was an additional sub-clause included (in the 2014 Software Sector Summary version, this clause was in G-S.1.d(1).ii, and read directly linked to the software itself;) That line has been removed in this year's submission after further discussion during the 2015 joint meeting. Objections were raised that the clause did not actually represent a marking requirement. One suggestion was that it could be removed from Identification and moved to Sealing Requirements. Tina Butcher suggested instead that it be removed and a definition be added for Software Version or Revision Identifier. Unfortunately, if a definition is used instead the non-retroactive date would be lost. Another alternative suggested was to add a brand new section specifically for this; however, there's a general reluctance to add new sections to Handbook 44 that would have to be overcome.

It was realized that the word "permanently" in the very first paragraph of G-S.1 was sufficient language to require the software version or revision identifier to be linked to the software, so we ultimately decided to remove it from the proposed change. Since we already have a proposal on the agenda for the S&T Committee's meeting we will be submitting an amendment to reflect the new version of this proposal, rather than using Form 15 as for a new proposal.

This new version of the proposal has been sent to the various regions. Ideally, we should have someone at each of the regional meetings to answer any questions and champion this proposal.

Conclusion:

The amended proposal solves several areas of concern and has garnered consensus within multiple Sectors. We have forwarded the proposal to each of the Regional S&T committees and asked for consideration as a voting item; we also recommend that the Conference S&T committee consider making this a voting item in 2016.

2. Identification of Certified Software

Source:

NTEP Software Sector

Background:

This item originated as an attempt to answer the question "How does the field inspector know that the software running in the device is the same software evaluated and approved by the lab?" In previous meetings it was shown that the international community has addressed this issue (both WELMEC and OIML).

From WELMEC 7.2:

Required Documentation:

The documentation shall list the software identifications and describe how the software identification is created, how it is inextricably linked to the software itself, how it may be accessed for viewing and how it is structured in order to differentiate between version changes with and without requiring a type approval.

From OIML D-31:

The executable file “**tt100_12.exe**” is protected against modification by a checksum. The value of checksum as determined by algorithm **XYZ** is **1A2B3C**.

Previous discussions have included a listing of some additional examples of possible valid methods (not limiting):

- CRC (cyclical redundancy check)
- Checksum
- Inextricably Linked version no.
- Encryption
- Digital Signature

Is there some method to give the weights and measures inspector information that something has changed?

Yes, the Category III Audit Trail or other means of sealing.

How can the weights and measures inspector identify an NTEP Certified version?

They can't, without adding additional requirements like what is described here, in conjunction with including the identifier on the CC).

The sector believes that we should work towards language that would include a requirement similar to the International Organization of Legal Metrology (OIML) requirement in *NIST Handbook 44*. It is also the opinion of the sector that a specific method should not be defined; rather the manufacturer should utilize a method and demonstrate the selected identification mechanism is suitable for the purpose. It is not clear from the discussion where such proposed language might belong.

NTEP strongly recommends that metrological software be separated from non-metrological software for ease of identification and evaluation.

From OIML:

Separation of software parts - All software modules (programmes, subroutines, objects etc.) that perform metrologically significant functions or that contain metrologically significant data domains form the metrologically significant software part of a measuring instrument (device or sub-assembly). The conformity requirement applies to all parts and parts shall be marked according to Section G-S-X.X.

If the separation of the software is not possible or needed, then the software is metrologically significant as a whole.

(Segregation of parameters is currently allowed - see table of sealable parameters)

Identification of Certified Software:

Software-based electronic devices shall be designed such that the metrologically significant software is clearly identified by the version or revision number. The identification, and this identification of the software shall be inextricably directly and inseparably linked to the software itself. The version or revision number may consist of more than one part, but at least one part shall be dedicated to the metrologically significant software.

Discussion:

Some of the sectors have already agreed to put the below two paragraphs of text in the pertinent section(s) in Pub. 14. It is not yet reflected in the LMD and Vehicle Tank sections that are controlled by the Measuring Sector. The Measuring Sector was asked to consider inclusion of the paragraphs in 2014 as a sub-part of their Agenda Item 2, but it doesn't appear that it was specifically addressed.

From NCWM Publication 14:

Identification of Certified Software:

Note: Manufacturers may choose to separate metrologically significant software from non-metrologically significant software. Separation would allow the revision of the non-metrological portion without the need for further evaluation. In addition, non-metrologically significant software may be updated on devices without breaking a seal, if so designed. Separation of software requires that all software modules (programs, subroutines, objects etc.) that perform metrologically significant functions or that contain metrologically significant data ~~domains~~ form the metrologically significant software part of a measuring instrument (device or sub-assembly). If the separation of the software is not possible or needed, then the software is metrologically significant as a whole. ~~The conformity requirement applies to all parts and parts shall be marked according to Section G-S-X.X.~~

The manufacturer must describe and possibly demonstrate how the version or revision identifier is directly and inseparably linked to the metrologically significant software. Where the version or revision identifier is comprised of more than one part, the manufacturer shall describe which portion represents the metrologically significant software and which does not.

There was concern expressed related to the term "Certified Software" as it does not currently appear anywhere in Pub. 14 or Handbook 44. Jim Truex pointed out that this is intended as a note for Pub. 14, and "Certified" simply means that the software is traceable to a certificate.

