NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

National Conference on Weights and Measures

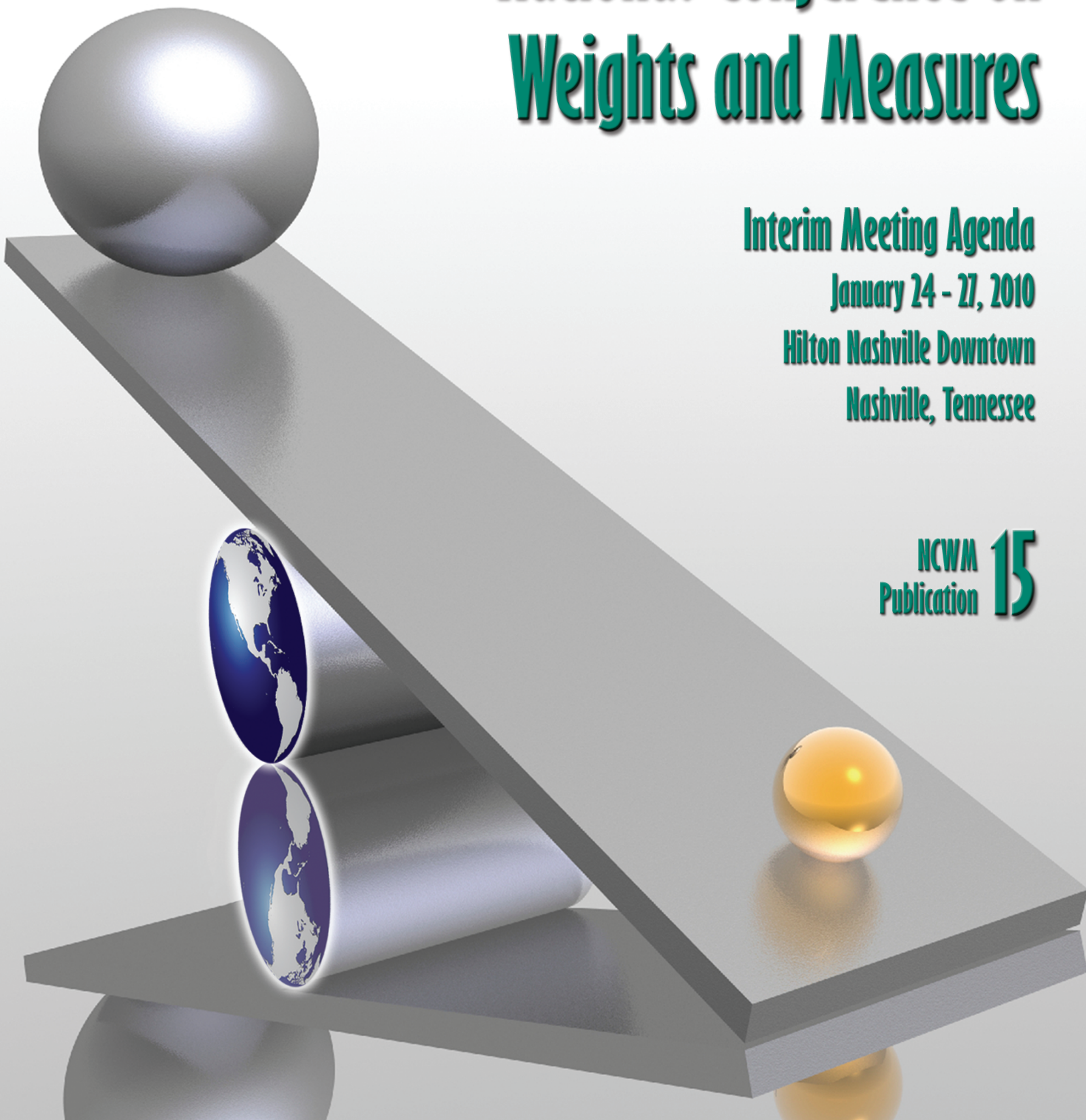
Interim Meeting Agenda

January 24 - 27, 2010

Hilton Nashville Downtown

Nashville, Tennessee

NCWM Publication 15



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NATIONAL CONFERENCE
ON
WEIGHTS AND MEASURES

Interim Meeting of the 95th NCWM

January 24 - 27, 2010
The Hilton Nashville Downtown
Nashville, Tennessee

NCWM Publication 15

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National Conference on Weights and Measures

Interim Meeting of the 95th NCWM

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*Sector summaries can be viewed online at www.ncwm.net under Meetings, or www.nist.gov/owm under Publication 15 Interim Meeting Agenda for 2010.

National Conference on Weights and Measures / National Type Evaluation Program

2009-2010 Organizational Chart

National Conference on Weights and Measures (NCWM) Board of Directors

OFFICE	NAME	AFFILIATION	TERM ENDS
Chairman	Randy Jennings	Tennessee	2010
Chairman-Elect	Tim Tyson	Kansas	2010
NTEP Committee Chair	Judy Cardin	Wisconsin	2010
Treasurer	Richard Cote	New Hampshire	2010
Active Membership - Western	Kirk Robinson	Washington	2012
Active Membership - Central	Steven Malone	Nebraska	2010
Active Membership - Southern	Stephen Benjamin	North Carolina	2013
Active Membership - Northeastern	Michael Sikula	New York	2014
At-Large	Mark Coyne	City of Brockton, Massachusetts	2011
At-Large	Stephen Langford	Cardinal Scale Manufacturing, Co.	2013
Associate Membership	Robert Murnane, Jr.	Seraphin Test Measure	2010
Honorary NCWM President	Dr. Patrick D. Gallagher	NIST, Director	NA
Executive Secretary	Carol Hockert	NIST, Weights and Measures Division	NA
Executive Director	Don Onwiler	NCWM Headquarters	NA
Board of Directors Advisor	Gilles Vinet	Measurement Canada	NA
NTEP Administrator	Jim Truex	NCWM Headquarters	NA

National Type Evaluation Program Committee (NTEP)

OFFICE	NAME	AFFILIATION	TERM ENDS
Committee Chair	Judy Cardin	Wisconsin	2010
Member	Randy Jennings	Tennessee	2011
Member	Kirk Robinson	Washington	2012
Member	Michael Sikula	New York	2014
Member	Tim Tyson	Kansas	2012
NTEP Administrator	Jim Truex	NCWM Headquarters	NA

Finance Committee

OFFICE	NAME	AFFILIATION	TERM ENDS
Committee Chair	Randy Jennings	Tennessee	2010
Member	Robert Murnane, Jr.	Seraphin Test Measure	2010
Member	Tim Tyson	Kansas	2010
Member	Richard Cote	New Hampshire	2010
Executive Director	Don Onwiler	NCWM Headquarters	NA

Laws and Regulations Committee (L&R)			
OFFICE	**NAME**	**AFFILIATION**	**TERM ENDS**
Committee Chair	Joe Benavides	Texas	2011
Member	Terence McBride	Memphis, Tennessee	2010
Member	John Gaccione	Westchester County, New York	2012
Member	Jonelle Brent	Illinois	2013
Member	Raymond Johnson	New Mexico	2014
Associate Membership Representative	Rob Underwood	Petroleum Marketers Association of America	2013
Canadian Technical Advisor	Doug Hutchinson	Measurement Canada	NA
NIST Technical Advisor	Kenneth Butcher	NIST, Weights and Measures Division	NA
NIST Technical Advisor	Lisa Warfield	NIST, Weights and Measures Division	NA

Professional Development Committee (PDC)			
OFFICE	**NAME**	**AFFILIATION**	**TERM ENDS**
Committee Chair	Ross Andersen	New York	2010
Member	John L. Sullivan	Mississippi	2011
Member	Stacy Carlsen	Marin County, California	2012
Member	Julie Quinn	Minnesota	2013
Member	Dale Saunders	Virginia	2014
Associate Membership Representative	Steven Grabski	Walmart Stores, Inc.	2013
Safety Liaison	TBD		
Technical Advisor	TBD		

Specifications and Tolerances Committee (S&T)			
OFFICE	**NAME**	**AFFILIATION**	**TERM ENDS**
Committee Chair	Brett Saum	San Luis Obispo County, California	2010
Member	Carol Fulmer	South Carolina	2011
Member	Steve Giguere	Maine	2012
Member	Kenneth Ramsburg	Maryland	2013
Member	Paul Moyer	Nebraska	2014
Canadian Technical Advisor	Ted Kingsbury	Measurement Canada	NA
NIST Technical Advisor	Tina Butcher	NIST, Weights and Measures Division	NA
NIST Technical Advisor	Steven Cook	NIST, Weights and Measures Division	NA

Nominating Committee

OFFICE	NAME	AFFILIATION	TERM ENDS
Committee Chair	Jack Kane	Montana	2010
Member	Ross Andersen	New York	2010
Member	Judy Cardin	Wisconsin	2010
Member	Dennis Ehrhart	Arizona	2010
Member	Thomas Geiler	Barnstable Regulatory Services, Massachusetts	2010
Member	Maxwell Gray	Florida	2010
Member	Steven Malone	Nebraska	2010

Credentials Committee

OFFICE	NAME	AFFILIATION	TERM ENDS
Committee Chair	David Pfahler	South Dakota	2010
Member	Kim Connors	Town of Barnstable, Massachusetts	2011
Member	Kevin Upschulte	Missouri	2012
Coordinator	Thomas Geiler	Barnstable Regulatory Services, Massachusetts	2010

Appointive Officials

OFFICE	NAME	AFFILIATION	TERM ENDS
Chaplain	Stephen Langford	Cardinal Scale Manufacturing, Co.	2010
Parliamentarian	Louis Straub	Fairbanks Scale, Inc.	2010
Presiding Officer	Kim Connors	Town of Barnstable, Massachusetts	2010
Presiding Officer	Tim Chesser	Arkansas	2010
Presiding Officer	Douglas Deiman	Alaska	2010
Presiding Officer	Maureen Henzler	Kansas	2010
Sergeant-at-Arms	Kathleen Sundt	Minnesota	2010
Sergeant-at-Arms	Richard Tredder	Minnesota	2010

Associate Membership Committee

OFFICE	NAME	AFFILIATION	TERM ENDS
Chair	Paul Lewis	Rice Lake Weighing Systems, Inc.	2014
Vice Chair	Robert Murnane, Jr.	Seraphin Test Measure	2014
Secretary/Treasurer	Darrell Flocken	Mettler-Toledo, Inc.	2013
Member	Christopher Guay	Procter and Gamble, Co.	2010
Member	Thomas Herrington	Nestlé USA-Prepared Foods Division	2010
Member	Rob Underwood	Petroleum Marketers Association	2010
Member	Steven Grabski	Walmart Stores, Inc.	2011
Member	Kathleen Madaras	Fuel Merchants Association of New Jersey	2011
Member	Doug Biette	Sartorius North America	2012
Member	Michael Gaspers	Farmland Foods, Inc.	2013

National Type Evaluation Technical Committee (NTETC) Belt-Conveyor Sector		
OFFICE	**NAME**	**AFFILIATION**
Chair	Bill Ripka	Thermo Fisher Scientific
Technical Advisor	John Barton	NIST, Weights and Measures Division
NTEP Administrator	Jim Truex	NCWM Headquarters
Public Sector Member	Tina Butcher	NIST, Weights and Measures Division
Public Sector Member	Ken Jones	California
Private Sector Member	Rafael Jimenez	Association of American Railroads Transportation Technology Center, Inc.
Private Sector Member	Lars Marmsater	Merrick Industries, Inc.
Private Sector Member	Stephen Patoray, CAE	Consultants on Certification, LLC
Private Sector Member	Peter Sirrico	Thayer Scale / Hyer Industries
Private Sector Member	Thomas Vormittag	

NTETC Grain Analyzer Sector		
OFFICE	**NAME**	**AFFILIATION**
Chair	Cassie Eigenmann	DICKEY-john Corporation
Technical Advisor	John Barber	J B Associates
NTEP Administrator	Jim Truex	NCWM Headquarters
Public Sector Member	Randall Burns	Arkansas
Public Sector Member	Tina Butcher	NIST, Weights and Measures Division
Public Sector Member	Karl Cunningham	Illinois
Public Sector Member	Richard Pierce	USDA, GIPSA Technical Services Division
Public Sector Member	Edward Szesnat, Jr.	New York
Public Sector Member	Cheryl Tew	North Carolina
Private Sector Member	James Bair	North American Miller's Association
Private Sector Member	Martin Clements	The Steinlite Corporation
Private Sector Member	Victor Gates	Shore Sales Company
Private Sector Member	Andrew Gell	Foss North America
Private Sector Member	Charles Hurburgh, Jr.	Iowa State University
Private Sector Member	David James Krejci	Grain Elevator and Processing Society
Private Sector Member	Jess McCluer	National Grain and Feed Association
Private Sector Member	Thomas Runyon	Seedburo Equipment Co.

NTETC Measuring Sector		
OFFICE	**NAME**	**AFFILIATION**
Chair	Michael Keilty	Endress + Hauser Flowtec AG, USA
Technical Advisor	Tina Butcher	NIST, Weights and Measures Division
NTEP Administrator	Jim Truex	NCWM Headquarters
Public Sector Member	Ross Andersen	New York
Public Sector Member	Dennis Beattie	Measurement Canada
Public Sector Member	Jerry Butler	North Carolina
Public Sector Member	Michael Frailer	Maryland
Public Sector Member	James (Steve) Hadder	Florida
Public Sector Member	Dan Reiswig	California
Public Sector Member	Will Wotthlie	Maryland
Private Sector Member	Marc Buttler	Emerson Process Management – Micro Motion, Inc.
Private Sector Member	Rodney Cooper	Itron, Inc.
Private Sector Member	Maurice Forkert	Tuthill Transfer Systems
Private Sector Member	Mike Gallo	Cleanfuel USA
Private Sector Member	Paul Glowacki	Murray Equipment, Inc.
Private Sector Member	Alejandro Gutierrez	Meggitt Fueling Products, Whittaker Controls
Private Sector Member	Gordon Johnson	Gilbarco, Inc.
Private Sector Member	Yefim Katselnik	Dresser Wayne
Private Sector Member	Douglas Long	RDM Industrial Electronics
Private Sector Member	Andrew MacAllister	Daniel Measurement and Control
Private Sector Member	Wade Mattar	Invensys/Foxboro
Private Sector Member	Richard Miller	FMC Technologies Measurement Solutions, Inc.
Private Sector Member	Andre Noel	Neptune Technology Group, Inc.
Private Sector Member	Johnny Parrish	Brodie International
Private Sector Member	Stephen Patoray, CAE	Consultants on Certification, LLC
Private Sector Member	Richard Tucker	RL Tucker Consulting, LLC

NTETC Software Sector		
OFFICE	**NAME**	**AFFILIATION**
Co-Chair	Norman Ingram	California
Co-Chair	James Pettinato	FMC Technologies Measurement Solutions, Inc.
Technical Advisor	Doug Bliss	Mettler-Toledo, Inc.
Secretary	Teri Gulke	Liquid Controls, LLC
NTEP Administrator	Jim Truex	NCWM Headquarters
Public Sector Member	Dennis Beattie	Measurement Canada
Public Sector Member	William Fishman	New York
Public Sector Member	Michael Frailer	Maryland
Public Sector Member	John Roach	California
Private Sector Member	John Atwood	Tyson Foods
Private Sector Member	Cassie Eigenmann	DICKEY-john Corporation
Private Sector Member	Andre Elle	Endress + Hauser Flowtec AG, USA
Private Sector Member	Travis Gibson	Rice Lake Weighing Systems, Inc.
Private Sector Member	Keith Harper	Gencor Industries, Inc.
Private Sector Member	Tony Herrin	Cardinal Scale Manufacturing Co.
Private Sector Member	Gordon Johnson	Gilbarco, Inc.
Private Sector Member	Paul Lewis	Rice Lake Weighing Systems, Inc.
Private Sector Member	Michael McGhee	Itron, Inc.
Private Sector Member	Richard Miller	FMC Technologies Measurement Solutions, Inc.
Private Sector Member	Michael Parks	Vulcan Materials Company
Private Sector Member	Stephen Patoray, CAE	Consultants on Certification, LLC
Private Sector Member	Mike Roach	VeriFone
Private Sector Member	Robin Sax	CompuWeigh Corporation
Private Sector Member	Mark Schwartz	Accu-Sort Systems, Inc.
Private Sector Member	Scott Szurek	Emerson Process Management
Private Sector Member	David Vande Berg	Vande Berg Scales

NTETC Weighing Sector		
OFFICE	**NAME**	**AFFILIATION**
Chair	Darrell Flocken	Mettler-Toledo, Inc.
Technical Advisor	Steven Cook	NIST, Weights and Measures Division
NTEP Administrator	Jim Truex	NCWM Headquarters
Public Sector Member	L. Cary Ainsworth	USDA, GIPSA
Public Sector Member	Ross Andersen	New York
Public Sector Member	William Bates	USDA, GIPSA, FGIS
Public Sector Member	Luciano Burtini	Measurement Canada
Public Sector Member	Tina Butcher	NIST, Weights and Measures Division
Public Sector Member	Terry Davis	Kansas
Public Sector Member	Ken Jones	California
Public Sector Member	Jack Kane	Montana
Public Sector Member	Dan Reiswig	California
Public Sector Member	Juana Williams	NIST, Weights and Measures Division
Private Sector Member	Steven Beitzel	Systems Associates, Inc.
Private Sector Member	Doug Biette	Sartorius North America
Private Sector Member	Neil Copley	Thurman Scale Co.
Private Sector Member	Mitchell Eyles	Flintec, Inc.
Private Sector Member	Robert Feezor	Scales Consulting and Testing
Private Sector Member	Scott Henry	NCR Corporation
Private Sector Member	Rafael Jimenez	Association of American Railroads Transportation Technology Center, Inc.
Private Sector Member	Stephen Langford	Cardinal Scale Manufacturing, Co.
Private Sector Member	Paul Lewis	Rice Lake Weighing Systems, Inc.
Private Sector Member	L. Edward Luthy	Brechbuhler Scales, Inc.
Private Sector Member	Nigel Mills	Hobart Corporation
Private Sector Member	Stephen Patoray, CAE	Consultants on Certification, LLC
Private Sector Member	Louis Straub	Fairbanks Scales, Inc.
Private Sector Member	Jerry Wang	A&D Engineering, Inc.
Private Sector Member	Walter Young	Emery Winslow Scale Company

Western Weights and Measures Association (WWMA) www.westernwma.org		
States	Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming	
Contact	Raymond Johnson New Mexico Department of Agriculture	(575) 646-1616 rjohnson@nmda.nmsu.edu
Annual Meeting	September 27 - October 1, 2010	Olympia, Washington
Central Weights and Measures Association (CWMA) www.cwma.net		
States	Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin	
Contact	Jonelle Brent Illinois Department of Agriculture	(217) 785-8301 jonelle.brent@illinois.gov
Annual Meeting	May 16 - 20, 2010	Springfield, Illinois
Interim Meeting	September 12 - 15, 2010	Rock Island, Illinois
Southern Weights and Measures Association (SWMA) www.swma.org		
States	Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, US Virgin Islands, Virginia, West Virginia	
Contact	Derek Underwood South Carolina Department of Agriculture	(803) 734-7321 derekmunderwood@bellsouth.net
Annual Meeting	October 2010	TBD
Northeastern Weights and Measures Association (NWMA) www.newma.us		
States	Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont	
Contact	John Walsh Town of Framingham	(508) 532-5480 jbw@framinghamma.gov
Annual Meeting	May 10 - 13, 2010	Groton, Connecticut
Interim Meeting	October 13 - 14, 2010	Norwich, Connecticut

General Conference Information

Introduction

This document contains the Board of Directors and Standing Committee agendas for the Interim Meeting of the National Conference on Weights and Measures, Inc., (NCWM) scheduled for January 24 - 27, 2010, at the Hilton Nashville Downtown, Nashville, Tennessee. To reserve a room, call Hilton Reservations at (800) 445-8667 or call the hotel directly at (615) 620-2150 and ask for the National Conference on Weights and Measures meeting rate of $119 single or double, plus tax. To obtain this special rate, call no later than Wednesday, December 23, 2009, and identify the group name of National Conference on Weights and Measures. The rate is available on a first come first served basis as space is limited.