In 2010, the sector recommended the following change to *NIST Handbook 44*, General Code: G-S.1(d) to add a new subsection (3):

(d) *the current software version or revision identifier for ~~not built for purpose~~ software-based electronic devices;*

[Nonretroactive as of January 1, 2004]

*(Added 2003) **(Amended 20XX)***

(1) The version or revision identifier shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required version or revision.

[Nonretroactive as of January 1, 2007]

(Added 2006)

(2) Abbreviations for the word "Version" shall, as a minimum, begin with the letter "V" and may be followed by the word "Number." Abbreviations for the word "Revision" shall, as a minimum, begin with the letter "R" and may be followed by the word "Number." The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).

[Nonretroactive as of January 1, 2007]

(Added 2006)

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

[Nonretroactive as of January 1, 201X]

(Added 20XX)

Also the sector recommended the following information be added to *NCWM Publication 14* as explanation/examples:

2015 Software Sector Meeting Summary

- Unique identifier must be displayable/printable on command or during operation, etc.
- At a minimum, a version/revision indication (1.02.09, rev 3.0 a, etc). Could also consist of / contain checksum, etc. (crc32, for example)

Darrell Flocken shared his recollection of why the S&T Committee objected to this wording back in 2010. Basically, it went too deep for Handbook 44 and would be better placed in Pub. 14.

There was some additional discussion on this item regarding where this new requirement was best located. It was suggested that the first sentence of G-S.1.d.(3) could be added as a clause to the base paragraph G-S.1(d) text, e.g. *“the current software version or revision identifier for ~~not-built-for-purpose~~ software-based devices, which shall be directly and inseparably linked to the software itself;”* .

It also was suggested that the second sentence in G-S.1.d. (3) might be more suitable for *NCWM Publication 14*, as it describes more “how” than “what” the requirement entails.

In addition, the sector considered the following information to be added to *NCWM Publication 14* as explanation/examples:

- The current software identifier must be displayable/printable on command during operation (or made evident by other means deemed acceptable by G-S.1.)
- At a minimum, the software identifier must include a version/revision indication (1.02.09, rev 3.0 a, etc). It could also consist of / contain checksum, etc. (crc32, for example).
- The version or revision identifier may consist of more than one part, but at least one part shall be dedicated to the metrologically significant software.

Other questions previously brought up that have not really been satisfied to date are:

- If we allow hard-marking of the software identifier (the sector has wavered on this in the past), does the above wording then imply that some mechanical means is required (i.e. physical seal) to “inseparably link” the identifier to the software?
- If a device is capable of doing so, does it still have to be able to display, print or communicate the identifier somehow, even if it is hard-marked?

The possibility of creating a separate Publication 14 section specific to software was debated. There are pros and cons in terms of the chances of adoption with that approach. It might be beneficial to manufacturers, due to keeping the requirements in one place. This becomes a philosophical question – is the content of Handbook 44 intended to be a guide to manufacturers, or is it intended as direction to field inspectors? This discussion was tabled for present.

Historically, CC’s have been written in terms of “version X and higher”. It is not our intention to change that “policy”, but it isn’t documented anywhere. Perhaps that should be addressed by the Software Sector. Jim Truex reviewed the administrative policy text, which includes the requirement to report changes to NTEP, based on whether they’re metrologically significant.

California indicated that their NTEP lab only puts the software version on the certificate if it’s not-built-for-purpose, but it seems that the other labs do so for all software-based devices.

If pushed, the Sectors agreed that a simple defining statement to qualify the class of devices that are to be included would be forwarded to the interested parties:

Software Based Device – Any device with metrologically significant software.

Conclusion:

The Software Sector decided that we'd leave the recommendation as-is, in the hopes that the changes to G-S.1 will be adopted at some point and then this can be revisited. Rich Miller, Marc Buttler, Dmitri Karimov, and the labs all indicated their support for the language as written.

The list of acceptable menu text and symbols in Appendix A are intended to assist the labs in finding the certification number. The sector noticed no action by the sectors had been taken when this list was circulated for comment. We would like to remind them that we would like to have it reviewed. We feel that this belongs in, for example, the Weighing Device Pub. 14, page DES-22, Section 3; the Belt – Conveyor Scales, page BCS-10, Section 8.7; the Measuring Devices, page LMD-21, Section 1.6; the Grain Moisture Meter, page GMM-14, Section 1 (G.S.1); and Near Infrared Grain Analyzers, page NIR-8, Section 1 (G.S.1).

- Tina Butcher mentioned that the Weighing Sector has a Weighing Checklist that has a similar set of approved symbols, so the examples shown in Appendix A would be in line with their current practice.

3. Software Protection / Security

Source:

NTEP Software Sector

Background / Discussion:

See the 2014 Software Sector Summary for additional background on this item.

The Sector continued to develop a proposed checklist for *NCWM Publication 14*. The numbering will still need to be added. This is based roughly on R 76 – 2 checklist and discussions beginning as early as the October 2007 NTEP Software Sector Meeting. The information requested by this checklist is currently voluntary, however, it is recommended that applicants comply with these requests or provide specific information as to why they may not be able to comply. Based on this information, the checklist may be amended to better fit with NTEP's need for information and the applicant's ability to comply.

The California, Maryland and Ohio laboratories agreed to use this check list on one of the next devices they have in the lab and report back to the sector on what the problems may be. In February 2011, the North Carolina laboratory was also given a copy of the check list to try.

The labs using this checklist on a trial basis indicated that there was some confusion as to versions/wording. There may be more than one version in circulation. The version shown in this Summary shall be used henceforth.

During the discussion, Ed Payne (NTEP lab, MD) said that his impression is that this is at least making some of the manufacturers think about security, which they hadn't necessarily done in the past.

It was indicated that some more or better examples may be helpful to manufacturers, and that more guidance is needed. Clearer instructions could be part of the checklist, or it could be a separate document. The Sector would like additional feedback specifically regarding what portions of it are causing confusion.

Due to proprietary issues, the labs can't simply give us direct feedback from the companies they interact with. Darrell Flocken volunteered to obtain information from the labs, aggregate it, and remove any potential proprietary information issues.

The checklist as updated during the 2014 meeting:

1. Devices with Software

- 1.1. Declaration of the manufacturer that the software is used in a fixed hardware and software environment. Yes No N/A
The manufacturer should indicate

whether it's solely software or includes hardware in the system. Can the software be changed after the system has been shipped without breaking a seal? AND

- 1.2. Cannot be modified or uploaded by any means after securing/verification. Yes No N/A
With the seal intact, can you change the software?

Note: It is acceptable to break the "seal" and load new software, audit trail is also a sufficient seal.

- 1.3. The software documentation contains:
- 1.3.1. Description of all functions, designating those that are considered metrologically significant. Yes No N/A
 - 1.3.2. Description of the securing means (evidence of an intervention). Yes No N/A
 - 1.3.3. Software Identification, including version/revision. **It may also include things like name, part number, CRC, etc.** Yes No N/A
 - 1.3.4. Description how to check the actual software identification. Yes No N/A
- 1.4. The software identification is:
- 1.4.1. Clearly assigned to the metrologically significant software and functions. Yes No N/A
 - 1.4.2. Provided by the device as documented. Yes No N/A
 - 1.4.3. Directly linked to the software itself. **This means that you can't easily change the software without changing the software identifier. For example, the version identifier can't be in a text file that's easily editable, or in a variable that the user can edit.** Yes No N/A

2. Programmable or Loadable Metrologically Significant Software

- 2.1. The metrologically significant software is:
- 2.1.1. Documented with all relevant (see below for list of documents) information. *The list of docs referred to exists in agenda item 5.* Yes No N/A
 - 2.1.2. Protected against accidental or intentional changes. Yes No N/A
- 2.2. Evidence of intervention (such as, changes, uploads, circumvention) is available until the next verification / inspection (e.g., physical seal, Checksum, Cyclical Redundancy Check (CRC), audit trail, etc. means of security). Yes No N/A

3. Software with no access to the operating system and/or programs possible for the user. This section and section 4 are intended to be mutually exclusive. Complete this section only if you replied Yes to 1.1.

- 3.3. Check whether there is a complete set of commands (e.g., function keys or commands via external interfaces) supplied and accompanied by short descriptions. Yes No N/A
- 3.4. Check whether the manufacturer has submitted a written declaration of the completeness of the set of commands. Yes No N/A

4. Operating System and / or Program(s) Accessible for the User. Complete this section only if you replied No to 1.1.

- 4.5. Check whether a checksum or equivalent signature is generated over the machine code of the metrologically significant software (program module(s) subject to legal control Weights and Measures jurisdiction and Yes No N/A

type-specific parameters). **This is a declaration or explanation by the manufacturer.**

- 4.6. Check whether the metrologically significant software will detect and act upon any unauthorized alteration of the metrologically significant software using simple software tools (e.g., text editor). **This is a declaration or explanation by the manufacturer.** Yes No N/A

5. Software Interface(s)

- 5.7. Verify the manufacturer has documented:
- 5.7.1. **If software separation is employed,** the program modules of the metrologically significant software are defined and separated. Yes No N/A
 - 5.7.2. **For software that can access the operating system or if the program is accessible to the user,** the protective software interface itself is part of the metrologically significant software. Yes No N/A
 - 5.7.3. The functions of the metrologically significant software that can be accessed **via the protective software interface.** Yes No N/A
 - 5.7.4. The **metrologically significant** parameters that may be exchanged **via the protective software interface** are defined. Yes No N/A
 - 5.7.5. The description of the functions and parameters are conclusive and complete. Yes No N/A
 - 5.7.6. There are software interface instructions for the third party (external) application programmer. Yes No N/A

The Sector discussed examples, such as the upgrade of application programs and how these changes would affect audit trails and version numbers. It should be clear that if the upgraded software doesn't affect anything metrologically significant, then it's irrelevant for the purposes of this checklist. On the other hand, if it does affect metrologically significant functions or parameters, it should be tracked and/or identified somehow.