Agenda items to be addressed by the Standing Committees are assigned Reference Key numbers as follows:

Committee	Reference Key
Board of Directors	100 series
Laws and Regulations	200 series
Specifications and Tolerances	300 series
Professional Development Committee	400 series
National Type Evaluation Program Committee	500 series
Nominating Committee	800 series

The subject matter listed on each Standing Committee's agenda will be open for discussion as noted. Each committee may also take up routine or miscellaneous items brought to its attention after the preparation of this document. At its discretion, each committee may decide to accept items for discussion that are not listed in this document.

The agendas:

1. include items brought to the attention of the Standing Committees prior to the submission deadline of November 1, 2009, and approved for inclusion in their agendas by the Committees, and

2. serve as the basis for the Standing Committee Interim Reports (to be printed in the Program and Committee Reports of the National Conference on Weights and Measures 95th Annual Meeting, NCWM Publication 16). The final reports of the Committees will be published in the NIST Special Publication Report of the 95th Annual Meeting of the NCWM, following the Annual Meeting in 2010, scheduled for July 11 - 15, 2010, at the Crown Plaza St. Paul Riverfront, St. Paul, Minnesota.

The Committees have not determined whether the items presented will be voting or informational in nature; these determinations will result from their deliberations at the Interim Meeting.

Special Meetings

Several Annual Committees and other organizations are conducting meetings concurrently with the Standing Committees of the Conference.

Joint Meetings for All Committees

A joint meeting for all committees will be held on Sunday, January 24, and Wednesday, January 27, 2010. Each Standing Committee will highlight the major decisions made during the week, and the Nominating Committee will present its report.

Participation

Sunday meetings are scheduled for Committee members to review their agendas (see the particular committee agenda for details). Although the sessions are open to all delegates, participation in discussions during agenda reviews is normally limited to Committee members. Comments and input are welcome when specific topics are scheduled in the Committee agendas.

All sessions of NCWM meetings are normally open to members of the Conference. If a Committee chairman recognizes a special situation involving a proprietary issue (e.g., NTEP appeals) or sensitive issue or other substantive need, that portion of the session dealing with the special issue may be closed, provided that: (1) the Conference chairman (or in his absence, the chairman-elect) approves, and (2) announcement of the closed meeting is posted on or near the door to the meeting session and on the announcement board at the registration desk. If at all possible, the posting will be done at least a day prior to the planned closed session. Please note that the one day notice will not always be possible if a closed meeting is called on Sunday. Since Sunday is a day for agenda reviews and participants may make their travel reservations in order to observe these agenda reviews, if a closed meeting becomes necessary on Sunday, every effort will be made to limit such a meeting to only part of the day.

To request an appearance with a Standing Committee, contact the appropriate technical advisor by December 31, 2009:

Board of Directors	Don Onwiler	(402) 434-4880
Laws and Regulations Committee	Kenneth Butcher or	(301) 975-4859
	Lisa Warfield	(301) 975-3308
Specifications and Tolerances Committee	Tina Butcher or	(301) 975-2196
	Steve Cook	(301) 975-4003
Professional Development Committee	Ross Andersen	(518) 457-3146
National Type Evaluation Program Committee	Judith Cardin	(608) 224-4945

You may also contact the Executive Secretary at the following address and telephone number:

Weights and Measures Division
National Institute of Standards and Technology
100 Bureau Drive, STOP 2600
Gaithersburg, MD 20899-2600
Telephone: (301) 975-4004

Contact for More Information

If you have questions about the program, registration, lodging, or meeting arrangements, contact NCWM Headquarters at the following address and telephone number:

National Conference on Weights and Measures
1135 M Street, Suite 110
Lincoln, NE 68508
Telephone: (402) 434-4880

Reports

There will **not** be a transcript made of the proceedings of the Interim Meetings. Each committee will prepare its report to the NCWM containing its recommendations based upon the presentations, discussions, and deliberations on all matters on its agenda that were addressed during the Interim Meetings. These reports will be published in the Committee Reports for the 95th Annual Meeting, NCWM Publication 16, to be posted to the NIST WMD website at www.nist.gov/owm and to the NCWM website at www.ncwm.net in early April. Printed copies of Publication 16 will be distributed to meeting attendees at the Annual Meeting in July.

95th Annual Meeting of the National Conference on Weights and Measures

The National Conference on Weights and Measures 95th Annual Meeting will be held at the Crown Plaza St. Paul Riverfront, St. Paul, Minnesota, from July 11 - 15, 2010. The room rate for the Annual Meeting will be $121 per night, single or double, plus tax. For reservations, please call the hotel at (866) 422-3185. To obtain this special rate, call no later than Friday, June 11, 2010, and identify the group name of 2010 NCWM Annual Meeting.

Units of Measurement

In keeping with the provisions of the Omnibus Trade and Competitiveness Act of 1988, which establishes the metric system as the preferred system of measurement for commerce and trade, units of the metric system have been used in this document, except where industry has not yet converted from the inch-pound system. In some instances, submitted proposals quoted in the Committee agendas may appear in inch-pound units only.

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2010 NCWM Interim Meeting

January 24 - 27, 2010
Hilton Nashville Downtown ♦ Nashville, Tennessee

Schedule of Events

(as of November 23, 2009)

		Location
Saturday, January 23		
8:30 a.m. - 5:00 p.m.	**NCWM Board of Directors Meeting**	Ryman I
Sunday, January 24		
7:30 a.m. - 9:00 a.m.	Coffee Service	Prefunction
7:30 a.m. - 5:00 p.m.	Registration and Exhibits	Prefunction
8:30 a.m. - 10:30 a.m.	**Industry Committee on Packaging & Labeling**	Armstrong 1
12:00 p.m. - 12:30 p.m.	Lunch on your own	
1:00 p.m. - 1:30 p.m.	**Joint Meeting for all Standing Committees**	Boone
1:30 p.m. - 5:00 p.m.	**STANDING COMMITTEES' AGENDA REVIEW**	
	Laws & Regulations Committee	Ryman 2
	Professional Development Committee	Ryman 3
	Specifications & Tolerances Committee	Donelson
	Board of Directors	Ryman 1
	NTEP Committee	
2:45 p.m. - 5:00 p.m.	Moisture Loss Work Group	Armstrong 1
5:30 p.m. - 7:00 p.m.	**Chairman's Reception**	Market Street Restaurant
Monday, January 25		
7:30 a.m. - 9:00 a.m.	Coffee Service	Prefunction
7:30 a.m. - 5:00 p.m.	Registration and Exhibits	Prefunction
8:30 a.m. - 11:30 a.m.	**OFFICIAL SESSION - OPEN HEARINGS** *(**NOTE:** Times of hearings are not firm; when one committee finishes, the next committee will begin.)* Laws & Regulations Committee Specifications & Tolerances Committee Professional Development Committee Board of Directors NTEP Committee	Boone
11:30 a.m. - 12:30 p.m.	Lunch on your own	

2010 NCWM Interim Meeting
January 24 - 27, 2010
Hilton Nashville Downtown ♦ Nashville, Tennessee

Schedule of Events
(as of November 23, 2009)

Monday, January 25
(continued)

12:30 p.m. - 5:00 p.m.	**OPEN HEARINGS CONTINUED** *(**NOTE**: Times of hearings are not firm; when one committee finishes, the next committee will begin.)* Laws & Regulations Committee Specifications & Tolerances Committee Professional Development Committee Board of Directors NTEP Committee	Boone

Tuesday, January 26

7:30 a.m. - 9:00 a.m.	Coffee Service	Prefunction
7:30 a.m. - 5:00 p.m.	Registration and Exhibits	Prefunction
8:30 a.m. - 12:00 p.m.	**OFFICAL SESSION – OPEN HEARINGS** (if necessary) *(**NOTE**: Times of hearings are not firm; when one committee finishes, the next committee will begin.)* Laws & Regulations Committee Specifications & Tolerances Committee Professional Development Committee Board of Directors NTEP Committee *(**NOTE:** Each committee will begin their individual work sessions at the conclusion of the Open Hearings/Technical Session.)*	Boone
12:00p.m. - 1:00 p.m.	**Associate Membership Committee**	Armstrong 1
12:00 p.m. - 1:00 p.m.	Lunch on your own	
1:00 p.m. - 5:00 p.m.	**COMMITTEE WORK SESSIONS**	
	Laws & Regulations Committee	Ryman 2
	Professional Development Committee	Ryman 3
	Specifications & Tolerances Committee	Donelson
	Board of Directors	Ryman 1
	NTEP Committee	

2010 NCWM Interim Meeting

January 24 - 27, 2010

Hilton Nashville Downtown ♦ Nashville, Tennessee

Schedule of Events

(as of November 23, 2009)

Wednesday, January 27

7:30 a.m. - 9:00 a.m.	Coffee Service	Prefunction
7:30 a.m. - 12:00 p.m.	Registration and Exhibits	Prefunction
8:30 a.m. - 11:00 a.m.	**COMMITTEE WORK SESSIONS**	
	Laws & Regulations Committee	Ryman 2
	Professional Development Committee	Ryman 3
	Specifications & Tolerances Committee	Donelson
	Board of Directors	Ryman 1
	NTEP Committee	
11:00 a.m. - 12:00 p.m.	**JOINT MEETING – ALL STANDING COMMITTEES**	Boone

*(**NOTE:** 2010 Interim Meeting schedule of events is tentative and subject to change.)*

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Report of the Board of Directors

Randy Jennings
Executive Assistant
Tennessee Department of Agriculture

Reference
Key Number

100 INTRODUCTION

The Board will hold its quarterly Board of Directors meeting on Saturday and Sunday, January 23 - 24, 2010, and continue that meeting during work periods throughout the remainder of the Interim Meetings. Except when posted, all meetings are open to the membership. The Board of Directors and NTEP Committee will hold open hearings at the Interim Meeting and members will be invited to engage in dialogue with the Board on issues the Board and NTEP Committee have on their agenda. The Board of Directors is currently working on the following issues: membership services, web hosting, website and newsletter improvements, NCWM efficiency and effectiveness as an organization, providing additional services to regional weights and measures associations, and strategic planning. In addition to these items, the Board Agenda contains two appendices that cover the Activities of the International Organization of Legal Metrology (OIML) and Regional Legal Metrology Organizations (Appendix A) and the Interim Agenda of the Associate Membership (AMC) (Appendix B).

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Table B
Appendices

Details of all Items
(In order by Reference Key Number)

100-1 NCWM Automatic Temperature Compensation (ATC) Steering Committee

The ATC Steering Committee was formed in 2007 to assist NCWM in forming a consensus on issues before the Specifications and Tolerances Committee and the Laws and Regulations Committee. The Board receives quarterly activity reports from the Chair of the ATC Steering Committee. In addition, they review future Steering Committee activities and related NCWM work on this issue.

To date, the Steering Committee has forwarded numerous recommendations to the standing committees to assist them in the development of their respective agenda items. Following the 2008 Annual Meeting, the Steering Committee was asked to provide responses to comments and questions that were received by the Specifications and Tolerances Committee during its open hearings. The responses were provided to the Specifications and Tolerances Committee for consideration at the January 2009 NCWM Interim Meeting.

Based on actions taken by the Laws and Regulations Committee at the 2009 Annual Meeting, the Board of Directors has chosen to discontinue the ATC Steering Committee. Members of the Board expressed great appreciation for the work of the Steering Committee for the meetings and the charge given to it when it was formed in 2007. Specific praise was given for the meeting the Board conducted in Chicago that year and the recommendations that followed.

100-2 Membership and Meeting Attendance

The Board continues to assess avenues for improving membership and participation at Interim and Annual Meetings. Membership and attendance are driven to some degree by the items on the agendas and by the economy. It is important that NCWM be active in notifying potential stakeholders of agenda items that may be of interest and warrant their attention. This effort will have an impact on both membership and attendance.

The following is a comparison of NCWM membership levels for the past 6 years.

NCWM Membership Report

	October 2009	October 2008	October 2007	October 2006	October 2005	October 2004
Associate	728	742	771	736	737	712
Foreign Assc	48	44	50	44	41	29
Federal Gov't	12	10	9	9	12	17
NIST	11	13	14	14	11	18
State Gov't	525	603	684	620	637	613
Local Gov't	503	499	537	512	417	450
Int'l Gov't	11	23	22	28	20	15
Retired	197	214	220	227	222	229
Total	**2035**	**2148**	**2337**	**2190**	**2097**	**2083**

100-3 NCWM Newsletter and Website

The Board continuously considers ways to monitor and improve the content of the newsletter and website. Members are encouraged to bring ideas and articles forward for inclusion in newsletters. Of particular interest are articles that would be pertinent to field inspectors and the service industry.

In the fall of 2009, NCWM contracted with a new website hosting service to redesign and host the site going forward. This new site provides e-commerce through PayPal and a new "shopping cart" feature that allows visitors to pay fees for membership, meeting registration, publication orders, NTEP applications, and NTEP maintenance fees online. With the new e-commerce features, the site gives each member control of their log-in password for improved security.

Lindsay Hier, Project Coordinator for NCWM, serves as the NCWM webmaster. Approved meeting minutes from the Board of Directors quarterly meetings have been added to the "Members Only" portion of the website. This will allow membership insight into the work of the Board and its decision making. Also, new to the "Members Only" portion is an online NCWM Policy Manual.

Comments and suggestions for improvements to the newsletters and website should be directed to NCWM Headquarters at (402) 434-4880 or via e-mail at info@ncwm.net.

100-4 Meetings Update

Interim Meetings

January 24 - 27, 2010	Hilton Nashville Downtown, Nashville, Tennessee
January 23 - 26, 2011	The Fairmont Dallas, Dallas, Texas
January 2012	To be determined

Annual Meetings

July 11 - 15, 2010	Crowne Plaza St. Paul Hotel, St. Paul, Minnesota
July 10 - 14, 2011	Holiday Inn Downtown at the Park, Missoula, Montana
July 2012	To be held in the Northeastern Region

After receiving recommendations from the Western Region for a location to conduct the 2011 Annual Meeting, the Board of Directors has selected the Holiday Inn Downtown in Missoula, Montana. The hotel is adjacent to the Clark Fork River and within easy walking distance to the downtown district, where attendees can enjoy food and entertainment that caters to tourists, the college crowd, and locals.

The 2012 Annual Meeting will be in the Northeast Region. NCWM Staff have received recommendations from the Northeast Region and will make contact with properties to obtain proposals.

The 2013 Annual Meeting will be held at a location to be determined in the Southern Region. The SWMA is asked to provide suggestions of cities and properties to NCWM. It is not necessary for members to enter into negotiation with hotels. Members may obtain site selection criteria from Don Onwiler, Executive Director, at (402) 434-4880 or e-mail to don.onwiler@ncwm.net.

100-5 Participation in International Standard Setting

Chuck Ehrlich and other NIST Weights and Measures Division (WMD) staff briefed the NCWM Board and NCWM members on key activities of OIML and regional legal metrology organizations during open hearings (see Appendix A).

Of particular interest is the International Committee of Legal Metrology (CIML) Meeting to be held at the Doubletree Hotel in Orlando, Florida, September 20 - 24, 2010. Those interested in attending should contact Charles Ehrlich, NIST at (301) 975-4834 or Lisa Warfield, NIST at (301) 975-3308 for more information. Interested vendors should contact Bob Murnane, Seraphin Test Measure at (609) 267-0922.

100-6 Efficiency and Effectiveness

The Board is examining cost efficiency measures to control meeting and administrative costs and new methods of promoting effective service to its members and stakeholders. The Board welcomes member feedback on ideas to increase the effectiveness of the Conference.

Website

Regional Website Hosting: Two regional association websites are hosted through the NCWM website. In the past, regional associations have paid NCWM for updates to these websites on an hourly rate. This has caused the regional associations to economize by requesting updates to information posted on their sites only once or twice per year.

At the May 2009 Board Meeting, the Board adopted the following policy for hosting regional websites that incorporates an annual flat fee for NCWM staff services to post updates:

1. NCWM will invoice the Treasurers of participating regional associations annually during the month of January in the amount of $200 for the hosting and maintaining of regional association websites.

2. Hosting fees will pertain to any routine website maintenance and updates that are performed in-house.

3. A bid will be provided to the regional association for any requested services that would involve fees outside the scope of normal maintenance. And, additional costs for these services will be assessed to the regional association.

4. NCWM will contact the regional representative for each participating regional association on a quarterly basis requesting any updates to their respective web pages.

NCWM has also received bids from its new webhost to add additional regions. The proposal includes adding optional PayPal and "shopping cart" features, which would be at an additional cost to the regional association. If regional associations choose to incorporate these features through NCWM-hosted sites, the Board and staff would consider the option of maintaining regional membership databases and meeting registration records. This would be possible through the simplified online meeting registration and membership renewals.

Staffing

NCWM Staff: The recent transition in NCWM management has provided an opportunity for significant cost savings to NCWM. These savings combined with the benefit of full-time dedicated staff has enabled the Board of Directors to consider dramatic enhancements to its level of service and effectiveness. More information is available in the NCWM strategic plan made available at www.ncwm.net in the "Members Only" portion of the website.

Meetings: The Board has considered options for meeting staffing, including the use of volunteer assistance from the local jurisdiction as a means of conserving meeting costs. In the past year, volunteer assistance was used in combination with NCWM staff. The Board has recognized that the number of NCWM staff at meetings in 2009 was less than under previous management so a cost savings is realized if the Board continues at that level. The Board also discussed the benefits of the full-service NCWM staff to maintain the professional image of the organization at these national events. The Board's decision is to support the level of staffing that was used in 2009. The Executive Director will assess staffing needs on an ongoing basis to ensure an appropriate level of professional service at NCWM events without undue cost.