Some of the labs have used the checklists, but they don't have easy access for the data to share. Not all of the labs have tried to use the checklist yet. In general, when the software programmers themselves are approached with the checklist, it's useful, but that's heavily dependent on who is interacting with the labs.

Jim Pettinato reiterated the Software Sector's request that the labs continue (or begin) to ask manufacturers whether they're willing to participate in the use of this checklist (on a voluntary basis), and to send their feedback to Darrell Flocken. Teri Gulke will clean up the checklist and put it in a separate document that can be posted on the NCWM website under the Software Sector's documents.

The contents of the checklist should tie back to requirements in Pub. 14. We originally crafted our checklist from the contents of D-31, so we went back to it to see if we could use it as a starting point for writing our own requirements for Pub. 14.

Though they need to be reworded, of course, the most useful portion of D-31 for our current purposes are probably sections 5.1.1., 5.1.3.2.a., 5.1.3.2.d, and 5.2.6.1. which state, respectively:

5.1.1 Software identification

Legally relevant software of a measuring instrument / electronic device / sub-assembly shall be clearly identified with the software version or another token. The identification may consist of more than one part but at least one part shall be dedicated to the legal purpose. The identification shall be inextricably linked to the software itself and shall be presented or printed on command or displayed during operation or at

start up for a measuring instrument that can be turned off and on again. If a sub-assembly/an electronic device has neither display nor printer, the identification shall be sent via a communication interface in order to be displayed/printed on another sub-assembly/electronic device.

5.1.3.2.a The legally relevant software shall be secured against unauthorized modification, loading, or changes by swapping the memory device. In addition to mechanical sealing, technical means may be necessary to secure measuring instruments having an operating system or an option to load software.

5.1.3.2.d Software protection comprises appropriate sealing by mechanical, electronic and/or cryptographic means, making an unauthorized intervention impossible or evident.

5.2.6.1 Only versions of legally relevant software that conform to the approved type are allowed for use (see 5.2.5). Applicability of the following requirements depends on the kind of instrument and is to be worked out in the relevant OIML Recommendation. It may differ also depending on the kind of instrument under consideration.

The question was asked, do these new requirements need to go into a new appendix specific to software in Pub. 14? Do we need to document new requirements at all if the checklist is put into Pub. 14? It could be considered that the checklist itself constitutes the new requirements. Darrell Flocken and Jim Truex supported that interpretation.

Conclusion:

The Sector asked that the revised checklist continue to be used by the labs. As we meet with each Sector jointly, we can get an updated report on the trial and decide if we're ready to recommend it for Pub. 14.

4. Software Maintenance and Reconfiguration

Source:

NTEP Software Sector

Background:

After the software is completed, what do the manufacturers use to install/secure/update their software? The following items were reviewed by the sector.

1. Verify that the update process is documented (OK)
2. For traced updates, installed Software is authenticated and checked for integrity

Technical means shall be employed to guarantee the authenticity of the loaded software i.e. that it originates from the owner of the type approval certificate. This can be accomplished e.g. by cryptographic means like signing. The signature is checked during loading. If the loaded software fails this test, the instrument shall discard it and either use the previous version of the software **or become inoperative.**

Technical means shall be employed to guarantee the integrity of the loaded software i.e. that it has not been inadmissibly changed before loading. This can be accomplished e.g. by adding a checksum or hash code of the loaded software and verifying it during the loading procedure. If the loaded software fails this test, the instrument shall discard it and either use the previous version of the software **or become inoperative.**

Examples are not limiting or exclusive.

3. Verify that the sealing requirements are met

A question from the floor, "What sealing requirements are we talking about?"

This item is **only** addressing the **software update**, it can be either verified or traced. It is possible that there are two different security means, one for protecting software updates (software log) and one for protecting the other metrological parameters (Category I II or III method of sealing). Some examples provided by the sector members include but are not limited to:

- Physical Seal, software log
- Category III method of sealing can contain both means of security

4. Verify that if the upgrade process fails, the device is inoperable or the original software is restored

The question before the group is, Can this be made mandatory?

The manufacturer shall ensure by appropriate technical means (e.g. an audit trail) that traced updates of metrologically significant software are adequately traceable within the instrument for subsequent verification and surveillance or inspection. This requirement enables inspection authorities, which are responsible for the metrological surveillance of legally controlled instruments, to back-trace traced updates of metrologically significant software over an adequate period of time (that depends on national legislation). The statement in italics will need to be reworded to comply with US weights and measures requirements.

The sector **agreed** that the two definitions below for Verified update and Traced update were acceptable.

Verified Update

A verified update is the process of installing new software where the security is broken and the device must be re-verified. Checking for authenticity and integrity is the responsibility of the owner/user.

Traced Update

A traced update is the process of installing new software where the software is automatically checked for authenticity and integrity, and the update is recorded in a software update log or audit trail.

Note: It's possible that the Philosophy of Sealing section of NCWM Publication 14 may already address the above IF the definitions of Verified and Traced Updates (and the statement below) were to be added. The contrary argument was that it may be better to be explicit).

Use of a Category 3 audit trail is required for a Traced Update. A log entry representing a traced software update shall include the software identification of the newly installed version.

The sector recommended consolidating the definitions with the above statement thus:

Verified Update

A verified update is the process of installing new software where the security is broken and the device must be re-verified. Checking for authenticity and integrity is the responsibility of the owner/user.

Traced Update

A traced update is the process of installing new software where the software is automatically checked for authenticity and integrity, and the update is recorded in a ~~software update log or~~ Category 3 audit trail. The audit trail entry shall include the software identification of the newly installed version.

The sector recommended that as a first step, the following be added to *NCWM Publication 14*:

The updating of metrologically significant software, including software that checks the authenticity and integrity of the updates, shall be considered a sealable event.

Mr. Truex, NTEP Administrator, believes the above sentence is unnecessary since it's self-evident. It was agreed to ask the other sectors for feedback on the value of this addition.

Though the sector is currently recommending only the single sentence be incorporated into *NCWM Publication 14* for the time being, ultimately, the sector may wish to advance the remaining language of the original item submission.

At the 2013 meeting, the Sector had no information indicating that the other sectors had yet been approached for feedback on the value of the addition of the proposed sentence. This sector would still like the other sectors to evaluate this for inclusion in Pub. 14. We'd also like to include some description indicating that an existing audit trail should be protected during a software update, though that may already be a requirement. This does appear to be addressed in the Requirements for Metrological Audit Trails Appendices in Pub. 14.

Last year's Weighing Sector feedback indicated they were opposed because:

1. It would change the methods of sealing (category 1, 2, and 3 audit trails) and require a change to Handbook 44.
2. It's not clear that the requirement for authenticity and integrity of the updates is limited to metrologically significant software.

The other sectors were concerned about this as well.

Legacy equipment that's still being manufactured might need to be changed to meet this obligation since their audit trails wouldn't necessarily indicate that the software has been updated.

Reference G-S.8., which is rather loose. Pub. 14 goes into much more detail about what is metrologically significant.

Darrell Flocken referred to Handbook 44, the Scales code – the event logger category 3 – the software is not a parameter. It's not so much that the software would be tracked, as the fact that it has not been in the list of sealable parameters is the concern. It sounds like this may be a procedural issue – sections of Handbook 44 may need to be altered before the sectors can add this suggestion to Pub. 14.

In 2010 the Software Sector had considered the following:

G-S.9. Metrologically Significant Software Updates

The updating of metrologically significant software shall be considered a sealable event.

Metrologically significant software that does not conform to the approved type is not allowed for use.

Ambler Thompson suggested that the notes under G-S.8. could be amended to include software updates as a new example. Rick Harshman recommended having it as a stand-alone item, such as discussed in 2010.

This could possibly be tied back to G-S.2.

What is the sealable parameter? Is it the software version / revision? Currently all of the parameters are user-selectable, which would make this unique.

If the general code in Handbook 44 is amended to include this in some form, it applies to everything. The various sectors don't need to add to their specific sections of Handbook 44.

Darrell Flocken suggested that we try to come up with a declaration of intent and see how the sectors respond. Doug Bliss will add it to the existing presentation. Jim Truex thought it might be valuable to obtain the opinion of the S&T Committee. The Legal Metrology group should be asked, "Is a software change that updates metrologically significant software a sealable event?" Rick Harshman can obtain an answer from them.

Ambler Thompson raised a concern about the fact that at this point none of the suggested wording requires that the software identifier be unique, i.e. a change to the metrologically significant software should require a change to the software identifier. You could perhaps infer it from the requirement that it be inextricably linked to the software, but that isn't clear. Jim Truex thinks this will eventually need to be addressed, but not right now.

After the discussion during the 2014 joint meeting, we revised the wording of the proposed G-S.9 to reflect some of the concerns heard from the other Sectors and interested parties:

G-S.9. Metrologically Significant Software Updates

A software update that changes the metrologically significant software shall be considered a sealable event.

The Sector still feels that explicitly requiring the metrologically significant software to be given at least the same level of protection as metrologically significant parameters is the best approach. We look forward to feedback from the S&T Committee and other Sectors on this proposed change. The Software Sector still would like to consider the issue of audit trail protection; there is some doubt as to whether the existing language is sufficient as it does not address the integrity of the audit trail during a software update, etc.

Discussion:

We debated once again whether this would be redundant. It can certainly be argued that G-S.8. already covers this requirement. If G-S.9. isn't added, is there support for changing Pub. 14 to add the software to the existing list of sealable parameters?

Philosophy of Sealing Appendix A in Pub. 14 doesn't specifically say anything about software. It discusses calibration and configuration parameters. There is a list of features and parameters that are typically sealed and another list of features and parameters that are not sealed. A note below states that these lists aren't fully inclusive, but anything that's metrologically significant does need to be sealed.

We've discussed before the fact that the terminology in Philosophy of Sealing repeatedly uses the term "parameter", which could cause confusion due to people interpreting this to only require sealing of parameters.

G-N.8. Checklist 2.18. for LND's in the Measuring Sector's Pub. 14 might be another place to add the word "software". This checklist is specific to the Measuring Sector's Pub. 14, so there wouldn't necessarily be something analogous in the other sectors' versions of Pub. 14.

G-S.8 refers to changing adjustable components, which could be interpreted as not having anything to do with software.