Standing Committee Structure

Specifications and Tolerances Committee: The Board is exploring the possibility of splitting the Specifications and Tolerances Committee (S&T) into two separate standing committees – one for measuring instruments and one for weighing instruments. Historically, the agenda of the S&T Committee has been very demanding. By dividing the committee into more specialized scopes, it would:

- effectively reduce the number of agenda items for a standing committee,
- allow the committees to give more attention to the items that are on their respective agendas,
- provide specialized expertise to each standing committee, and
- expedite the standards development process.

The Board envisions that General Code items and codes that do not fall clearly into "weighing" or "measuring" would be addressed by some form of joint committee.

At the fall 2009 Board meeting, a small group was formed to review ideas and options on the S&T Committee structure. This work group will report back to the Board at the 2010 Interim Meeting.

Work Session Protocol

NCWM standing committees have historically refrained from accepting comments from observers during their committee work sessions at Interim and Annual Meetings. The rational has been that all meeting attendees should benefit from stakeholder input during open hearings.

However, there are times when an observer could offer technical clarifications that would make a committee's work session more productive and its decisions more informed. Past policy has made observers hesitant to raise their hand because perception exists that it is bad form. Likewise, committee chairs have been hesitant to call on observers for assistance.

The Board has determined it necessary to provide a clear policy that would enable standing committees to accept input from observers in an appropriate manner during these work sessions. This would allow the committees to work more efficiently without circumventing due process.

The following policy is under consideration:

- Committee chairs may accept contributions of technical clarification only from observers during their work sessions.
- Observers shall not dominate discussions, restate positions from the open hearings, or provide new positions.
- Committees shall communicate any new information received during work sessions in their addendums so other attendees have an opportunity to respond.
- For consistency, the following prepared statement shall be read out loud by the committee chair at the beginning of each work session and throughout as deemed necessary:

  "This is a work session of the standing committee. Observers who wish to contribute technical clarification to assist in the committee's decision process shall raise their hand to be recognized by the committee chair. No opinions or positions will be heard from observers during the work session and should be stated publicly during open hearings."

100-7 Bylaws Amendment: Article I, Section 6 – Resolution of Disputes and Mediation

Purpose: Establish a mediation process in the NCWM Bylaws that fosters amiable dispute resolution through free exchange of ideas.

Proposal: Amend Article I by adding a new Section 6 as follows:

Section 6 – Dispute Resolution

All members and entities acknowledge that the open discussion of any disputed matter may lead to positive resolution. Upon completion of any applicable administrative appeal procedure, all members and entities shall be required to submit any grievance or claim to the mediation process set forth in this section before filing any lawsuit. Conclusion of the mediation process is a mandatory condition precedent to the filing of any litigation against or involving NCWM, and its directors, officers, employees and agents. No person or entity shall have legal standing to file any lawsuit against or involving NCWM and its directors, officers, employees, and agents unless and until the mediation process has been completed.

The mediation process includes the following: the specific grievance or claim and supporting information shall be discussed by the aggrieved party and the NCWM at the staff level; if the matter is not resolved within 30 days of the completion of the staff level discussions, the aggrieved party and the NCWM shall schedule a face-to-face meeting at a mutually acceptable location. The Board of Directors of the NCWM shall determine at its discretion the number and identity of the NCWM representatives attending the face-to-face mediation. The Chief Executive Officer or designated representative of the aggrieved entity shall attend the face-to-face mediation with such other persons as the aggrieved party identifies, not to exceed three representatives. NCWM and the aggrieved entity shall designate a mutually acceptable, independent mediator to conduct the mediation. The mediator shall provide a written report on the mediation to the parties within 30 days following the face-to-face mediation session(s). The mediator shall determine in such report if the dispute or grievance has or has not been resolved in a mutually accepted manner. The receipt of the mediator's report shall be the conclusion of the mediation process.

Discussion: NCWM has always favored the free exchange of ideas and the opportunity to be heard in an appropriate, professional setting. The proposed by-law adds a further opportunity for exchange of ideas before an independent mediator. The mediation process is a prerequisite to any litigation being brought against NCWM and its directors, officers, employees and agents.

100-8 Strategic Planning

The Board has developed a new strategic plan that will be updated and revised on a continual basis as goals are met, changed, or added. The purpose of the strategic plan is to ensure the organization is moving forward and in the right direction. Members may view the new strategic plan on the website at www.ncwm.net.

Five primary goals are contained in the strategic plan:

1. Enhance the NCWM as a national and international resource for measurement standards development.
2. Promote uniform training for individuals involved in weights and measures.
3. Continue to improve the National Type Evaluation Program (NTEP).
4. Expand the role of the NCWM as a resource for state and local weights and measures programs.
5. Ensure financial stability of the NCWM.

The Board is continuing to refine the strategies and measurements for meeting these goals. One of the strategies for the second goal is the implementation of a National Certification Program for weights and measures officials. This strategy has been placed as a top priority. The Board is working closely with the Professional Development Committee (PDC) to achieve implementation in the very near future. More details are available in the PDC report.

Another strategy of high priority is to maintain viable support for NTEP laboratories under the third goal. The Board will be monitoring the number of full-time employees associated with the authorized laboratories and will continue to track evaluation time and backlog statistics to ensure that NTEP evaluations can be completed in a timely manner.

A third priority item is a proposal to develop a web-based system that enables participation by members including those who may not be able to attend the NCWM annual meetings. The system would require log-in as a member. After opening an item that the member wishes to enter a position on, the user would select of one of the following positions:

- Support as written.
- Support but with suggestions and comments.
- Oppose with comments.
- Neutral with comments.
- Neutral without comments.

Position comments would be accepted until a predetermined closing date. Entries would be posted on the website for membership access following the closing date. These postings would be archived on the website for future reference. Members and non-members could continue to submit comments or positions in writing the traditional way.

This web-based system would promote participation by those who cannot attend meetings, and when they view others' comments, they may realize the importance of attending to defend/advance their position.

100-9 Financial Report

The NCWM operates on a fiscal year of October 1 through September 30. The net cost of the management transition for fiscal year 2007 - 2008 was approximately $155,000. This cost included obtaining office space, furniture, computers and other equipment, office supplies, salaries, etc. The net surplus for the last fiscal year of 2008 - 2009 was over $236,000. This surplus can be attributed to two major factors: 1) the new management structure is more cost efficient, and 2) NCWM received a record number of NTEP applications during that 12-month period.

The budget for the current fiscal year is conservative toward revenues, yet projects a net surplus for the year. The Board of Directors anticipates adequate resources to fund new initiatives currently under consideration.

The following is the balance statement as of October 30, 2009.

	October 30, 2009
ASSETS	
Current Assets	$
Checking/Savings	
Associate Member Fund	4,210.66
Certificates of Deposit	625,216.64
Checking	35,526.66
Savings	297,245.37
Total Checking/Savings	962,199.33
Accounts Receivable	0.00
Other Current Assets	65,580.06
TOTAL ASSETS	**1,027,779.39**
LIABILITIES & EQUITY	
Liabilities	
Other Current Liabilities	2,916.64
Total Liabilities	2,916.64
Equity	
Unrestricted Net Assets	224,959.78
Opening Balance Equity	-92,738.10
Retained Earnings	688,607.06
Net Income	204,034.01
Total Equity	1,024,862.75
TOTAL LIABILITIES & EQUITY	$ **1,027,779.39**

Randy Jennings, Tennessee, NCWM Chairman
Tim Tyson, Kansas, Chairman-Elect
Judy Cardin, Wisconsin, NTEP Chairman
Will Wotthlie, Maryland, Treasurer
Michael Sikula, New York, Northeastern Regional Representative
Steven Malone, Nebraska, Central Regional Representative
Stephen Benjamin, North Carolina, Southern Regional Representative
Kirk Robinson, Washington, Western Regional Representative
Stephen Langford, Cardinal Scale, At-Large
Mark Coyne, Barnstable, MA, At-Large
Robert Murnane, Seraphine Test Measure, Associate Membership
Gilles Vinet, Measurement Canada, Advisory
Carol Hockert, Chief, NIST, Weights and Measures Division, Executive Secretary
Jim Truex, NTEP, Administrator
Don Onwiler, NCWM, Executive Director

Board of Directors

Appendix A

Report on the Activities of the International Organization of Legal Metrology (OIML) and Regional Legal Metrology Organizations

Weights and Measures Division, NIST

INTRODUCTION

The Weights and Measures Division (WMD) of the National Institute of Standards and Technology (NIST) is responsible for coordinating U.S. participation in the International Organization of Legal Metrology (OIML) and other international legal metrology organizations. Learn more about OIML at the website (www.oiml.org) and about NIST Weights and Measures Division at the WMD website (www.nist.gov/owm). Dr. Charles Ehrlich, Group Leader of the International Legal Metrology Group (ILMG), can be contacted at charles.ehrlich@nist.gov or at (301) 975-4834 or by fax at (301) 975-8091.

Please note:

- *OIML publications are available without cost at http://www.oiml.org.*
- *The United States will host the annual meeting of the International Committee of Legal Metrology (CIML) in Orlando, Florida, September 20 - 24, 2010.*

Table A
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Table B
Glossary of Acronyms

BIML	International Bureau of Legal Metrology	IR	International Recommendation
B	Basic Publication	IWG	International Work Group
CD	Committee Draft[1]	MAA	Mutual Acceptance Arrangement
CIML	International Committee of Legal Metrology	MC	Measurement Canada
CPR	Committee on Participation Review	OIML	International Organization of Legal Metrology
D	Document	R	Recommendation
DD	Draft Document[2]	SC	Technical Subcommittee
DR	Draft Recommendation[2]	TC	Technical Committee
DoMC	Declaration of Mutual Confidence	WD	Working Draft[3]
DV	Draft Vocabulary[2]	USNWG	U.S. National Work Group
ILMG	International Legal Metrology Group		

[1] CD: a draft at the stage of development within a technical committee or subcommittee; in this document, successive drafts are numbered 1 CD, 2 CD, etc.

[2] DD, DR, and DV: draft documents approved at the level of the technical committee or subcommittee concerned and sent to BIML for approval by CIML.

[3] WD: precedes the development of a CD; in this document, successive drafts are number 1 WD, 2 WD, etc.

Details of All Items
(In Order by Reference Key Number)

I. Report on the Activities of the OIML Technical Committees

This section reports on recent activities and the status of work in OIML technical committees (TCs) and technical subcommittees (SCs) of specific interest to members of the NCWM. Also included are schedules of future activities of the Secretariats, the U.S. National Work Groups (USNWGs), and the International Work Groups (IWGs) of the committees and subcommittees.

TC 3/SC 5 "Conformity assessment" (United States and BIML)
The Subcommittee held a meeting in May 2008 to discuss the revision of the documents B 3 (Certificate System) and B 10 (MAA). A 2 CD of B 3 and a first CD of B 10 were sent to TC 3/SC5 members in December 2009. The meeting included discussion of a working draft (WD) of a new document on the incorporation of measurement uncertainty into conformity assessment decisions in legal metrology. In April 2009, the Secretariat distributed the 1 CD of a new document entitled "The role of measurement uncertainty in conformity assessment decisions in legal metrology." International comments on this document have been received and are being used to develop the 2 CD. A meeting of the MAA Committee on Participation Review (CPR) was held in June 2009 in Berne, Switzerland (please see the MAA section in the NTEP report of this publication for more details). For more information on the activities of this subcommittee, please contact Dr. Charles Ehrlich at (301) 975-4834 or at charles.ehrlich@nist.gov.

TC 5/SC 1 "Environmental conditions" (Netherlands)
The Secretariat has started the revision cycle of D11 "General requirements for electronic measuring instruments." This is a very important document in the OIML system and is used by all of the OIML technical committees as a general reference for technical and testing requirements on all electronic instruments. Please contact Dr. Ambler Thompson at (301) 975-2333 or at ambler@nist.gov if you would like further information on this project.

TC 5/SC 2 "Software" (Germany and BIML)
The new OIML Document D 31 "General requirements for software-controlled measuring instruments" was published in December 2008 and will serve as guidance for software requirements in International Recommendations by OIML technical committees. The United States participated in the technical work on this document and submitted votes and comments on several drafts of the document. A new project on software verification was also approved by the CIML, and the United States is waiting for the first draft of this document. The ILMG participated in NCWM Software Sector meetings in Columbus, Ohio, in March 2009. Please contact Dr. Ambler Thompson at (301) 975-2333 or at ambler@nist.gov if you would like to discuss OIML software efforts.

TC 6 "Prepackaged products" (South Africa)
Discussions continue on the issue of an OIML International Quantity Mark, referred to as an IQ Mark. The IQ Mark, designed to eliminate trade barriers, would be a program that would allow for an international system of acceptance of prepackaged goods. Receiving countries want imported packages to meet all requirements and packers in exporting countries want to ensure prepackages will not be rejected after arriving in the destination country. Such a program would also require that participants meet specific requirements in order to participate in a program for quantity control and marking of prepackaged goods.

The United States is participating in a work group that is developing guidelines on good manufacturing practices and additional documentation for selected criteria that would be used in the IQ Mark's accreditation programs. It was agreed that all members of the TC 6 would send out a questionnaire to all current stakeholders, including industry, and federal and state agencies seeking input to specific questions. NIST WMD surveyed U.S. industry, including the largest manufacturers of packaged goods, and found no support for the IQ Mark effort. The United States believes the effort to manage and certify quality control systems will add costs to all participating suppliers. Even though there is significant opposition to the IQ Mark effort from several countries (including the United States), the technical committee continues to move forward with this project under the premise that such a voluntary system would be of great value to developing countries. A TC 6 meeting was held in March 2009 in South Africa. Please contact Mr. Ken Butcher at (301) 975-4859 or at kenneth.butcher@nist.gov if you would like more information about the work of this subcommittee or to participate in any of these projects.

TC 8/SC 1 "Static volume and mass measurement" (Austria and Germany)
Two revised Recommendations, OIML R 71, "Fixed storage tanks," and R 85, "Automatic level gages for measuring the level of liquid in fixed storage tanks," were published in January 2009. The United States, however, had serious opposition to the inclusion of specialized tanks (including pressurized tanks and non-vertical tanks) in the scope statements of both R 71 and R 85 because the requirements in the Recommendations did not fully reflect this inclusion. The United States now chairs a work group that is drafting new sections of R 71 and R 85 that will include the specific requirements for specialized tanks. OIML R 80-1, "Road and rail tankers, metrological and technical requirements," was published in May 2009. OIML R 80-2, "Road and rail tankers, test methods," is being developed. The revisions to R 71 and R 85 and the development of R 80-2, were discussed at a subcommittee meeting in Vienna, Austria, in October 2009. Please contact Mr. Ralph Richter at (301) 975-3997 or at ralph.richter@nist.gov if you would like copies of the documents or to participate in any of these projects.

TC 8/SC 3 "Dynamic volume and mass measurement for liquids other than water" (United States and Germany)
OIML R 117-1, "Dynamic measuring systems for liquids other than water, Part 1: Metrological and technical requirements" has undergone an extensive revision. The Recommendation was published in March 2008. The revision incorporates new instrument technologies and includes a merger with OIML Recommendations R 86, "Drum meters," and R 105, "Mass flowmeters." The ILMG has worked closely with the USNWG, Canada, Germany, and the Netherlands on this effort. Meetings of the USNWG on flowmeters were held during the NCWM Annual Meeting in July 2009, in San Antonio, Texas. Subcommittee work is continuing on the development of R 117-2, "Test methods," and R 117-3 "Test report format." A meeting of the IWG for R 117-2 was held in Vienna, Austria, in April 2009. A first draft of R 117-2 is planned for early 2010. If you have any questions or would like to participate in the next phases of this project, please contact Mr. Ralph Richter at (301) 975-3997 or ralph.richter@nist.gov.

TC 8/SC 5 "Water Meters" (UK)
OIML, ISO, and CEN are working together to harmonize requirements for water meters using OIML R 49 "Water meters intended for the metering of cold potable water and hot water" parts 1, 2, and 3 as the base document. A WD was distributed in January 2009, and a joint meeting of the three organizations was held in May 2009 in Ottawa, Canada. The joint work group is now developing a new committee draft based on submitted comments and decisions made in Ottawa. The American Water Works Association (AWWA) Committee on Water Meters is assisting in these efforts. Please contact Mr. Ralph Richter at (301) 975-3997 or at ralph.richter@nist.gov if you would like copies of documents or to participate in this project.

TC 8/SC 6 "Measurement of cryogenic liquids" (United States)
Members of the subcommittee and U.S. stakeholders decided that there is sufficient justification for revising R 81, "Dynamic measuring devices and systems for cryogenic liquids." Responses received by the Secretariat indicated that a revision of R 81 was justified to update: (1) electronic tests in accordance with the latest edition of OIML D 11 (2004) and/or the latest IEC and ISO standards; (2) technical requirements to include new developments in hydrogen measurements; (3) Annex C to include current recommendations for density equations; and (4) existing sections into three distinct parts similar in format to recently-developed OIML Recommendations. The Secretariat will ask members of TC 8/SC 6 and the USNWG to review and formally comment on the first draft of the revised R 81. To obtain more information or to participate in this project, please contact Ms. Juana Williams at (301) 975-3989 or juana.williams@nist.gov.

TC 8/SC 7 "Gas metering" (Netherlands)
The Secretariat has distributed the first committee draft (1 CD) of OIML R 137-1 and R 137-2, "Gas meters; Part 1: Metrological and Technical Requirements, and Part 2: Metrological controls and performance tests." U.S. comments are being developed in cooperation with the measurement committees of the American Gas Association (AGA) and will be returned to the Secretariat in January 2010. This document is especially important to U.S. interests because the ANSI B 109 committee on gas measurement is using OIML R137 to create a new performance-based standard for gas meters in the United States. Please contact Mr. Ralph Richter at (301) 975-3997 or ralph.richter@nist.gov if you would like to obtain a copy any gas measurement documents or if you would like to participate in the work of this subcommittee.

TC 9 "Instruments for measuring mass" (United States)
At the 43rd CIML meeting in October 2008, the CIML approved a new work item to begin revision of OIML R 60:2000 "Metrological regulation for load cells." It is anticipated that this revision will cover everything from the basic principles of R 60 (e.g., tolerances and accuracy classes) to exploring the addition of new requirements. For more information on these efforts, please contact John Barton at (301) 975-4002 or john.barton@nist.gov.

TC 9/SC 2 "Automatic weighing instruments" (United Kingdom)
The Recommendation R 134-1, "Automatic instruments for weighing road vehicles in motion – total load and axle weighing," has been approved by CIML and published. U.S. comments concerning terminology and document scope were incorporated in the document. The test report format of this document, R 134-2, has been approved by the Subcommittee and was published in October 2009. If you would like to receive a copy of these documents or get more information on the work of this subcommittee, please contact Mr. Richard Harshman at (301) 975-8107 or at harshman@nist.gov.

It is anticipated that the DR of OIML R 106 Parts 1 and 2, "Automatic rail-weighbridges," will receive final CIML approval in 2010. If you would like to receive copies of these documents or get more information on the work of this subcommittee, please contact Mr. John Barton at (301) 975-4002 or john.barton@nist.gov.

TC 17/SC 1 "Humidity" (China and United States)
The Co-secretariats (China and the United States) are working with a small IWG to revise OIML R 59 "Moisture meters for cereal grains and oilseeds." All drafts have been distributed to the USNWG, which for the most part is a subset of the NTEP Grain Sector. In October 2008, the Secretariat of TC 17/SC 1 was jointly allocated to China and the United States. The 5 CD of OIML R 59 was distributed to the Subcommittee in February 2009. A 6 CD is being developed based on international comments received on the 5 CD. Please contact Ms. Diane Lee at (301) 975-4405 or at diane.lee@nist.gov if you would like to participate in this work group.

TC 17/SC 8 "Quality Analysis of Agricultural Products" (Australia)
This subcommittee was formed to study the issues and write a working draft document "Measuring instruments for protein determination in grains." Australia is the Secretariat. A TC 17/SC 8 meeting was hosted by NIST to discuss the 2 CD. At the NIST meeting, the TC 17/SC 8 also discussed comments concerning the maximum permissible errors (MPEs) and harmonization of the TC 17/SC 8 Recommendation for protein with the TC 17/SC 1 Recommendation for moisture. Please contact Ms. Diane Lee at (301) 975-4405 or at diane.lee@nist.gov if you would like to participate in this work group.

OIML Mutual Acceptance Arrangement (MAA)
The report on the OIML Mutual Acceptance Arrangement (MAA) has moved. It can now be found in the NTEP section of this document. For further information on the MAA and its implementation, please contact Dr. Charles Ehrlich at charles.ehrlich@nist.gov or at (301) 975-4834 or by fax at (301) 975-8091.

II. Report on the 44th CIML Meeting in Mombasa, Kenya, October 2009

The International Committee of Legal Metrology (CIML) opened with addresses given by Mr. Alan E. Johnston, CIML President.

The Committee welcomed the Dominican Republic and the Union Economique et Monetaire de l'Ouest Africain, (UEMOA) as new Corresponding Members. The approval of UEMOA, a group of West African countries, represents a new type of arrangement for Member States, but this type of corresponding membership is still under review by the CIML. It was again noted that the Committee wants to continue to raise the level of awareness of the advantages of OIML Membership in order to encourage the widest possible participation in the International Legal Metrology System.

The Committee expressed its appreciation for the strong level of interaction and cooperation between the BIML and the International Bureau of Weights and Measures (BIPM). The Committee asked the Director of the BIML to prepare a draft report on the relationship between the two Organizations and to encourage further discussion on this relationship during the 45th CIML Meeting. This report should be mainly strategic in nature and should consider the point of view of the stakeholders of both organizations.

The Committee expressed its appreciation for the continued cooperation with the International Laboratory Accreditation Cooperation (ILAC) and the International Accreditation Forum (IAF). In order to develop this cooperation at a national level, CIML Members were invited, within their applicable national legal framework, to contact their National Accreditation Bodies and promote the use of appropriate technical and metrological experts and lead assessors and the associated requirements in the OIML Systems in accreditation or peer assessment wherever appropriate.

The Committee instructed the Bureau to start a revision of the OIML/IEC Memorandum of Understanding (MoU) and develop cooperation with the IEC similar to that followed for the revision of the OIML/ISO MoU.

The Committee took note of the progress on several projects at the BIML. The revision of part 1 of the Directives for OIML Technical Work has advanced, and the committee requested that the Bureau and the work group for this effort plan to complete this revision with a view to submitting it to the CIML for approval at its meeting in 2010. The Committee also expressed its appreciation for the training provided to TC/SC Secretariats and instructed the Bureau to continue to develop formats and templates for use by the TC/SC Secretariats.

The Committee approved the following publications:

- Amendment to R 138, "Vessels for commercial transactions;" and
- R 143, "Instruments for the continuous measurement of SO2 in stationary source emissions."

The Committee took note of the re-confirmation of the following publications:

- R 14, "Polarimetric saccharimeters graduated in accordance with the ICUMSA International Sugar Scale;"
- R 48, "Tungsten ribbon lamps for the calibration of radiation thermometers;"

- R 75-1, "Heat meters. Part 1 : General requirements; Part 2 : Type approval tests; Part 3 : Test Report Format;"
- R 84, "Platinum, copper, and nickel resistance thermometers (for industrial and commercial use);" and
- R 124, "Refractometers for the measurement of the sugar content of grape musts."

The Committee approved the withdrawal of the following publications:

- R 70, "Determination of intrinsic and hysteresis errors of gas analyzers;"
- R 73, "Requirements concerning pure gases CO, CO2, CH4, H2, O2, N2 and Ar intended for the preparation of reference gas mixtures;"
- D 7, "The evaluation of flow standards and facilities used for testing water meters."

The Committee approved the following new work items:

- TC 3/SC 5: Revision of D 30, "Guide for the application of ISO/IEC 17025 to the assessment of Testing Laboratories involved in legal metrology;"
- TC 6: Revision of R 87, "Quantity of product in prepackages;"
- TC 6: New publication on methods to determine the actual quantity of product in prepackages (drained weight, etc.) in collaboration with WELMEC WG 6;
- TC 8: Revision of R 63, "Petroleum measurement tables;" and
- TC 8: Revision of R 119, "Pipe provers for testing of measuring systems for liquids other than water."

The Committee approved the launching of a new DoMC that will be based on OIML R 118, "Testing procedures and test report format for pattern examination of fuel dispensers for motor vehicles" (edition 1995). This new DoMC will be limited to fuel dispensers and will include all of the requirements of OIML R 117-1 (edition 2007) as additional requirements.

The CIML meeting included a seminar on "Priorities for Legal Metrology for Trade," and the issue of international standards to facilitate trade was a significant issue. The Committee noted that:

- the increasing importance of prepackaged foods and beverages in global trade now accounts for over 75 % of agri-foods exports; and
- developing country exports are particularly disadvantaged by having to conform to a multiplicity of international requirements.

The Committee noted that the term of the current BIML Director will expire in December 2010. The Committee decided to advertise the position of Director of BIML in 2010 with the aim of either appointing a new Director or reappointing the present Director.

The Committee also noted that the election for the position of CIML President will be held in 2010 and reminded CIML Members that candidacies must be sent to the Bureau before the end of May 2010.

The CIML established a small work group to study a proposal to restructure the BIML Pension Plan according to a "modern accountancy" scheme, which could have a significant impact on the financial statement of the BIML.

III. Future OIML Meetings

The United States is excited to be hosting the 45th CIML Meeting in Orlando, Florida, September 20 - 24, 2010. Dr. Charles Ehrlich made a presentation on plans for this meeting, including a scheduled presentation on "Metrology at NASA." Please contact Dr. Ehrlich at (301) 975-4834 or at charles.ehrlich@nist.gov if you would like to attend the CIML meeting as an observer.

The Committee thanked and accepted the invitation of the Czech Republic to hold the 46th CIML Meeting in the Czech Republic. The meeting will most likely be held in October 2011 in Prague.

IV. Regional Legal Metrology Organizations

Meeting of the Inter-American Metrology System (SIM) General Assembly and the SIM Legal Metrology Work Group (LMWG)
The SIM General Assembly was held in Lima, Peru, during the last week of October 2009. Dr. Humberto S. Brandi, Director of Scientific and Industrial Metrology (SIM) at INMETRO Brazil, is the SIM President. Marcos Senna (senna@inmetro.rs.gov.br), also of INMETRO in Brazil, serves as the Chairman of the SIM Legal Metrology Work Group (LMWG). Training sessions of the SIM LMWG were held in March 2009; course topics included: non-automatic weighing instruments, liquid fuel dispensers, electrical energy meters, and taximeters. The organization is working to build capacity in legal metrology for SIM member countries. Please contact Dr. Ambler Thompson at (301) 975-2333 or at ambler@nist.gov for more information.

Asia-Pacific Legal Metrology Forum (APLMF) Meeting
The 16th APLMF meeting was held in Chiang Mai, Thailand (a one-hour flight north of Bangkok). The Peoples Republic of China holds the Presidency and Secretariat of the APLMF. Mr. Pu Changcheng, APLMF President and Vice Minister of AQSIQ, chaired the meeting. APLMF activities are facilitated through its seven work groups. The most active is the work group on Training Coordination chaired by Australia.

There were two training courses and two Workshops given by APLMF this year. The training courses, covering requirements in select OIML Recommendations, and offered primarily to assist the developing countries in APLMF, were on prepackaged goods and electricity meters. The Workshops were on 1) Product Safety, Food Safety and Agricultural Metrology, and 2) Legal Metrology of Speedometers. Workshops planned for 2010 include training on gas meters, mass flow meters, electronic weighing instruments, and software-controlled measuring instruments. Future priorities for APLMF training courses also include OIML R 117 (flowmeters for liquids other than water), R 126 (Breathalyzers), and R 91 (Radar Devices). While feedback from the previously-held training courses has been positive, it is becoming clear that in order to continue to receive funding for the training, APLMF needs to do a more thorough job of assessing and documenting the impact of the training courses on the economies that receive the training.

The United States was represented by Dr. Charles Ehrlich, who serves as Chairman of the APLMF Work Group on Mutual Recognition Arrangements. Dr. Ehrlich gave an extensive report and update on the OIML Mutual Acceptance Arrangement (MAA).

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Associate Membership Committee (AMC)
Interim Agenda
January 2010

- Call to Order
- Approval of July 13, 2009, AMC Minutes
- Financial Condition
- NCWM Industry Representative Reports

  Board of Directors Report (Bob Murnane)

  Professional Development Report (Position left open)

  Laws and Regulations Report (Rob Underwood)
- AMC Fund Disbursement Requests

  2009 Training Funds Report

  New Training Requests
- Recommendations for AMC Members on Professional Development Committee (PDC)
- Old Business
- New Business
- Adjournment

Paul Lewis, Rice Lake Weighing Systems, Chair (2014)
Robert Murnane, Jr., Seraphin Test Measure, Vice Chair (2014)
Darrell Flocken, Mettler-Toledo, Inc., Secretary/Treasurer (2013)

Chris Guay, Procter & Gamble (2010)
Thomas Herrington, Nestlé USA-Prepared Food Division (2010)
Rob Underwood, Petroleum Marketer's Assoc. (2010)
Stephen Grabski, Walmart Stores, Inc. (2011)
Kathleen Madaras, Fuel Merchants Association of New Jersey (2011)
Doug Biette, Sartorius North America (2012)
Michael Gaspers, Farmland Foods, Inc. (2013)

ASSOCIATE MEMBERSHIP COMMITTEE

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Laws and Regulations Committee
Interim Agenda

Joe Benavides, Chairman
Austin, Texas

Reference
Key Number

200 INTRODUCTION

The Laws and Regulations Committee (Committee) will address the following items at its Interim Meeting. Table A identifies agenda items by Reference Key Number, title, and page number. The first three digits of the Reference Key Numbers of the items are assigned from the subject series listed below. The fact that an item may appear on the agenda does not mean it will be presented to the National Conference on Weights and Measures (NCWM) for a vote; the Committee may withdraw some items, present some items for information and further study, issue interpretations, or make specific recommendations for changes to the publications listed below. The recommendations presented in this agenda are statements of proposal and not necessarily recommendations of the Committee. The appendices to the report are listed in Table B. Table C is a glossary of Acronyms and Terms.

This agenda contains recommendations to amend National Institute of Standards and Technology (NIST) Handbook 130, "Uniform Laws and Regulations," (2010), and NIST Handbook 133, "Checking the Net Contents of Packaged Goods," (2005) Fourth Edition. Revisions proposed for the handbooks are shown in **bold face print** by **~~striking out~~** information to be deleted and **underlining** information to be added. Additions proposed for the handbooks are designated as such and are shown in **bold face print**. Proposals presented for information only are designated as such and are shown in *italic* type. The section mark, "§," is used in most references in the text and is followed by the section number and title, (for example, Section 1.2. Weight).

Subject Series

INTRODUCTION .... 200 Series

NIST Handbook 130 – General .... 210 Series
- Uniform Laws .... 220 Series
  - Weights and Measures Law (WML) .... 221 Series
  - Weighmaster Law (WL) .... 222 Series
  - Engine Fuels and Automotive Lubricants Inspection Law (EFL) .... 223 Series

- Uniform Regulations .... 230 Series
  - Packaging and Labeling Regulation (PLR) .... 231 Series
  - Method of Sale Regulation (MSR) .... 232 Series
  - Unit Pricing Regulation (UPR) .... 233 Series
  - Voluntary Registration Regulation (VRR) .... 234 Series
  - Open Dating Regulation (ODR) .... 235 Series
  - Uniform National Type Evaluation Regulation (UNTER) .... 236 Series
  - Engine Fuels and Automotive Lubricants Regulation (EFR) .... 237 Series

- Examination Procedure for Price Verification .... 240 Series

- Interpretations and Guidelines .... 250 Series

Table A
Index to Reference Key Items

Table B
Appendices

Table C
Glossary of Acronyms and Terms

AASCO	Association of American Seed Control Officials	L&R	Laws and Regulations
AOSA	Association of Official Seed Analyst	NCWM	National Conference on Weights & Measures
ASTA	American Seed Trade Association	NIST	National Institute of Standards & Technology
ASTM	American Society for Testing and Materials International	MLWG	Moisture Loss Work Group
CFR	Code of Federal Regulations	NCWM	National Conference on Weights & Measures
CNG	Compressed Natural Gas	NEWMA	Northeast Weights & Measures Association
CWMA	Central Weights & Measures Assn.	NFPA	National Fire Protection Association
FALS	Fuels and Lubricants Subcommittee	NTEP	National Type Evaluation Program
FDA	Food and Drug Administration	Pa	Pascal
FD&C Act	Food Drug and Cosmetic Act	S&T	Specifications & Tolerances
FPLA	Fair Packaging and Labeling Act	SI	International System of Units
FSIS	Food Safety and Inspection Service	SWMA	Southern Weights & Measures Association
FSS	Fuel Specifications Subcommittee	UPLR	Uniform Packaging and Labeling Regulation
FTC	Federal Trade Commission	USDA	U.S. Department of Agriculture
HB 44	NIST Handbook 44, *Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices*	USNWG	U.S. National Work Group
HB 130	NIST Handbook 130, *Uniform Laws and Regulations in the areas of Legal Metrology and Engine Fuel Quality*	Weights	Mass
HB 133	NIST Handbook 133, *Checking the Net Content of Packaged Goods*	WG	Work Group
IDFA	International Dairy Food Association	WMD	NIST Weights & Measures Division
IICA	International Ice Cream Association	WWMA	Western Weights & Measures Association
kg	Kilogram		

Details of all Items

(In order by Reference Key Number)

232 METHOD OF SALE REGULATION

232-3 Method of Sale for Fireplace and Stove Wood, Flavoring Chips, and Packaged Natural Wood

Source: Southern Weights and Measures Association (SWMA). (2008 Carryover Item.)

Purpose: The current regulation lacks a clearly stated requirement for the appropriate unit use of metric measure by volume for fireplace and stove wood, flavoring chips and packaged natural wood. When a quantity statement for cubic meter is carried out to three decimal points, it is likely not useful in making value comparisons. The purpose of this proposal is to clarify the requirement for the display of metric units.

Handbook 130 (HB 130), *Uniform Laws and Regulations in the areas of Legal Metrology and Engine Fuel Quality,* Method of Sale Regulation, Section 2.4.3.(d) states that flavoring chips shall be sold by volume, but it falls short of saying which volume units are required. Packers refer to Section 2.4.3. Quantity, where the guidance seems to imply that chips must be sold by the cubic meter. This creates a conflict between the Method of Sale of Commodities Regulation and the Uniform Packaging and Labeling Regulation (UPLR) Declaration of Quantity for Consumer Packages Rule of 1000. Using cubic centimeters creates a conflict as well.

Item Under Consideration: Amend Section 2.4.3. as follows:

2.4.3. Quantity. – Fireplace and stove wood – Shall be advertised, offered for sale, and sold only by measure, using the term "cord" and fractional parts of a cord or the cubic meter, except that:

(a) Packaged natural wood. – Natural wood offered for sale in packaged form in quantities less than 0.45 m^3 ($^1/_8$ cord or 16 ft^3) shall display the quantity in terms of ~~cubic meters~~ **liters**, to include ~~**decimal**~~ fractions of ~~**cubic meters**~~ **liters**; or cubic feet **or cubic inches up to one cubic foot**, to include fractions of **a** cubic ~~feet~~ **foot**.

(Amended 20XX)

(b) Artificial compressed or processed logs. – A single fireplace log shall be sold by weight, and packages of such individual logs shall be sold by weight plus count.

(c) Stove wood pellets or chips. – Pellets or chips not greater than 15 cm (6 in) in any dimension shall be sold by weight. This requirement does not apply to flavoring chips.

(Amended 1976 and 1991)

(d) Flavoring chips. – ~~**Flavoring chips shall be sold by volume.**~~ Flavoring chips offered for sale in **packaged form in quantities less than 0.45 m^3 ($^1/_8$ cord or 16 ft^3) shall display the quantity in terms of liters, to include fractions of liters, cubic feet, or cubic inches up to one cubic foot, to include fractions of a cubic foot.**

(Added 1998) (Amended 20XX)

Note: In determining the appropriate Method of Sale, a clear distinction must be made as to whether the wood is being sold primarily as fuel (some wood is sold as fuel but flavoring is a byproduct) or strictly as a wood flavoring.

(Added 20XX)

Background/Discussion: A state cited a company for a violation of the jurisdictions net quantity contents labeling for flavoring chips. This citation also led to this company's product being removed from sale. The company then initiated a review of all of its packaging and labeling to ensure compliance with HB 130 regulations. The company requested assistance from Weights and Measures Division (WMD) on the appropriate unit of metric measure for their flavoring chip packaging. Upon review, it became apparent that the regulation was ambiguous about the appropriate unit to be used of metric measure by volume. When a quantity statement for cubic meter is carried out to three decimal points, it is likely not useful in making value comparisons.

In HB 130, Method of Sale Regulation, Section 2.4.3.(d) states that flavoring chips shall be sold by volume, but it falls short of saying which volume units are required. Most packers also refer to Section 2.4.3. Quantity; where the Commodities Regulation and UPLR-Declaration of Quantity for Consumer Packages Rule of 1000. Using cubic centimeters also causes a conflict. Most states, if not all, give precedent to UPLR over the Method of Sale because most jurisdictions adopt the UPLR and not the Method of Sale of Commodities Regulation.

This item was presented at NCWM 2008 Annual Meeting and at all of the 2008 Regional Meetings.

At the 2009 Interim Meeting, it was requested to add the words "up to one cubic foot" after the words cubic inches. The Committee agreed to modify the proposal and move it forward for a vote at the 2009 Annual Meeting.