At one point the Software Sector had considered amending G-S.8., but that proved to be overly complicated.

Conclusion:

The Software and Measuring Sector attendees, as well as the lab representatives, have consensus that the proposed G-S.9 should be moved forward to the S&T Committee to be considered as a voting item in 2016. The Sector submitted this Recommendation for the addition of G-S.9 via Form 15.

5. NTEP Application for Software and Software-based Devices

Source:

NTEP Software Sector

Background:

The purpose of initiating this item was to identify issues, requirements and processes for type approving Type U device applications. It was suggested that it may be useful to the labs to devise a separate submission form for software for Type U devices. What gets submitted? What requirements and mechanisms for submission should be available? Validation in the laboratories - all required subsystems shall be included to be able to simulate the system as installed.

Mr. Roach, California Division of Measurement Standards, stated that if the software package being evaluated supports platforms/subsystems from multiple manufacturers, testing should be done using at least two platforms/subsystems. Scale laboratories and scale manufacturers indicated that this is not usually done for scale evaluations.

Since the NTEP Committee passed the related item at NCWM Annual Meeting we will continue to work on this. Mr. Truex, NTEP Administrator, indicated that we can move in this direction, but felt that it was somewhat premature to develop this thoroughly now. At the point where the sector has developed checklist requirements, then we could move to perhaps add a subsection to current NTEP applications for applicable software. Refer to D-31.6.1. It was also agreed that there seems to be no reason for limiting the scope of this item to software-only applications, and hence all software/software-based devices could benefit from an enhanced application process. Hence the description of this agenda item was modified as shown in the marked up heading.

Comments given at the meeting indicate that current practice does not require anything different for software / software based devices compared to any other type approval. It was also noted that for international applications, OIML D-31.6.5 states, "The approval applicant is responsible for the provision of all the required equipment and components." This would likely also be the policy of NTEP.

Since the checklist is still being tried out by some of the laboratories, the sector is not quite ready to develop this fully. Some documentation that eventually might be required by applicants could include (from WELMEC doc. 7-2 Issue 4): This is the list of documents referred to in the checklist.

- A description of the software functions that are metrologically significant, meaning of the data, etc., e.g. an architecture diagram or flowchart.
- The software identification (version, revision, etc.) and how to view it.
- An overview of the security aspects of the operating system, e.g. protection, user accounts, privileges, etc.

Darrell Flocken and Jim Truex reviewed existing documentation required for obtaining certification in Pub. 14, administrative policy, and the application, to see what is already required. Administrative policy 9.1.7 was where this was found:

- Engineering specification
- Operating descriptions that characterize the type

NTEP evaluators already have the authority to request whatever documentation they need. We can provide them with a list of documents that we think would assist the evaluator in his job and also give the manufacturer a good idea of what they should be capable of providing.

Darrell Flocken suggested that this list could be added to administrative policy 9.1.7 in Pub. 14. Jim Truex suggested it could also be added to the application.

If we combine the two lists, it might appear as something like this:

- A description of the software functions that are metrologically significant, meaning of the data, etc., e.g. an architecture diagram or flowchart.
- A description of the user interface, communication interface, menus, and dialogs.
- The software identification (version, revision, etc.) and how to view it.
- An overview of the system hardware, e.g. topology block diagram, type of computer(s), type of network, etc, if not described in the operating manual.
- An overview of the security aspects of the operating system, e.g. protection, user accounts, privileges, etc.
- The operating manual.
- Engineering specification.
- Operating descriptions that characterize the type.

A statement could be made along the lines of, "If not included in the operating manual, provide the following, as applicable."

After the last sentence in 9.1.7, this could be added:

As part of the type evaluation submission, the following information should be provided for software-based devices:

- **A description of the software functions that are metrologically significant, meaning of the data, etc., e.g. an architecture diagram or flowchart.**
- **The software identification (version, revision, etc.) , how to view it, and how it is tied to the software.**
- **An overview of the security aspects of the operating system, e.g. protection, user accounts, privileges, etc.**

These documentation requirements will be considered as input for requirements that will eventually appear in *NCWM Publication 14* and the application paperwork. Further work by the sector to develop the *NCWM Publication 14* requirements is needed, after more input from the labs is gathered. The Sector recommends including the above bulleted list as an introduction to the checklist as part of our recommendation to include the checklist from agenda item 3 in Pub. 14. As a description of the accuracy of the measuring algorithms, simply declaring the type and class being aimed for may be sufficient. This list should reflect the needs of the labs for an evaluation. The bulleted list and the paragraph before it should be brought to the labs for an initial review and their input.

There may be concerns with disclosure of proprietary information. Jim Truex says that the labs already protect other proprietary information. If the information provided is sufficiently high level, even theft of the data shouldn't cause too much of a concern.

Discussion:

The Measuring Sector Chair indicated that it was his opinion that it is not appropriate for the Measuring Sector, as a body, to make a recommendation regarding this proposal since it has to do with administrative policy.

According to Jim Truex, the labs already have the authorization to require this information.

While working on writing requirements for Pub. 14 from the checklist we've designed, we considered altering the second bullet point in our proposal for 9.17, so that it will require a description of how the software version or revision identifier is tied to the software itself.