At the 2009 Central Weights and Measures Association (CWMA) Annual Meeting in St. Louis, Missouri, on May 3 - 6, 2009, a NIST Technical Advisor recommended that the proposal be changed in Section 2.4.3.(a) to read as …fractions of **<u>liters</u>** **~~cubic meters~~.** A state regulator stated that the proposal conflicts with HB 44 "Units of Measures" and believes that liters should only be used for fluid measurements. After review of HB 44, Appendix C (pgs C-2 and C-8), the CWMA L&R Committee did not feel that there is a conflict. The CWMA L&R Committee supports this item for the following reasons: "A precedent has been established for use of liters in dry measure (e.g., mulch), traditional industry practices utilize liters as their method of sale, it provides a better value comparison, and it would remove the current conflict with violation of the Rule of 1000 when cubic meters are used."

At the 2009 Northeast Weights and Measures Association (NEWMA) Annual Meeting in South Portland, Maine, May 11 - 14, 2009, the NEWMA L&R Committee supported this item along with the recommended changes from the NIST Technical Advisor. A NIST Technical Advisor recommended that the proposal be change in Section 2.4.3.(a) to read as: …fractions of **<u>liters</u>** **~~cubic meters~~.** A state official stated that the changes to this section are being made to correct a technical error with the use of metric measure and that customary units will not change. An industry representative questioned whether liters would be the correct metric measure and suggested decimeters. It was noted that decimeters and liters are equivalent.

At the 2009 NCWM Annual Meeting in San Antonio, Texas, there was discussion that this proposal needs additional review by the NCWM L&R Committee for editorial changes. The original proposal did not adequately correct the issue and for that reason it was not adopted at the 2009 NCWM Annual Meeting and was returned to the NCWM L&R Committee for further consideration. It was recommended that the term "fraction of liters and cubic feet" be given consideration.

At the 2009 Central Weights and Measures Association (CWMA) Interim Meeting in Rock Island, Illinois, the participants supported the proposal in the recommendation shown above. The CWMA recommended to the NCWM Committee that the proposal under consideration go forward as a Voting item.

At the 2009 Western Weights and Measures Association (WWMMA) Annual Meeting in Los Cruces, New Mexico, the WWMA L&R Committee heard specific recommendations for changes to the current proposal during its open hearings. The WWMA L&R Committee supports the need for clarification and this could be accomplished by changing the following wording to replace the current recommendation with:

> **2.4.3. Quantity.** – Fireplace and stove wood shall be advertised, offered for sale, and sold only by measure, using the term "cord" and fractional parts of a cord or the cubic meter, except that:
>
> (e) Packaged natural wood. – Natural wood offered for sale in packaged form in quantities less than 0.45 m^3 ($^1/_8$ cord or 16 ft^3) shall display the quantity in terms of:
>
> **(1)** **~~cubic meters~~ liters**, to include **~~decimal~~** fractions of **~~cubic meters~~** **<u>liters</u>**; or

(2) for quantities less than one cubic foot, in terms of cubic inches; or

(3) for quantities of one cubic **foot or greater, in terms of cubic feet,** to include fractions of **a** cubic ~~feet~~ **foot**.

(f) Artificial compressed or processed logs. – A single fireplace log shall be sold by weight, and packages of such individual logs shall be sold by weight plus count.

(g) Stove wood pellets or chips. – Pellets or chips not greater than 15 cm (6 in) in any dimension shall be sold by weight. This requirement does not apply to flavoring chips.

(Amended 1976 and 1991)

(h) Flavoring chips. – ~~**Flavoring** chips shall be sold by volume.~~ **Flavoring chips offered for sale in packaged form in quantities less than 0.45 m^3 ($^1/_8$ cord or 16 ft^3) shall display the quantity in terms of:**

(1) ~~**cubic meters**~~ **liters**, to include ~~**decimal**~~ fractions of ~~**cubic meters**~~ **liters**; or

(2) for quantities less than one cubic foot, in terms of cubic inches; or

(3) for quantities of one cubic **foot or greater, in terms of cubic feet,** to include fractions of **a** cubic ~~feet~~ **foot**.

(Added 1998) **(Amended 20XX)**

At the 2009 Southern Weights and Measures Association (SWMA) Annual Meeting in Clearwater, Florida, the SWMA L&R Committee received a comment from an industry representative that there are two legal units of measurement but only one unit of measurement is being proposed in this item. An industry representative expressed that additional work needs to be done on this item. The SWMA recommends to the NCWM L&R Committee that this item go forward as a Voting item.

At the 2009 Northeast Weights and Measures Association (NEWMA) Interim Meeting held in Springfield, Massachusetts, they received positive comments on this proposal. NEWMA also reviewed the WWMA 2009 changes and supports this Item.

260 NIST HANDBOOK 133

260-1 Guidance on Allowing for Moisture Loss and Other Revisions

Source: Moisture Loss Work Group (MLWG).

Purpose: Revise and update the 4th Edition of NIST Handbook 133 (HB 133) "Checking the Net Contents of Packaged Goods" (2005). Some of the changes were developed to improve the guidance on making moisture allowances.

Item Under Consideration: Current changes and recommendations to HB 133 are reflected in Appendix A, Proposed Amendments and Editorial Changes. A working draft document of Handbook 133 is presented in Appendix B, Handbook 133, "Checking the Net Contents of Packaged Goods," 4th Edition, proposed changes for 2011.

Background/Discussion: At the 2009 NCWM Interim Meeting in Daytona Beach, Florida, the NIST Technical Advisor gave a presentation to the MLWG titled, "NIST Handbook 133 Checking the Net Contents of Packaged Goods – An explanation of its statistical requirements and approaches to allowing for moisture loss from packaged goods."

The MLWG reviewed draft changes it developed to revise and update HB 133. Some of the proposed changes and recommendations were developed to improve the guidance on making moisture allowances. It was requested that comments or concerns regarding the draft changes be submitted to the NIST Technical Advisor. It was recommended that the states distribute this document to interested parties within their state for comment. The MLWG met Sunday, July 12, 2009, at the Annual Meeting in San Antonio, Texas, to consider any comments received prior to the meeting.

The U.S. Department of Agriculture (USDA), Food Safety and Inspection Service (FSIS) issued a final ruling on 9 CFR parts, 317, 381, and 442 (refer to NCWM Publication 15, 2009 NCWM Interim Meeting Agenda, Table B, Appendix B) "Determining Net Weight Compliance for Meat and Poultry Products," that states the procedures set forth for determining "net weight compliance." This ruling requires the use of the 4th Edition of HB 133 for all inspections of packages of meat and poultry products subject to federal law and USDA regulations effective October 9, 2008. Therefore, the incorporated provisions of NIST Handbook 133 do not serve merely as compliance guidance but are a part of the meat and poultry products inspection regulations.

To be consistent with this final rule, state and local officials must determine net weight compliance for meat and poultry products, including single-ingredient, raw poultry, in a manner that includes the free-flowing liquids as part of the product and not part of the tare weight.

The MLWG updated HB 133 Section 2.3., "Basic Test Procedure," to be consistent with 9 CFR parts, 317, 381, and 442. That means removing any reference to the "wet tare" method for determining net weight of USDA restricted products, since FSIS considers free-flowing liquid to be part of the product.

At the CWMA 2009 Annual Meeting held May 3 - 6, 2009, in St. Louis, Missouri, the Committee recommended support of this item after reviewing the current proposed revisions (refer to CWMA's 2009 Annual Report) to HB 133. Comments documented during open hearings included the following recommendations from an industry representative:

1. Chapter 1-3 – add "compliance" to the reasons listed since manufacturers "overpack" to meet current regulations;
2. Chapter 1-2 – "moisture" should be inserted in front of allowance (last paragraph of page L&R - C5); there is a need to recognize that other products may be subject to moisture loss for which allowances have not been established;
3. Chapter 2-3 and Chapter 2-5 – the dates referenced can be removed since they are already in the past. The representative cautioned that this proposal does not "finish" the issue with moisture loss.

The CWMA position is there are two questions which remain unanswered: 1) What guidance can be provided for manufacturers with products other than those listed for moisture loss?; and 2) What methodology is necessary for manufacturers to demonstrate the data needed for a moisture allowance?

A state regulator objected to this proposal as a Voting item and stated that members cannot vote on this item since the information will not be available until the July meeting. The official recommended that the proposal be moved to Informational. The regulator acknowledged that HB 133 is a NIST publication but stated that due process must be provided since the NCWM does vote to adopt the changes in this handbook. At the CWMA voting session, the membership voted not to accept the recommendation of the Committee and recommended the item be made Informational.

At the 2009 NEWMA Annual Meeting, held May 11 - 14, 2009, in South Portland, Maine, the Committee recommended support of this item. The group discussed the meaning of "editorial" and agreed that due to the volume of changes being recommended, the correct process is to review all comments received, and then have a vote on them by NCWM. A state official suggested that the document be distributed over the NIST Commodities Server List. A recommended change to HB 133 Chapter 2, Section 2.6., specifically references the use of glaze with frozen seafood products. It was suggested that wording include other glazed products, such as frozen chicken (i.e., glazed chicken wings).

At the 2009 NCWM Annual Meeting in San Antonio, Texas, the MLWG met on July 12, 2009. A NIST Technical Advisor informed the Committee and the MLWG that the draft HB 133 was sent out mid-May 2009 to the Weights and Measures Directors, NCWM HB 44 and Commodities list servers, and e-mailed to stakeholders, MLWG attendees, and trade associations. Additional comments and recommendations received were distributed to the Committee.

HB 133 was reviewed in its entirety by the MLWG (refer to NCWM L&R Committee Report for the 94th Annual Meeting, Appendix F.). Several State Directors voiced concern that they had not had ample time to thoroughly review and evaluate the changes. A draft document of HB 133 is located in NCWM L&R Committee Report for the 94th Annual Meeting, Appendix G.

NIST will incorporate changes from the July 12, 2009, MLWG meeting. NIST will disseminate this information to all stakeholders using their contact point information system and list servers (Weights and Measures (W&M) Directors and the NCWM HB 44 and Commodities list server).

At the 2009 CWMA Interim and the SWMA Annual Meetings, both regions recommended moving the proposed revisions forward as a Voting item at the 2010 NCWM Annual Meeting.

At the 2009 WWMA Annual Meeting held in Los Cruces, New Mexico, the WWMA L&R Committee heard concerns at the open hearings regarding moisture allowance being applied before the packages errors are determined. The WWMA L&R Committee discussed that there are jurisdictions that use the before and after application process. Software applications currently in use also apply this method. A California Director informed the Committee that California policy is to take moisture allowance after the package errors are determined. It was requested that the MLWG remain active to clarify and work on the moisture loss issues. Additional resources need to be found to help support the MLWG. The WWMA Committee recommends moving this item forward as a Voting item with the following noted changes (refer to WWMA 2009 Conference Addendum, Appendix A for a detailed description of line items):

- The majority of the WWMA L&R Committee recommended moving forward line Item 7 from the WWMA agenda Appendix A (not accepting line item 8).

  - Section 1.2.(5)a.: The amount of ~~lost~~ moisture **loss** depends upon the nature of the product, the packaging material, the length of time it is in distribution, environmental conditions, and other factors.

    Revise the first paragraph, last sentence: …For loss or gain of moisture, ~~apply~~ the moisture allowances **may be applied before or after the package errors are determined.**

- Line Item 25, Section 2.3.8.b. "What are the moisture allowances for flour and dry pet food?" The Committee recommends changing the title on Table 2-3 to read as "**Moisture Allowances for Product in Distribution.**" This could help the Inspector from potentially applying an incorrect test procedure at a production facility.

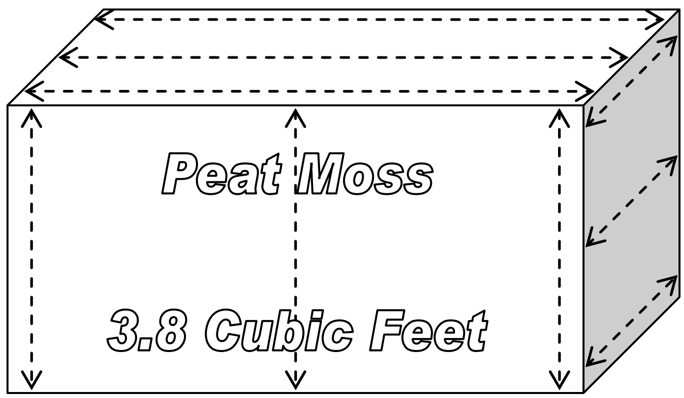
- Line item 29, Section 2.3.8.d. "What moisture allowance is used with wet tare when testing packages bearing a USDA seal of inspection?" should read as: When there is free-flowing liquid **and liquid** ~~or absorbent~~ **absorbed by** packing materials in contact with the products, all free liquid **and the absorbed liquid** is part of the wet tare.

- Remove line Item 30, Section 2.3.8.e. "How is moisture loss handled for products not listed in HB 133?" in its entirety and retain as a Developmental item with future work to be done by the MLWG.

- Line Item 61, Section 3.10.a. "How are packages of peat and peat moss labeled by compressed volume testing?" modify the second sentence to add the underlined words and graphic:

- **For each dimension (length, width, and height) take three equidistant measurements, take the average of each respective dimension and multiply to determine the cubic measure as follows:**

  Average height X average width X average length = cubic measurement



At the NEWMA 2009 Interim Meeting, officials reviewed the changes, located in Appendix A, of language deemed "editorial changes." While NEWMA supports the majority of "editorial changes," they have concerns that some of the changes go beyond "editorial" and requests that the language proposed for inclusion on Section 2.3.8. question (e) on page 25 by [Kraft: Paul Hoffman (7/09)] be removed from the editorial changes. NEWMA felt the language proposed for that section is repetitive and that it already exists in other Federal Law.

A state director also requested language previously included in the 3rd edition of HB 133 but was omitted from the 4th edition be included in the newest revision. That language addresses the issue of gray area as it pertains to moisture content and moisture loss. NEWMA also recommends a mocked up copy of HB 133 with highlights of changes be posted on the NIST website.

270 OTHER ITEMS – DEVELOPING ITEMS

INTRODUCTION

The NCWM established a mechanism to disseminate information about emerging issues which have merit and are of national interest. Developing items are those items that have not received sufficient review by all parties affected by the proposals or may be insufficiently developed to warrant review by the NCWM L&R Committee. The Developing items listed are currently under review by at least one regional association, subcommittee, or work group (WG).

The Developing items are marked according to the specific NIST handbook into which they fall – HB 130 or HB 133. The Committee encourages interested parties to examine the proposals included in the appendices and to send their comments to the contact listed in each part.

The Committee asks that the regional weights and measures associations, subcommittees, and WGs continue their work to fully develop each proposal. Should an association, subcommittee, or WG decide to discontinue work on a Developing item, the Committee asks that it be notified. When the status of an item changes because the submitter withdraws the item, the item will be listed in a table below. For more details on items moved from the Developing items list to the Committee's main agenda, refer to the new reference number in the main agenda.

270-1 Section 2.2.1. in Handbook 130, Uniform Engine Fuels Regulation – Premium Diesel Lubricity

Source: Southern Weights and Measures Association (SWMA) (See Item 270-5 in the Report of the 92nd Annual NCWM Meeting in 2006)

Purpose: Effective January 1, 2005, the test tolerance for regular diesel lubricity was ASTM D6079 reproducibility of 136 µm (see ASTM D975-04b). The NCWM chose to accept the ASTM reproducibility limits for all diesel (D975) and gasoline (D4814) properties (see HB 130, Section 7.2.2. Reproducibility), but chose a different reproducibility limit for premium diesel lubricity without providing any explanation as to why the ASTM reproducibility limit was insufficient. The Chairman of the Fuels and Lubricants Subcommittee (FALS) will provide an update at the 2010 Interim Meeting on the work being done at ASTM.

Item Under Consideration: Amend HB 130, Uniform Engine Fuels and Automotive Lubricants Regulation. Section 2.2.1., Premium Diesel Fuel. The following reflects the current text as it was modified in 2003.

2.2. Diesel Fuel. – shall meet the most recent version of ASTM D975, "Standard Specification for Diesel Fuel Oils."

2.2.1. Premium Diesel Fuel. – All diesel fuels identified on retail dispensers, bills of lading, invoices, shipping papers, or other documentation with terms such a premium, super, supreme, plus, or premier must conform to the following requirements:

(a) **Cetane Number.** – A minimum cetane number of 47.0 as determined by ASTM Standard Test Method D613.

(b) **Low Temperature Operability.** – A cold flow performance measurement which meets the ASTM D975 tenth percentile minimum ambient air temperature charts and maps by either ASTM Standard Test Method D2500 (Cloud Point) or ASTM Standard Test Method D4539 (Low Temperature Flow Test, LTFT). Low temperature operability is only applicable October 1 - March 31 of each year.

(c) **Thermal Stability.** – A minimum reflectance measurement of 80 % as determined by ASTM Standard Test Method D6468 (180 min, 150 °C).

(d) **Lubricity.** – A maximum wear scar diameter of 520 µm as determined by ASTM D6079. If an enforcement jurisdiction's single test of more than 560 µm is determined, a second test shall be conducted. If the average of the two tests is more than 560 µm, the sample does not conform to the requirements of this part.

(Amended 2003)

Background/ Discussion: (Refer to the NCWM 93rd Annual Meeting (2008) for background information on this item.) A member of the petroleum industry believed the test and associated tolerances for lubricity on premium diesel specified in Section 2.2.1.(d) Lubricity were inconsistent with that for regular diesel. Effective January 1, 2005, the test tolerance for regular diesel lubricity was the ASTM D6079 reproducibility of 136 µm (see ASTM D975-04b). The NCWM chose to accept the ASTM reproducibility limits for all diesel (D975) and gasoline (D4814) properties (see Section 7.2.2. Reproducibility), but chose a different reproducibility limit for premium diesel lubricity without providing any explanation as to why the ASTM reproducibility limit was insufficient. If the NCWM intended to impose a stricter lubricity requirement for premium diesel, it should have designated a tighter specification for this property, not a different test tolerance (e.g., for regular and premium gasoline, premium has a different octane specification than for regular, but the test tolerance is the same). ASTM reproducibility limits were, by definition, based on establishing a 95 % probability that product that should pass, will pass. Applying an average test, as specified in Section 2.2.1.(d), reduced that probability to 80 %.

At the 2006 WWMA Annual Meeting, the L&R Committee received only one comment regarding this item, acknowledging the ongoing review by the FALS. The WWMA noted that the NCWM L&R Committee forwarded the proposal for review by the Subcommittee and agreed this item should remain Developmental pending its recommendation.

At its 2006 CWMA Interim Meeting, the Committee indicated the NCWM Fuel and Lubricant Subcommittee would make recommendations after ASTM improved the test method's precision and after the conclusion of other tests. The CWMA L&R Committee is awaiting the recommendation from the Subcommittee.

During the 2007 NCWM Interim Meeting, the Committee carried this item over as an Information item. The Committee sent this proposal to FALS and requested its recommendation on how to proceed with the issue. The FALS suggested this item remain on the agenda as an Information item until further notice and reported that the activities of ASTM International and the Coordinating Research Council were continuing.

At the 2008 NCWM Interim Meeting in Albuquerque, New Mexico, and the 2008 NCWM Annual Meeting in Burlington, Vermont, the Committee carried this item over as a Developing item. This proposal was sent to FALS for its recommendation on how to proceed with the issue. FALS suggested this item continue to remain on the agenda as a Developmental item.

At the 2008 CWMA Interim Meeting, the Committee requested that this item remain Informational pending release of the FALS recommendation, Coordinating Research Council study, and the ASTM Lubricity Test Method Task Force reports. At the 2008 NEWMA, WWMA and SWMA Annual Meetings, the Committees recommended that this item remain Informational.

In October 2008, NEWMA held their Interim Meeting, where they heard from a representative of the bio-diesel industry who briefed members on the newly adopted FTC standards regarding bio-diesel products, including the labeling of B-5, B-20, and B-100. One member expressed a concern regarding the "field testing" of bio-fuel blends and quality. This member also expressed that not enough testing occurs with regard to "octane quality" and that bio-blend testing would probably be conducted even less.

At the 2009 NCWM Interim Meeting in Daytona Beach, Florida, FALS reported to the Committee that they are awaiting development of items from ASTM.

At the 2009 CWMA Annual Meeting, the Committee recommended that this item remain Informational. The Chairman of the FALS provided an update on the work being done at ASTM. ASTM conducted a round robin to develop better precision for measuring lubricity. There is a Coordinating Research Council study to determine whether the wear scar limit is adequate to provide protection.

At the 2009 NEWMA Annual Meeting, the Committee recommended that this item remain Informational.

At the 2009 Annual Meeting held in San Antonio, Texas, the FALS Chairperson gave an update that ASTM is still working on improving the precision of the test method. This should go to ballot at ASTM this semester and be final in December. The Committee recommends that this item remain informational until ASTM adopts a revision to its standard.

At the 2009 CWMA Interim Meeting, the FALS Chairperson, Ron Hayes, provided CWMA an update on the ASTM ballot to revise the precision of the test method as a result of the recent round robin study. The ballot failed in June at the main committee and the new proposal is being developed for ballot.

At the 2009 WWMA Annual, SWMA Annual, and the NEWMA Interim Meetings there were no comments heard and these regions recommended that this proposal remain a Developing item.

For additional information, please contact Mr. Ron Hayes, FALS Chairman, (573) 751-2922 or ron.hayes@mda.mo.gov by e-mail.

270-2 Fuels and Lubricants Subcommittee (FALS)

Source: The Fuels and Lubricants Subcommittee

Purpose: Update the Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Regulation in HB 130. Another task will be to update the Basic Engine and Fuels, Petroleum Products, and Lubricants Laboratory Publication.

Item Under Consideration: The FALS has met since the 2007 Annual Meeting and continues its work on a number of items in addition to preparing a major revision of the Fuel Ethanol Specifications.

Background/Discussion: The Subcommittee met on January 24, 2007, at the NCWM Interim Meeting to undertake a review of a number of significant issues related to fuel standards. Their first project was to undertake a major review and update of the Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Regulation in HB 130. The Subcommittee also met at the 2007 NCWM Annual Meeting and continued its work on a number of items in addition to preparing a major revision of the Fuel Ethanol Specifications.

An additional project will be to update and possibly expand the Basic Engine Fuels, Petroleum Products, and Lubricants Laboratory Publication. The Subcommittee will undertake other projects as time and resources permit.

At the 2009 NCWM Interim Meeting and Annual Meeting, the FALS Chairperson informed the Committee that FALS is working toward getting changes made to the language within the document.

At the CWMA 2009 Interim, WWMA 2009 Annual, SWMA 2009 Annual, and the NEWMA 2009 Interim Meetings, there were no comments heard. They recommend that this proposal remain a Developing item.

If you would like to participate in this Subcommittee, contact Mr. Ron Hayes, Chairperson Fuels and Lubricants Subcommittee, at (573) 751-2922, e-mail: ron.hayes@mda.mo.gov, or Mr. David Sefcik at (301) 975-4868, e-mail: david.sefcik@nist.gov

270-3 Pelletized Ice Cream

Source: NIST Weights and Measures Division, International Dairy Foods Association (IDFA), Food and Drug Administration (FDA)

Purpose: Pelletized ice cream is manufactured using very low temperatures and a liquid nitrogen process in order to form the unique beads. FDA declared that pelletized ice cream is a semi-solid food, in accordance with 21 CFR 101.105(a), the appropriate net quantity of content declaration for this type of product is net weight. An FDA official attending the 2009 NCWM Annual Meeting stated that manufacturers have until April 2010 to modify their labels with a net weight declaration. The purpose of this proposal is to amend the current method of sale requirements, which require ice cream to be sold by volume to reflect that FDA now requires pelletized ice cream to be sold by weight.

Item Under Consideration: Insert the following language into HB 130, Method of Sale Regulation

1.7.2. Pelletized Ice Cream - A semi-solid food product manufactured at very low temperatures using a nitrogen process and consisting of small beads of varying sizes. Bits of inclusions (cookies, candy, etc.) that also vary in size and weight may also be mixed with the pellets.

1.7.2.1. Method of Retail Sale - Packaged pelletized ice cream shall be kept, offered, or exposed for sale on the basis of net weight.

(Note: This method of sale shall be enforceable after April 17, 2010)

Background/Discussion: At the 2008 NCWM Annual Meeting open hearings, Ms. Cary Frye, Vice President, Regulatory & Scientific Affairs from the International Ice Cream Association (IICA), gave a briefing on behalf of industry on pelletized ice cream. Ms. Frye gave a briefing on the product, standard of identity, test method procedures, and several other key points. Ms. Frye informed the conference that additional assistance would be required from the FDA (refer to the Table B, Appendix D in the 93rd NCWM Conference Report). Once FDA has addressed the issues and concerns, NIST will host a second meeting at NIST in Gaithersburg, Maryland, to follow up and seek resolution on the outstanding concerns. NIST will send out a meeting announcement to all state Directors and all other interested parties via the NIST Weights and Measures list server.

The WMD submitted to the NCWM L&R Committee detailed minutes pertaining to the June 27, 2008, meeting held at NIST, concerning issues with the pelletized ice cream product. The minutes (refer to Table B Appendix E refer to Item 237-2 in the report of the 94th Interim Meeting in 2009) provide great detail of the current issue, background information, representatives and manufacturers, method of sale, and test method procedure.

This item has been presented at the 2008 WWMA and SWMA Annual Meetings and at the NEWMA and CWMA Interim Meetings. NEWMA discussed this issue, including the FDA's role and their impact on the NCWM process. One member stated that the FDA may be slow to reach a decision because of an impending change in leadership. Another member expressed the difficulty (practical experience) of testing this product. All regions are in agreement that this item should remain Developmental until further information is received from FDA.

At the 2009 NCWM Interim Meeting, it was reported by a NIST technical advisor that FDA was actively working on this item.

At the 2009 NCWM Annual Meeting in San Antonio, Texas, the NIST Technical Advisor presented a letter dated April 17, 2009, (see L&R Appendix D) from the FDA regarding their decision on the method of sale for pelletized ice cream. The FDA declared that pelletized ice cream is a semi-solid food, in accordance with 21 CFR 101.105(a), and the appropriate net quantity of content declaration for this type of product is net weight. An FDA official attending the NCWM Annual Meeting stated that manufacturers have until April 2010 to modify their labels with a net weight declaration. Manufacturers that are unable to meet this deadline will need to contact the FDA. The FDA will look at each extension request on a case-by-case basis. FDA replied to the International Dairy Food Association (IDFA)/International Ice Cream Association (IICA) in a letter dated October 22, 2009, denying their request to change the label compliance date to January 2, 2012 (see L&R Appendix E). The FDA will continue to review any request for an extension on a case-by-case basis.

At the CWMA 2009 Interim, WWMA 2009 Annual, SWMA 2009 Annual, and the NEWMA 2009 Interim Meetings, there were no comments heard, and all regions recommend to the NCWM L&R Committee that the proposed item move forward as a Voting item.

270-4 Method of Sale and Engine Fuel Quality Requirements for Hydrogen

Source: Western Weights and Measures Association (WWMA)

Purpose: Adopt a method of sale and engine fuel quality requirements for hydrogen in HB 130 to address gaseous hydrogen refueling applications. There is a corresponding proposal in Section 360 Other Items of the January 2010 NCWM Interim S&T Agenda to add a Draft Hydrogen Gas Measuring Devices Code to HB 44 to address requirements for hydrogen gas refueling equipment

Item Under Consideration: The U.S. National Work Group (USNWG) Fuel Specifications Subcommittee (FSS) presented the following recommendation for consideration.

Section 2. Non-food Products [*Note 1*, page 103]

2.XX. Retail Sales – Hydrogen Fuel (H).

Note: The symbol for hydrogen vehicle fuel shall be the capital letter "H" (the word Hydrogen may also be used).

2.XX.1. Definitions – Hydrogen Fuel (H).

2.XX.1.1. Hydrogen Fuel. – A fuel composed of the chemical hydrogen intended for consumption in an internal combustion engine or fuel cell.

2.XX.2. Method of Retail Sale and Dispenser Labeling. – All hydrogen fuel kept, offered, or exposed for sale and sold at retail shall be in terms of the kilogram.

2.XX.3. Retail Dispenser Labeling.

2.XX.3.1. A computing dispenser must display the unit price in whole cents on the basis of price per kilogram.

2.XX.3.2. The service pressure(s) of the dispenser must be conspicuously shown on the user interface in bar or the SI Unit of Pascal (Pa) (e.g., MPa).

2.XX.3.3. The product identity must be shown in a conspicuous location on the dispenser.

2.XX.3.4. National Fire Protection Association (NFPA) labeling requirements also apply.

2.XX.3.5. Hydrogen shall be labeled in accordance with 16 CFR 309 – FTC Labeling Alternative Fuels.

2.XX.4. Street Sign Prices and Advertisements.

2.XX.4.1. The unit price must be in terms of price per kilogram in whole cents (e.g., $3.49 per kg, not $3.499 per kg).

2.XX.4.2. The sign or advertisement must include the service pressure(s) at which the dispenser(s) delivers hydrogen fuel (e.g., H35 or $H70_{MPa}$).

FSS supports the proposed new definitions to address gaseous hydrogen refueling applications.

1. Specification for Hydrogen Fuel for Internal Combustion Engines and Fuel Cells

2. Definitions

1.XX. Fuel Cell. – an electrochemical device used to convert hydrogen and oxygen into electrical energy to power a motor vehicle.

1.XX. Hydrogen Fuel. – a fuel composed of the chemical hydrogen intended for consumption in an internal combustion engine or fuel cell.

1.XX. Internal Combustion Engine. – a device used to ignite hydrogen in a confined space to create mechanical energy to power a motor vehicle.

Specification for Hydrogen Fuel:
The FSS identified several quality criteria where there was tentative agreement with their associated values (see properties 6, 7, 8, 9, 12, 14, and 16 which are highlighted in green) in the proposed Table 1. Hydrogen Fuel Quality Specification. When a quality property and numerical value (defining a maximum or minimum limit) is added to the specification, appropriate test methods must then be identified. As test methods are identified and adopted by the FSS, they will be added to column 6 in Table 1. The FSS did not agree on all of the properties contained in the DMS proposal because there was either not enough research data or test methods available to support a decision (see properties 1, 2, 3, 4, 5, 10, 11, 13, and 15 which are highlighted in yellow) in Table 1 below. These and perhaps other properties will receive further consideration by the FSS and may be added to the quality standard in the future when such action is supported by research.

Table 1. Hydrogen Fuel Quality Specification*

Property		Value	Unit	Limit	Test Method(s)
1	Ammonia	0.1	ppm v/v	Maximum	to be specified
2	Carbon Dioxide	2.0	ppm v/v	Maximum	to be specified
3	Carbon Monoxide	0.2	ppm v/v	Maximum	to be specified
4	Formaldehyde	0.01	ppm v/v	Maximum	to be specified
5	Formic Acid	0.2	ppm v/v	Maximum	to be specified
6	Helium	300.0	ppm v/v	Maximum	to be specified
7	Hydrogen Fuel Index	99.97	% (a)	Minimum	to be specified
8	Nitrogen and Argon	100.0	ppm v/v	Maximum	to be specified
9	Oxygen	5.0	ppm v/v	Maximum	to be specified
10	Particulate Concentration	1.0	µg/L@NTP (b)	Maximum	to be specified
11	Particulates Size	10.0	µm	Maximum	to be specified
12	Total Gases	300.0	ppm v/v (c)	Maximum	to be specified
13	Total Halogenated Compounds	0.05	ppm v/v	Maximum	to be specified
14	Total Hydrocarbons	2.0	ppm v/v (d)	Maximum	to be specified
15	Total Sulfur Compounds	0.004	ppm v/v	Maximum	to be specified
16	Water	5.0	ppm v/v	Maximum	to be specified

Footnotes to Table 1:

a. Hydrogen fuel index is the value obtained with the value of total gases (%) subtracted from 100 %.
b. Particulate Concentration is stated as µg/L@NTP = micrograms per liter of hydrogen fuel at 0 °C and at one atmosphere pressure (1 bar).
c. Total Gases = Sum of all impurities listed on the table except particulates.
d. Total Hydrocarbons may exceed 2 ppm v/v only due to the presence of methane, provided that the total gases do not exceed 300 ppm v/v.

*The FTC's Fuel Rating Rule (16 CFR Part 309) see the requirements in "Labeling of Alternative Fuels" at www.ftc.gov/bcp/edu/pubs/business/autos/bus29.shtm requires dispensers to bear a declaration of minimum percent of hydrogen determined according to test methods described in "Standard Test Method for Analysis of Natural Gas by Gas Chromatography" (ASTM D1946).

Background/Discussion: Twenty-four states have hydrogen refueling dispensers in operation. Hydrogen stations using permanent and mobile refueling systems for automobiles, fleet vehicles (buses), forklifts, and airport totes are increasing and may go unnoticed. Many stakeholders who are not familiar with the weights and measures standards process will need to participate at this stage rather than after this is a commercial application. This effort by the USNWG for the Development of Commercial Hydrogen Measurement Standards is to ensure there are appropriate standards and test procedures in place in time for dispenser manufacturers, service agencies, and officials to educate the general public, not if, but for when retail hydrogen applications become commercially available.

Existing codes do not fully address hydrogen refueling applications because of hydrogen's properties and other technical differences in the setup and operations of dispensing systems. The development of legal metrology standards for newly emerging hydrogen technology is a necessary component of the hydrogen infrastructure. The weights and measures community must have time to consider requirements for hydrogen-refueling systems before this application is available for public access at corner service stations.

The USNWG is bringing the proposal before the weights and measures community to share this information about upcoming standards for an emerging technology. The simultaneous development of the code and corresponding test procedures will allow for input from the weights and measures and hydrogen communities, appropriate trials of the standards, and to address all areas of concerns early in the standards development process.

This item was reviewed at the WWMA and SWMA 2008 Annual Meeting and at the NEWMA 2008 Interim Meeting. NEWMA members generally discussed the "hydrogen issue" and its usage in the marketplace. It is anticipated that hydrogen at first will be relegated to "fleet vehicles" (such as compressed natural gas [CNG]), and that retail sales will be slow in coming to the marketplace. NEWMA recommends that this item remain a Developing item.

At the 2009 Interim and Annual Meetings, the NIST Technical Advisor briefed the Committee on work that the USNWG FSS has done to date (refer to the report of the 94th Annual NCWM Conference, Appendix J for Hydrogen USNWG FSS background information)

There were no comments heard on this proposal at the CWMA 2009 Interim Meeting.

At the WWMA 2009 Annual Meeting, industry representatives acknowledged that some details of the specifications for fuel standards are in development. The WWMA Committee believes it is best to be proactive on this item so that Hydrogen stations can be ready to make retail sales.

At the SWMA 2009 Annual Meeting, the SWMA L&R Committee heard a recommendation from a state that as the test methods are developed they get publish. They also requested that documentation be produced on the affects of hydrogen if they exceed certain property values listed in the table "Hydrogen Fuel Quality Specification," and why this is important in the testing of hydrogen.

NEWMA reviewed this proposal at their 2009 Interim Meeting and recommends leaving this as a Developing item.

Additional information on this hydrogen proposal and the corresponding hydrogen gas measuring devices code can be found at ts.nist.gov/WeightsAndMeasures/Developing-Commercial-Hydrogen-Measurement-Standards.cfm. For additional information on this item, contact Ms. Lisa Warfield at lisa.warfield@nist.gov or (301) 975-3308.

270-5 Seed Count for Agricultural Seeds

Source: Central Weights and Measures Association

Purpose: To adopt a test procedure for inspection of bulk agricultural seed (specifically corn seed, soybean seed, field bean seed, and wheat seed) labeled by "count," taking account of this prevalent method of sale and the value to the seed industry and farmers arising from an accurate, practical, efficient, and uniform method.

There is a current standard adopted by the Association of Official Seed Analyst (AOSA) which is broadly accepted by industry. Several states adopt both the AOSA standard and the HB133 regulation, which causes confusion due to conflicting Maximum Allowable Variations (MAV). The MAVs in HB 133 are not considered appropriate for seed counts in which counts can be as high as a 200,000.

Item under Consideration: Amend HB 133 by adding a new Section 4.11. Rules for Testing Seeds and amending Tables 1-1. and 2-10. to provide for a uniform, practical, and accurate method for conducting inspections of specified agricultural seed varieties when labeled and/or sold by "count." There is consensus among the seed industry, state seed control officials, and academics in support of the AOSA standard for seed counting. This standard should be adopted as part of HB133 to ensure that seed is sold with an accurate count.

American Seed Trade Association (ASTA) requests (see Appendix G, ASTA Seed Count Rule for Agriculture Seeds) that HB 133, Section 4.2. Packages Labeled by Count be amended by adding the language from AOSA "Rules for Testing Seeds," Section 12 (Mechanical Seed Count) (see below with incorporated changes) as Section 4.11. of Handbook 133, to be titled "Procedure for Checking the Content of Certain Agricultural Seed Packages Labeled by Count" (see Appendix H, AOSA, Section 12: Mechanical Seed Count).

HB 133 Section 4.2. amended to read:

4.2. Packages Labeled by Count

How are packages labeled by count tested?

If the labeled count is more than 50 items **with the exception of corn, soybeans, field beans, and wheat seeds, see** Section C 4.4. "Packages Labeled by Count of More than 50 Items." **If the labeled count is more than 50 items for corn, soybeans, field beans, and wheat seeds, see Section 4.11 "Procedure for Checking the Contents of Specific Agricultural Seed Packages Labeled by Count."**

Amend title of Table 2-10. (HB133, Appendix B) to read:

Table 2-10. Exceptions to the Maximum Allowable Variations for Textiles, Polyethylene Sheeting and Film, Mulch and Soil Labeled by Volume, Packaged Firewood and Packages Labeled by Count with Fewer than 50 Items**, and Specific Agricultural Seeds Labeled by Count**.