Conclusion:

The Sector needs to discuss any input from the labs and finalize this list, prior to submitting the list to the other Sectors for incorporation into Pub. 14. The goal of this agenda item has somewhat shifted back to the original purpose, which is how do we communicate to applicants the expectations related to software based devices?

6. Training of Field Inspectors

Source:

NTEP Software Sector

Background:

During discussions at the 2009 NTEP Software Sector Meeting, the sector concluded that a new agenda item should be initiated specific to the training of field inspectors in relation to evaluating/validating software-based devices.

California has an Examination Procedure Outline (EPO) that begins to address this. Use *California Handbook 112* as a pattern template for how it could read.

Items to be addressed:

- Certificate of Conformance
- Terminology (as related to software) beyond what is in *NIST Handbook 44*.
- Reference materials / information sources

System Verification Tests

NOTE: Item numbers 1 through 5 apply to both weighing and measuring devices. Numbers 6 and 7 are specific to weighing devices; while numbers 9 and 10 apply to measuring devices.

1. Identification. The identification (ID) tag may be on the back room computer server and could be viewed on an identification screen on the computer monitor. The ID information may be displayed on a menu or identification screen. Though currently discouraged, some systems may be designed so the system must be shut down and reset to view the ID information. G-S.1 (1.10)
 - 1.1. Manufacturer.
 - 1.2. Model designation.
2. Provisions for sealing. G-S.8 [1.10]; S.1.11 [2.20]; S.2.2 [3.30]
 - 2.1. Verify sealing category of device (refer to Certificate of Approval for that system).
 - 2.2. Verify compliance with certificate.
3. Units of measure.
 - 3.1. A computer and printer interfaced to a digital indicator shall print all metrological values, intended to be the same, identically. G-S.5.2.2(a); G-S.5.1 [1.10]
 - 3.2. The unit of measure, such as lb, kg, oz, gal, qts, liters, or whatever is used, must agree.
4. Operational controls, indications and features (buttons and switches). Verify that application criteria and performance criteria are met (refer to Certificate of Approval).
 - 4.1. Any indication, operation, function or condition must not be represented in a manner that interferes with the interpretation of the indicated or printed values.
5. Indications and displays.
 - 5.1. Attempt to print a ticket. The recorded information must be accurate or the software must not process and print a ticket with erroneous data interpreted as a measured amount.

Weighing Devices

6. Motion detection.
 - 6.1. For railway track, livestock, and vehicle scales apply or remove a test load of at least 15d while simultaneously operating a print button, push-button tare or push-button zero. A good way to do this is to try to print a ticket while pulling the weight truck or another vehicle onto the scale. Recorded values shall not differ from the static display by more than 3d. Perform the test at 10%, 50% and 100% of the maximum applied test load. S.2.5.1(a) [2.20]; EPO NO. 2-3, 2.4
 - 6.2. For all other scales, apply or remove at least 5d. Printed weight values must agree with the static weight within 1d and must exactly agree with other indications. S.2.5.4(b) [2.20]; EPO NO. 2-3, 2.4
7. Behind zero indication.
 - 7.1 Apply a load in excess of the automatic zero setting mechanism (AZSM) and zero the scale. S.2.1.3 [2.20]; EPO NO. 2-3, 2.4, 2.5.2
Example: On a vehicle scale have someone stand on the scale, then zero them off (AZSM is 3d). Remove the weight (person) and note the behind zero display (usually a minus weight value) or error condition.
 - 7.2. Attempt to print a ticket. With a behind zero condition, (manually or mechanically operated) a negative number must not be printed as a positive value.
8. Over capacity.
 - 8.1. Manually enter a gross weight if permissible or apply a test load in excess of 105% of the scale's capacity. S.1.7 [2.20]; S.1.12, UR.3.9 [2.20]
 - 8.2. Attempt to print a weight ticket. A system must not print a ticket if the manually entered weight or load exceeds 105% of the scale capacity.

Measuring Devices

9. Motion detection.
 - 9.1. Initiate flow through the measuring element. Attempt to print a ticket while the product is flowing through the measuring chamber. The device must not print while the indication is not stable. S.2.4.1. (3.30)
10. Over capacity.
 - 10.1. Attempt to print a ticket in excess of the indicated capacity. A system must not print a ticket if the device is manually or mechanically operated in excess of the indicated value.

NOTE: Be aware of error codes on the indicator which may be interrupted as measured values.

Mr. Jordan, California Division of Measurement Standards, is already doing something similar, and he may be able to assist. Mr. Roach, California Division of Measurement Standards, will talk to him to see whether they're available. In addition Mr. Parks, California Division of Measurement Standards, is based in Sacramento and a potential resource. If the meeting is held in Sacramento next year, they may be able to attend.

Mr. Truex, NTEP Administrator, pointed out that the PDC would also be a valuable resource on this subject. Mr. Pettinato, Co-Chair, will contact them.

**NIST Handbook 112- Examination Procedure Outline for Commercial Weighing and Measuring Devices.*

The PDC is focused on training sessions at the moment, so it's unsure how much time they'd have to review this currently.