Amend Table 2-10. to include an additional row as shown below:

Specific Agricultural Seeds Labeled By Count	**The MAVs are:** **For corn seed: 2 % of the labeled count** **For soybean seed: 4 % of the labeled count** **For field bean seed: 5 % of the labeled count** **For wheat seed: 3 % of the labeled count**

Amend HB 133, Appendix A, Table 1-1. to adjust for the new name of Table 2-10. ("Table 2-10. Exceptions to the Maximum Allowable Variations for Textiles, Polyethylene Sheeting and Film, Mulch and Soil Labeled by Volume, Packaged Firewood, and Packages Labeled by Count with Fewer than 50 Items**, and Specific Agricultural Seeds Labeled by Count").**

AOSA Section 12.6. Rules for Testing Seeds - modified for consideration as a new Section 4.11 to HB 133.

12.6. ~~Tolerances~~ **Maximum Allowable Variations** ~~for results from different laboratories.~~
Multiply the labeled seed count ~~**or first seed count test result**~~ by 4 % for soybean samples, 2 % for corn (round, flat or plateless) samples, 5 % for field bean samples and 3 %for wheat samples. Express the ~~tolerance~~ **maximum allowable variation** (the number of seeds) to the nearest whole number. Consider the results of two tests in ~~tolerance~~ **accord with the maximum allowable variation** if the difference, expressed as the number of seeds, is equal to or less than the ~~tolerance~~ **maximum allowable variation**.

Example:
Kind of seed: Corn
Label claim **~~(1st test)~~:** 2275 seeds/lb.

Lab Test **~~(2nd test)~~**: Purity working weight = 500.3 g
Seed count of pure seed = 2479 seeds

Number of seeds per pound = $\frac{453.6 \text{ g/lb} \times 2479 \text{ seeds}}{500.3 \text{ g}}$ = 2247.6 seeds/lb

Rounded to the nearest whole number = 2248 seeds/lb

Calculate ~~tolerance~~ **maximum allowable variation** value for corn:
multiply label claim by 2 %
2275 seeds/lb × 0.02 = 45.5 seeds/lb;
rounded to the nearest whole number = 46 seeds/lb

Determine the difference between label claim and lab test:
2275 seeds/lb – 2248 seeds/lb = 27 seeds/lb

The difference between the lab test ~~(2nd test)~~ and the label claim ~~(1st test)~~ is less than the ~~tolerance~~ **maximum allowable variation** (27 < 46); therefore, the two results are in ~~tolerance~~ **accord with the maximum allowable variation.**

Background/Discussion: The CWMA held their 2009 Interim Meeting on September 13 - 16, 2009, in Rock Island, Illinois. A representative from ASTA explained a proposal regarding seed count for four types of seeds: corn, soybeans, field beans, and wheat. An item to amend the requirement for testing seeds by count was considered approximately ten years ago, but there was a lack of industry consensus at that time. In the interim, state, federal, university seed regulators, and seed laboratories developed a test method after significant scientific testing to provide acceptable MAV's.

There are modern agricultural methods of farming. Farmers are now requesting the number of seeds on packages in order to accommodate their precision planting methods. Since seed is a natural biological product, it can vary in size and weight. There is currently a standard adopted by the Association of Official Seed Analysts (AOSA) that is broadly accepted. Several states adopt both the AOSA standard and HB 133 regulations which is causing confusion because of the conflicting MAV allowances. The HB 133 regulation is not seed specific; therefore, it does not contemplate items being sold in quantities as high as 200,000 per bag. A letter of support was received from the Association of American Seed Control Officials (see Appendix I).

270-6 Handbook 130, Method of Sale Regulation Section 2.13.4. "Declaration of Weight"

Source: Western Weights and Measures Association

Purpose: Update HB 130, Section 2.13.4. to provide new density values for heavier density plastics that are currently in the marketplace.

Item under Consideration: Amend HB 130, Method of Sale Regulation, Section 2.13.4. as follows:

2.13.4. Declaration of Weight. – The labeled statement ….

~~**For the purpose of this regulation, the minimum density shall be 0.92 g/cm³ (when D is not known).**~~
~~**For the purpose of this regulation, the minimum density shall be 0.92 g/cm³.**~~

Amend Section 2.13.4. as follows:

For the purpose of this regulation, **when D is not known,** the minimum density **(D) used to calculate the target net weigh for linear low polyethylene products (LLDP) and products other than high density (HDPE)** shall be 0.92 g/cm³ ~~(when D is not known)~~. **For products labeled "High Density," HDPE, or similar wording, the minimum density (D) used to calculate the target net weight shall be 0.95 g/cm³.**

Background/Discussion: It was stated at the 2009 WWMA Annual Meeting in Los Cruces, New Mexico, that some manufacturers and distributors of polyethylene bags are using the calculated target weight identified in HB 130 Section 2.13.4. to understate the net quantity of their labels. The polyethylene industry recognizes a density value of 0.92 g/cm³ for LLDP. When 0.92 g/cm³ is used to calculate the target net weight of HDPE, the product may make the target net weight. However, when the appropriate density value of 0.95 g/cm³ is used to test HDPE, the product often fails to meet the calculated target net weight. Further testing reveals than one or more of the labeled width, thickness, or count statements are inaccurate. It appears that some manufacturers are aware that weights and measures officials are restricted to testing HDPE product using the 0.92 g/cm³ value because the actual density value is not stated on the product label. Existing procedural guidelines do not address high density polyethylene materials. When testing at manufacturing locations, weights and measures officials are able to obtain information regarding the density of the product directly from the manufacturer. However, at distributor locations density information is not available and officials must test using the 0.92 g/cm³ value designated in Handbooks 130 and 133 to verify the weight of the product. When the product has no net weight statement on the package, 0.92 g/cm³ is the only factor that the inspector may use to calculate the target net weight.

The 2009 WWMA Association supports this item and recommends that it be a Voting item.

NEWMA reviewed this item at its 2009 Interim Meeting and recommends that this proposal be a Developing item.

270-7 Handbook 133, Chapter 4.7. Polyethylene Sheeting-Test Procedure - Footnote Step 3.

Source: Western Weights and Measures Association

Purpose: Update Handbook 133, Chapter 4.7 Polyethylene Sheeting – Test Procedure to provide new density values for heavier density plastics that are currently in the marketplace.

Polyethylene bags labeled as "High Density," or HDPE, have been found to package products whose labeled net weights meet calculated target net weights when employing a density factor of 0.92 g/cm³. When a density factor of 0.95 g/cm³ is used, as appropriate, in the calculation for high density polyethylene materials, these products commonly fail to meet the calculated target net weight. Further testing of these packages of polyethylene bags reveals that one or more of the labeled width, thickness, or count statements are inaccurate. HDPE product distributors that place a net weight statement on their packages based upon the Linear Low Density Polyethylene (LLDP) density value (0.92 g/cm³ have an approximately 3 % advantage over the distributor that uses the correct, high density, factor.

Item Under Consideration: Amend the asterisked footnote below Step 3 as follows:

*****Determined by ASTM Standard D 1505-98 **<u>(or latest issue)</u>** "Standard Method of Test for Density of Plastics by the Density Gradient Technique." For the purpose of this handbook, **<u>when the actual density is not known,</u>** the minimum density **<u>used to calculate the target net weight</u>** shall be 0.92 g/cm³ **~~when the actual density is not known~~.** **<u>For products labeled "High Density, HDPE, or similar wording, the minimum density (d) used to calculate the target net weight shall be 0.95 g/cm³.</u>**

Background/Discussion: A proposal was presented at the WWMA 2009 Annual Meeting in Los Cruces, New Mexico, that manufacturers and distributors of polyethylene bags labeled as "High Density," or HDPE, have been found to package products whose labeled net weights meet calculated target net weights when employing a density factor of 0.92 g/cm³. When a density factor of 0.95 g/cm³ is used, as appropriate, in the calculation for high density polyethylene materials, these products commonly fail to meet the calculated target net weight. Further testing of these packages of polyethylene bags reveals that one or more of the labeled width, thickness, or count statements are inaccurate.

For example, a box of HDPE has stated dimensions of 24 in x 40 in x .4 mil, and a count of 250. Using the only density factor found in HB 133, 0.92 g/cm³ the calculated target net weight, and that shown on the label, would be 6.38 lbs. If using the actual density factor for the HDPE bags of 0.95 g/cm³, the target net weight would be 6.59 lb. This means that HDPE product distributors that place a net weight statement on their packages based upon the Linear Low Density Polyethylene (LLDP) density value (0.92 g/cm³ have an approximately 3 % advantage over the distributor that uses the correct, high density, factor.

When the original testing procedure was developed, HDPE bags had not yet entered the marketplace. Currently, this product is quite prevalent in the United States. Amending the test procedure will aid weights and measures inspectors in enforcing labeling requirements that allow true value comparisons and close a loophole within HB 133.

The 2009 WWMA Association supports this item and recommends that it be a Voting item.

NEWMA reviewed this item at their 2009 Interim meeting and proposes this item be a Developing item.

270-8 Handbook 133, Chapter 4.7. Polyethylene Sheeting Test Procedure – T-shirt/cut-out bags

Source: Western Weights and Measures Association (WWMA)

Purpose: To offer guidelines on how to determine the net weights of the high density polyethylene "t-shirt" bags.

Item Under Consideration: Amend Chapter 4.7. Polyethylene Sheeting – Test Procedure as follows:

When testing "t-shirt" or other bags with cut-outs for handles use the following guideline to determine the target net weight amount of product cut-out of the original bag and removed from the container prior to packaging:

Calculate the target net weight in pounds of the bags as if there were no cut-out area:

T x A x D x 0.03613 x Ct. x 2 = Z

Calculate target net weight in pounds of the cut out area of bags (A) by multiplying TNW x the Handle Cutout % as found in Table 4.7.(a).

To determine the target net weight (X) of the package of t-shirt bags, subtract TNW-A.

TNW = Calculated Target Net Weight
A = Calculated Target Net Weight of of cut-out area
X = Target net weight of "T-shirt" bags

Example: A package of t-shirt bags is labeled 12 in x 7 in x 22 in, 0.3 mil, 2000 count,

0.0003 x [(12+7) x 22 x 2] x 0.95 x 0.03613 x 2000 = 17.216,

17.216 lbs x 0.107 (from Table 4.7(a) = 1.84 lbs,

17.216 lbs – 1.84 lbs = 15.37 lbs, the target net weight for the t-shirt bag container.

Table 4.7.(a)		
LENGTH (in)	TOTAL WIDTH FACE WIDTH + GUSSET WIDTH (in)	HANDLE CUT-OUT Percent (%)
14.0 to 16.5	12.0 to 16.5	16.27 %
16.6 to 18.5	12.0 to 16.5	15.60 %
17.0 to 18.5	16.6 to 19.75	13.10 %
18.6 to 19.5	16.6 to 19.75	12.40 %
19.6 to 20.5	16.6 to 19.75	12.65 %
20.6 to 22.0	16.6 to 19.75	10.70 %
22.1 to 23.5	16.6 to 19.0	9.63 %
22.0 to 24.0	19.76 to 22.0	10.40 %
24.1 to 25.5	19.76 to 22.0	8.35 %
28.0 to 32.0	22.0 to 24.0	7.10 %
32.1 to 36.0	22.0 to 24.0	6.04 %
28.0 to 32.0	24.1 to 26.0	6.20 %
32.1 to 36.0	24.1 to 25.0	5.14 %

Background/Discussion: At the 2009 WWMA Annual Meeting held in Los Cruces, New Mexico, this proposal was submitted. Over the past several years, there has been a rapid expansion of the production and distribution of high density polyethylene "t-shirt" (grocery) bags. The current directions for calculating the target net weight of packages containing these bags offer no guidelines on how to determine net weight. Calculating the net weight of the cut-out area has been a challenge. It has been difficult to ensure that the weight statements on the packages are accurate. Spectrum Plastics Inc. located in Los Angeles County, California, developed, with the assistance of an engineering firm, a table (above) to provide guidelines to calculate the amount of cut-out area.

The 2009 WWMA L&R Committee did not feel that sufficient background data was submitted from various sources. There are a large number of distributers of domestic and imported products with these types of bags. The HDPE shopping bags are a significant portion of the market. However, once additional data is received and validated, a proposed method of testing of the target net weights could save field testing time. They recommend this proposal be Developing.

NEWMA reviewed this proposal at its 2009 Interim Meeting and recommends it be a Developing item.

270-9 HB 130 - Uniform Regulation for Method of Sale of Commodities - Packaged Printer Ink and Toner Cartridges

Source: Southern Weights and Measures Association (SWMA)

Purpose: This proposal is to clarify the requirements for industry, consumers and weights and measures officials.

Item Under Consideration:

2.XX. Printer Ink and Toner Cartridges.

2.XX.1 Definitions.

2.XX.1.1. Printer ink cartridges – Any cartridge or module that contains ink or a similar substance in liquid form employed in the printing of documents, papers, pictures, etc., that is used in a printing device and designed to be replaced when no longer able to supply its contents in printing.

2.XX.1.2. Toner cartridges – Any cartridge or module that contains toner, powder, or similar non-liquid substance employed in the copying or printing of documents, papers, pictures, etc.

that is used in a copying device and designed to be replaced when no longer able to supply its contents in printing and/or copying.

2.XX.2. Method of Sale and Labeling.

2.XX.2.1. Method of sale, printer ink cartridges. – All printer ink cartridges kept, offered, or exposed for sale or sold shall be sold in terms of the count of such cartridges and the fluid volume of ink in each cartridge stated in terms of milliliters or fluid ounces.

2.XX.2.2. Method of Sale, toner cartridges. – All toner cartridges kept, offered, or exposed for sale or sold shall be sold in terms of the count of such cartridges and the net weight of toner substance

(Added 20XX)

Background/Discussion: Over the past several years, there has been a change in the marketplace on inkjet and toner cartridges net content statements. Currently, there is little uniformity in the marketplace on this item, and the Committee is seeing some labels with a net content or with only a page yield count (e.g., prints 1000 pages). The WMD follows guidelines printed in HB 130 from the Weights and Measures Law, Section 19 "information required on packages" that these products are required to have the net contents of the ink (and toner) labeled, but manufacturers have resisted, claiming an exemption under the Fair Packaging and Labeling Act. The purpose of this proposal is to specifically clarify the requirements for industry, consumers, and weights and measures officials.

At the 2009 SWMA Annual Meeting in Clearwater, Florida, a Lexmark representative commented that they do not believe that a net content statement should be required, and that a page yield is sufficient. He read the main points of a letter from Lexmark to Max Gray, dated March 17, 2009. The main points within the letter were: 1) the ink associated with a cartridge is a small fraction of the total cost of the print cartridge mechanism; 2) a page yield can provide a meaningful comparison to a consumer if all manufacturers employ the same estimating assumptions and techniques; and 3) International Organization for Standardization (ISO) studied this issue for years and has rejected reliance on ink volume or quantity, instead ISO has developed a yield estimating and claiming methodology that permits cartridges to be compared using a consistent yardstick. Unlike ink volume measurements, page yield measurements provide a consumer with a reliable way to compare the amount of printing that can be expected. Lexmark also stated that ink is expressly exempt from labeling as provided by the Fair Packaging and Labeling Act (FPLA) 16 CFR 503.2(a).

An industry representative feels this issue does need to be discussed and reviewed further. However, many officials believe that ink jet cartridges are expensive and consumers should know what they are getting. If it is determined that page count would be the identity, then the page print standard should be reviewed and have tighter standards.

Mr. Max Gray feels that more data is needed from manufacturers on this issue.

The SWMA L&R Committee recommends the item for consideration for Developing by the NCWM L&R Committee.

270-10 HB 130 Engine Fuels and Automotive Lubricants Regulation, Section 3.15 Biodiesel and Biodiesel Blends

Source: Southern Weights and Measures Association (SWMA)

Purpose: Amend Section 3.15. Biodiesel and Biodiesel Blends of the Engine Fuels and Automotive Lubricants Regulation to remove the exemption for declaration of biodiesel content on product transfer documents for biodiesel blends up to 5 %.

Item Under Consideration: Amend Section 3.15. Biodiesel and Biodiesel Blends of the Engine Fuels and Automotive Lubricants Regulation.

3.15. Biodiesel and Biodiesel Blends

3.15.1. Identification of Product. – Biodiesel shall be identified by the term "biodiesel" with the designation "B100." Biodiesel blends shall be identified by the term "Biodiesel Blend."

3.15.2. Labeling of Retail Dispensers.

3.15.2.1. Labeling of Grade Required. – Biodiesel shall be identified by the grades S15 or S500. ~~B~~**b**iodiesel ~~B~~**b**lends shall be identified by the grades No. 1-D, No. 2-D, or No. 4-D.

3.15.2.2. EPA Labeling Requirements Also Apply. – Retailers and wholesale purchaser-consumers of biodiesel blends shall comply with EPA pump labeling requirements for sulfur under 40 CFR § 80.570.

3.15.2.3. Automotive Fuel Rating. – Biodiesel and biodiesel blends shall be labeled with its automotive fuel rating in accordance with 16 CFR Part 306.

3.15.2.4. Biodiesel Blends. – When biodiesel blends greater than 20 % by volume are offered by sale, each side of the dispenser where fuel can be delivered shall have a label conspicuously placed that states "Consult Vehicle Manufacturer Fuel Recommendations."

The lettering of this legend shall not be less that 6 mm (¼ in) in height by 0.8 mm (1/32 in) stroke; block style letters and the color shall be in definite contrast to the background color to which it is applied.

3.15.3. Documentation for Dispenser Labeling Purposes. – The retailer shall be provided, at the time of delivery of the fuel, a declaration of the volume percent biodiesel on an invoice, bill of lading, shipping paper, or other document. ~~**This documentation is for dispenser labeling purposes only; it is the responsibility of any potential blender to determine the amount of biodiesel in the diesel fuel prior to blending.**~~

3.15.4. Exemption. – Biodiesel blends that contain less than or equal to 5 % biodiesel by volume are exempted from the requirements of Sections 3.15.1.~~,~~ **and** 3.15.2.~~, and 3.15.3.~~ when it is sold as "diesel fuel" as required in Section 3.3.

(Added 2005) (Amended 2008 **and 20XX**)

Background/Discussion: At the 2009 SWMA Annual Meeting held in Clearwater, Florida, a discussion over blending was presented by a FALS member. Biodiesel is being blended at many terminals across the country in concentrations up to 5 %. Marketers downstream of the terminal are then attempting to blend additional biodiesel to target levels, and finding that their product is being over-blended because they were not aware that the fuel contained any biodiesel. Per Randy Jennings, Tennessee, at least one major truck stop operator has already voiced concerns to the FALS Chairman. This amended proposal will remove the exemption declaration of biodiesel content on product transfer documents for biodiesel blends up to 5 %. Biodiesel is blended at terminals in concentrations up to 5 %. Randy Jennings felt it was important to start this recommendation and have the FALS Chairperson vet the proposal out to all members of the FALS Committee for their comments before the NCWM Interim meeting in January 2010.