Discussion:

It was suggested by Jim Truex and Darrell Flocken we make it part of our report as an attachment or an appendix of the meeting minutes. Then we can send out an email notifying the Software Sector members as to where to find it.

Alternatively, we could forward the document to the PDC Committee, tell them it was our starting point, and ask them for their suggestions.

The Sector would like to continue exploring means by which it can be of assistance in training of field inspectors as software and electronic systems become more and more prevalent in their daily tasks.

It was also suggested we contact Ross Anderson, a paid consultant working with the PDC committee, to ask his opinion on how the Software Sector could best proceed to assist in the training of field inspectors. The Sector chair, Jim Pettinato, will act as primary point of contact for this communication.

Conclusion:

The Sector would like to continue exploring means by which it can be of assistance in training of field inspectors as software and electronic systems become more and more prevalent in their daily tasks.

NEW ITEMS

7. Retrieval of Audit Log information

Source:

Adam Oldham, Gilbarco

Background:

The current requirements for a Category III audit trail include printing of log on demand. However, many devices are approved standalone and can be connected to systems that are approved standalone. How could Category 3 audit trail mechanisms be approved in situations where multiple devices need to work together to attain it? How can a device maintain Category 2 and 3 approvals in this scenario? What alternatives to printing can be considered as potentially valid solutions? (files, laptop, flash drive, etc).

Discussion:

This was discussed during the Measuring Sector's meeting on 9/15. The wording suggested was not agreed upon. Adam Oldham would like to have the Software Sector's suggestions, so he can put together a proposal for next year.

The US has rather unique requirements for printing the Category 3 audit trail, which are quite unwieldy – both in terms of the actual printing process (and results), as well as the needed approvals (the example provided by Adam

Oldham required an approval for each and every POS system that might be connected to their system). The most similar is from Mexico, but they require an electronic copy.

Darrell Flocken reported that there has been a little movement forward – alternative methods are now allowable, to some degree, but it's dependent on what the states are going to allow, and it still requires the ability to print it. The change will be in LMD Code S.2.2., not in Handbook 44 G-S.2.2.

We discussed the difficulty of requiring that the electronic data be printable on-site, given that some sites don't have any printers, and other sites may have printers attached to computers that are restricted in what can be used to attach to them.

In Mexico, Gilbarco relies upon laptops being present, supplied by the auditing company.

Darrell Flocken read the text of the actual changes that have been approved.

LMD Pub. 14 has a section in Appendix B Requirements for Metrological Audit Trails on the event logger, and that information doesn't seem to be in Handbook 44. In fact, it may even contradict what's in the LMD Pub. 14. In practice, what's in Pub. 14 tends to be more influential with evaluators.

Conclusion:

Adam Oldham will work on the wording for a proposal for next year that the Software Sector will review during the 2016 meeting.

8. Next Meeting

Background:

The sector is on a yearly schedule for NTEP Software Sector Meetings. Now that we've adopted a joint meeting system, the next Sector joint meeting will coincide with one of the remaining Sector meetings.

Discussion:

Belt Conveyor Scale Sector will meet in Feb. 2016 in Pittsburgh in conjunction with another association, and their meeting schedule does not allow for time on their agenda to discuss software issues. So this does not appear to be an option for a joint meeting.

Grain Analyzer didn't meet in 2015 because there were no new issues to discuss. We're not certain that they will have a meeting in 2016 either. They always meet in August in Kansas City at the same hotel, which doesn't have a meeting large enough to hold a joint meeting.

Conclusion:

Assuming the logistics can be worked out, the plan is to schedule a joint meeting with the Grain Analyzer Sector in Kansas City in 2016; ideally we'd like to have it in September.

9. 2015 NCWM Interim Meeting Report

There was one item on the NCWM S&T Committee Agenda for the 2015 NCWM Interim Meeting related to work done by the NTEP Software Sector:

- *2015 Publication 15* S&T Item 310-1 relates to the 2015 NTEP Software Sector Agenda Item 1: Marking Requirements.

The Committee concluded that the item would remain a Developing Item.

10. 2015 International Report










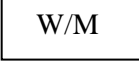
Dr. Ambler Thompson, NIST, Office of Weights and Measures (OWM), provided a synopsis of international activity that relates to the work of the Sector. Highlights of interest to the NTEP Software Sector:

OIML D31 is due to be updated, but there has been no activity as of yet. They have still not addressed field verification of software.

The terminology “inextricably linked” is under debate.

WELMEC 7.2 has superseded WELMEC 7.1.

Appendix A: Acceptable Menu Text/Icons for Weights & Measures information

<i>Permitted Menu Text examples</i>	<i>Permitted Icon shape examples</i>	<i>Essential characteristics</i>
Information Info	  	<p>Top level menu text or icon</p> <ul style="list-style-type: none"> • 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 ?	 	<p>Top level menu text or icon</p> <ul style="list-style-type: none"> • 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	 	<p>Top or second level menu text or icon</p> <ul style="list-style-type: none"> • 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 circular, rectangular, or rounded rectangle border. • If present, the activation of this menu text/icon must recall at a minimum the NTEP CC number.
NTEP Data N.T.E.P. Certificate		<p>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?</p>
Weights & Measures Info	 	

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2015 Software Sector Meeting Summary

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