The SWMA Committee recommends moving this item forward to the NCWM L&R Committee Agenda as a Voting item.

270-11 Handbook 133, Method of Measurement of the Volume of Bagged Mulch

Source: Southern Weights and Measures Association (SWMA)

Purpose: Update HB 133 for the volume measurement of bag mulch, and update moisture allowance, decomposition and specification changes for testing bag mulch.

Item Under Consideration: Amend HB 133

Chapter 2, Section 2.3. Basic Test Procedure, "Moisture Allowances":

The purchase date of the bagged mulch product needs to be known, so that an adjustment to the bagged mulch may to be made to reflect decomposition since the purchase date.

Chapter 3, 3.11. Mulch and Soils Labeled by Volume - Add a bulleted item:

The decomposition of wood mulch occurs over a period of time. The purchase date of the product needs to be known, so that an adjustment to the product may be made to reflect decomposition since the purchase date.

Chapter 3, 3.11. Revise Table 3-4 "Specifications for Test Measures for Mulch and Soils" **56.6 L (2 ft^3) bag measure for bag mulch 30.48 cm (12 in) X 30.48 cm (12 in) X 60.96 cm (24 in)**

Background/Discussion: Mr. Tomlinson from Amerigrow was unable to attend the SWMA 2009 Annual Meeting in Clearwater, Florida. Mr. Max Gray briefed the SWMA conference on this proposal (refer to appendix L, Amerigrow Mulch Proposal) for bag mulch. Bag mulch is a type of product that suffers from decomposition and desiccation and turns to dirt as it ages. However, no lot number, expiration date, or date of pack is being placed onto bags to determine its age.

Amerigrow recommends adding languages within HB 133 stating that the purchase date of the product needs to be proven so that reasonable adjustments can be made to reflect the decomposition since the "purchase date." Amerigrow also stated that that mulch bags are easy to tamper (open and reseal) and that a chain of custody needs to be implemented, beginning with the purchase date. A chain of custody will also assist with determining the age of the mulch and the conditions in which it was stored.

Another issue with bag mulch is it is available with different grinds that can produce different fill rates when measured in the measuring box specified in HB 133 Table 3-4. Finer mulch does not benefit from rolling the bags and fluffing the mulch. Amerigrow has provided the SWMA with new specifications for the measuring box (**56.6 L (2 ft^3) bag measure for bag mulch 30.48 cm (12 in) X 30.48 cm (12 in) X 60.96 cm (24 in).)**

The 2009 SWMA L&R Committee recommended moving this item forward as a Developing item to the NCWM L&R Committee. The Committee would like industry to be notified on this proposal and seeks additional information and comments.

270-12 Handbook 130, Method of Sale, Section 2.23. Animal Bedding

Source: Southern Weights and Measures Association (SWMA)

Purpose: To amend NIST HB 130, Method of Sale, Section 2.23. and the Interpretations and Guidelines Section 2.3.16. to accommodate the special needs and provisions of granular, pelleted, and other non-compressible dry laboratory animal bedding materials sold to commercial end-users in the specialized lab animal research industry on a weight or per pound basis.

Item Under Consideration: Amend HB 130, Method of Sale, Section 2.23, Section 2.23. Paragraph 1, Sentence 1 as follows:

2.23. Animal Bedding. – Packaged animal bedding of all kinds, except for baled straw, shall be sold by volume, that is, by the cubic meter, liter, or milliliter and by the cubic yard, cubic foot or cubic inch. If the commodity is packaged in a compressed state, the quantity declaration shall include both the quantity in the compressed state and the usable quantity that can be recovered.

Example: 250 mL expands to 500 mL (500 in^3 expands to 1000 in^3).

(Added 1990)

2.23.1. Packaged animal bedding consisting of granular corncobs and other dry (less than 8 % moisture or less), pelleted and/or non-compressible bedding materials that are sold to commercial (non-retail) end users in the laboratory animal research industry (government agencies, medical centers and universities, pharmaceutical and pre-clinical contract research organizations and other biotech and related research institutions) can still be sold on the basis of weight.

(Added 20XX)

HB 130, Interpretations and Guidelines: Remove this section.

~~**2.3.16. Animal Bedding**~~

~~**(L&R, 1988, p. 159)**~~

~~**Recommended Method of Sale**~~

~~**Animal bedding of all kinds, except for baled straw, should be sold by volume, that is, by the cubic meter, cubic yard, cubic foot or cubic inch.**~~

~~**The test method in Handbook 133, Section 4.11. Peat Moss, can be used for animal bedding. The test official should "fluff up" or in some way reduce the amount of compaction of product that may occur under ordinary packaging and distribution processes prior to testing.**~~

Background/Discussion: At the 2009 SWMA Annual Meeting in Clearwater, Florida, Terry Burns-Heffner from Harlan Laboratories gave a briefing on "Bedding Packaging for Research Applications."

The speaker recommended that HB 130 be modified primarily to better control and regulate retail materials, such as mulch, peat moss, and top soil that were being sold by weight, but could easily be "spiked" with moisture. During the revision of this guideline, animal bedding materials were also rolled into this category.

For dry, non-compressible bedding substrates, such as granular corn cobs and pelleted paper, wood, and corn cobs that are sold to commercial end users in the laboratory animal research industry, this generalized classification and change from selling by weight to selling by volume is inappropriate for numerous reasons:

1. Requiring the sale of dry, granular or non-compressible pelleted bedding materials on the basis of volume provides an incentive for the manufacturer to produce lighter, less dense bedding, and therefore that bedding has less absorptive capacity. Therefore, selling bedding by volume is not in the consumers' best interest, because it is the amount of absorbent material in a cage that is most important, not the volume.

2. Historically, consumers in this non-retail industry segment, including government and regulatory agencies, such as the NIH, the DOD, and pharmaceutical and university research sites, have purchased bedding material on the basis of weight.

3. There are existing governing bid specifications on all lab animal bedding material that tightly controls the nature and consistency of the bedding materials sold for this specific purpose. These specifications include restrictions on maximum moisture concentration, which generally require all bedding materials to contain

less than 10 % moisture. Typical moisture range for these materials is in the 6 % to 8 % range. This has become the industry standard.

4. Verification of package contents is very easy to do if it is packaged by weight. Verification of proper package content becomes difficult when product is packaged by volume, and once again there is the opportunity/incentive for the manufacturer to reduce amounts bedding material put into packages over time. This verification is even more difficult on larger, bulk packages, such as the large bulk totes ranging in weight from 500 lb to 2000 lb.

270-13 National Pasta Association - Handbook 133, Moisture Allowance for Pasta Products

Source: Southern Weights and Measures Association (SWMA)

Purpose: Amend Handbook 133 by adopting a 3 % moisture allowance for macaroni, noodle, and like products (pasta products).

Item Under Consideration: Amend HB 133, Chapters 1 and 2, Moisture allowance to be amended as follows and which will incorporate a 3 % moisture allowance for pasta products, adding the language in bold below:

- Chapter 1: Why do we allow for moisture loss or gain?
  - This handbook provides "moisture allowances" for some meat and poultry products, flour, **pasta products,** and dry pet food.
  - Test procedures for flour, **pasta products,** some meat, and poultry are based on the concept of a "moisture allowance" also known as a "gray area" or "no decision" area.
- Chapter 2: Moisture Allowances:
  - What is the moisture allowance for flour, pasta products, and dry pet food? The moisture allowance for flour, pasta products, and dry pet food is 3 % of the labeled net weight.

  Note: Pasta products means all macaroni, noodle, and like products packaged in Kraft paper bags, paperboard cartons, and/or flexible plastic bags with a moisture content of 13 % or less at the time of pack.

- Chapter 2: How is the average error for the moisture allowance corrected?
  - This handbook provides " moisture allowances" for some meat and poultry products, flour, pasta products, and dry pet food.

Background/Discussion: Studies indicate that moisture loss for pasta products is reasonably predictable over time (see Appendix M, National Pasta Association Proposal to Establish a Moisture Allowance for Pasta Products). Pasta exhibits consistent moisture loss in all environments and packaging, which can vary more than 4 % due to environmental and geographic conditions. Although it eventually reaches equilibrium with the surrounding atmosphere because it is hygroscopic, this balance does not occur until long after packaging and shipping.

270-14 Handbook 130, Packaging and Labeling Requirements, Section 6, Declaration of Quantity: Consumer Products

Source: Northeastern Weights and Measures Association (NEWMA)

Purpose: To allow manufacturers to develop multi-lingual labels. This item would permit manufacturers to use approved symbols on consumer packages.

Item Under Consideration: Amend HB 130 Packaging and Labeling Regulations, Section 6: Declaration of Quantity: Consumer Packages, addition to 6.4.1. Combination Declaration:

Numerical Count

Numerical count can be expressed as either:

(a) **alpha-numeric characters (Figure A) or,**

(b) **alpha-numeric characters in conjunction with an approved symbol of the commodity from Section 6.7.1 (Figure B).**

3 Razors (Figure A.)	 (Figure B)

HB 130 Packaging and Labeling Regulations, Section 6: Declaration of Quantity: Consumer Packages amend Section 6.7.1., Symbols and Abbreviations (Figure C).

Disposable Razor
(figure C)

Background/Discussion: A representative of Procter and Gamble submitted a proposal at the 2009 NEWMA Interim Meeting. This proposal is to amend the language in HB 130 Packaging and Labeling Regulation, Section 6 that will facilitate value comparisons for a diverse set of U.S. consumers. It is proposed to amend the net content declaration of content for consumer products labeled by only by count to allow the use of approved symbols. This will limit the language of net content information, especially products with multi-language declarations, making the statement more noticeable to the eye. In addition, labels that are intended towards those consumers whose first language is not English will benefit from knowing the content visually versus by text. By ensuring the net content information is more noticeable; consumers will be more likely to make value comparisons.

Procter and Gamble cites 21CFR 201.15 (c)(2); this requirement formally applies to over the counter drug products but absent guidance for other categories of products subject to the Food Drug and Cosmetic Act (FD&C Act) and Food Packaging and Labeling Act (FPLA), this provides the best guidance principles for manufacturers to develop compliant multilingual labels. Net content translation and package size considerations can make a compliant statement difficult to understand.

Language extracted from 21 CFR 201.15:

> (c)(1) All words, statements, and other information required by or under authority of the act to appear on the label or labeling shall appear thereon in the English language: *Provided, however,* that in the case of articles distributed solely in the Commonwealth of Puerto Rico or in a Territory where the predominant language is one other than English, the predominant language may be substituted for English.
>
> (2) If the label contains any representation in a foreign language, all words, statements, and other information required by or under authority of the act to appear on the label shall appear thereon in the foreign language.

(3) If the labeling contains any representation in a foreign language, all words, statements, and other information required by or under authority of the act to appear on the label or labeling shall appear on the labeling in the foreign language.

At the 2009 NEWMA Interim Meeting, the L&R Committee recommended this proposal be a Developing item.

Joe Benavides, Texas, Chairman
Mr. Raymond Johnson, New Mexico
Ms. Jonelle Brent, Illinois
Mr. John Gaccione, Westchester County, New York
Mr. Terence McBride, Tennessee

Mr. Ron Hayes, Missouri, Chairman FALS

Mr. Doug Hutchinson, Canada, Technical Advisor
Mr. Rob L. Underwood, Associate Member Representative

Ms. Lisa Warfield, NIST Technical Advisor: e-mail: lisa.warfield@nist.gov
Ms. David Sefick, NIST Technical Advisor: e-mail: david.sefcik@nist.gov
Mr. Ken Butcher, NIST Technical Advisor: e-mail: kenneth.butcher@nist.gov

Laws and Regulations Committee

Appendix A

Table of Proposed Amendments and Editorial Changes to

Handbook 133, *Checking the Net Contents of Packaged Goods,* Fourth Edition

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Appendix A

Table of Proposed Amendments and Editorial Changes to Handbook 133, *Checking the Net Contents of Packaged Goods,* Fourth Edition

The following table lists the amendments and editorial changes that are under consideration by the membership of the NCWM. As appropriate, the text on the cited pages indicates the changes to the section or paragraph as indicated in bold ~~**strikeout**~~ for deletions and bold **underscore** for insertions.

Line item #	Section # & Page #	Title	Action	Comments
Chapter 1				
General Information				
1	1.1. B1	Scope	Replaced ~~**standards**~~ with **laws and regulations**	
2	1.1.a. B1	When and where to use checking procedures?	a. ~~Where and when~~ **When** and **where** to use **package** checking procedures?	
3	1.1.a.(3) B1	Retail	Amend sentence 2. It is easily acceptable, practical means for **weights and measures** ~~**State, county and city**~~ jurisdictions to monitor packaging procedures and to detect present or potential problems. Amend sentence 3 & 4. Generally, retail package testing is not conducive to checking large quantities of individual products of any single production lot **but that fact in and of itself should not preclude enforcement action on the retail store lot inspected. However, it does indicate that follow-up inspections at other retail locations, wholesale distributors and point of pack should be conducted to determine the underlining cause, if any, of the retail store findings.** Amend sentence 7. **If the weights and measures jurisdiction conducting the inspection does not have access to other retail locations, wholesalers or point of pack location(s) then the weights and measures authorities having jurisdiction in those locations should be contacted and asked to conduct an inspection at those locations to determine the cause of the findings.**	Changes rec'd from C. Carroll (11/09)

Line item #	Section # & Page #	Title	Action	Comments
			Sentence 9: Change first word from ~~Therefore~~ to **There** Amend sentence 13. Therefore, being able to determine the cause of an error in order to correct defects is more difficult when **quantity shortages are found at the retail level** ~~**retail testing is used**~~.	
Package Requirements				
4	1.2.(1) B3	Inspection Lot	Replaced ~~**this collection**~~ with **the lot** for clarification.	
5	1.2.(3) B3	Individual Package Requirement	Change the end of the last sentence. This handbook does not specify limits of overfilling **(with the exception of textiles)**, which is usually controlled by the packer **for economic, compliance and other reasons.**	This is to provide an example of at least one of the factors that packers consider in setting their filling targets. Other reasons can be aversion to risk or concern over the accuracy of nutritional information. Packers of industrial packages are especially concerned with overfilling because their packaged goods may be used in the production of other products where they are added to the process based on the package's labeled quantity.
6	1.2.(4) B3	Maximum Allowable Variation	The limit of **the** "reasonable **minus** variation" for an individual package is called a "Maximum Allowable Variation" (MAV). An MAV is a deviation from the labeled weight, measure, or count of an individual package beyond which the deficiency is considered **an** unreasonable **minus error**.	Change sentence to improve clarity and to clarify that a package error that exceeds the Maximum Allowable Variation is an "unreasonable error."
7	1.2.(5)a. B3	Deviations Caused by Moisture Loss or Gain – Why do we allow for moisture loss or gain?	a. Why **and when** do we allow for moisture loss or gain?	
8	1.2.(5)a. B3	Deviations Caused by Moisture Loss or Gain – Why do we allow for moisture loss or gain?	Revise the first paragraph, second sentence. The amount of ~~**lost**~~ moisture **loss** depends upon the nature of the product, the packaging material, the length of time it is in distribution, environmental conditions, and other factors. Revised the first paragraph, last sentence. For loss or gain of moisture**,** ~~**apply**~~ the moisture allowances **may be applied before or after the package errors are determined**.	

Line item #	Section # & Page #	Title	Action	Comments
	1.2.(5)a. B3, B4	Deviations Caused by Moisture Loss or Gain – Why do we allow for moisture loss or gain?	For loss or gain of moisture**, apply** the moisture allowances **after the package errors are determined** ~~**may be applied before or after the package errors are determined**~~.	Recommendation from WWMA
9	1.2.(5)a. B4	Deviations Caused by Moisture Loss or Gain – Why do we allow for moisture loss or gain?	Added a paragraph explaining that moisture allowances can be made before or after determining package errors. **To apply an allowance before determining package errors, adjust the Nominal Gross Weight (see Section 2.3. “Basic Test Procedure”) – Determine Nominal Gross Weight and Package Errors for Tare Sample, so the package errors are increased by an amount equal to the moisture allowance. This approach is used to account for moisture loss in both the average and individual package errors.** **It is also permissible to apply the moisture allowances after individual package errors and average errors are determined. For example, a sample of a product that could be subject to moisture loss might fail because the average error is minus or the error in several of the sample packages are found to be unreasonable errors (i.e., the package error is greater than the Maximum Allowable Variation permitted for the package’s labeled quantity).** ~~**to both the maximum allowable variations permitted for individual packages and the average net quantity of contents before determining the conformance of a lot**~~ **You can apply an allowance after determining the errors by adding an amount equal to the moisture allowance to adjust the average error** ~~**so the adjusted average error**~~ **and individual package errors.** ~~**provide for loss of moisture from the sample packages.**~~	
10	1.2.(5)a. B4	Deviations Caused by Moisture Loss or Gain – Why do we allow for moisture loss or gain?	To apply ~~**an**~~ **a moisture allowance** before determining package errors, adjust the Nominal Gross Weight (see Section 2.3. “Basic Test Procedure”)	Recommendation by CWMA

Line item #	Section # & Page #	Title	Action	Comments
11	1.2.(5)a. B4	Deviations Caused by Moisture Loss or Gain – Why do we allow for moisture loss or gain?	**We suggest removing the first paragraph (To apply an allowance…) and rewording the second paragraph (It is also permissible to apply…) and replacing with the following wording:** Apply the moisture allowance after individual package and average errors are determined. For example, a sample of a product subject to moisture loss might fail because the errors in several of the sample packages are determined to be unreasonable (i.e., the package error is greater than the Maximum Allowable Variation permitted for the package's labeled quantity) or the average error is minus and outside the Sample Error Limit. Adjust the MAV after the individual package errors are determined and adjust the SEL after average error is determined. Compare individual package errors to the adjusted MLA and the average error to the adjusted SEL.	Recommendation from WWMA **Note:** California officials question the need for accommodating both methods (before or after). This only presents opportunities for confusion. Recorded package errors should be ACTUAL values. Adjusted package errors on an inspection report cause concern for prosecutors when presenting the report in evidence. The MLA should be applied to the MAV and the SEL only after determining package and average errors.
Chapter 2				
Basic Inspection Procedure and Recordkeeping				
12	2.3.3.d. B15	How many MAVs are permitted in a sample?	d. How many ~~MAVs~~ **unreasonable minus errors (UMEs)** are permitted in a sample?	
13	2.3.3.d. B15	How many MAVs are permitted in a sample?	To find out how many minus package errors are permitted to exceed the MAV, **(errors known as unreasonable minus errors or UME's),** ~~(refer to Appendix A)~~ see Column 4 in either Table 2-1. Sampling Plans for Category A or Table 2-2. Sampling Plans for Category B **(refer to Appendix A).** Record this number in Box 8.	
Tare Procedures				
14	2.3.5.a.(1) B17	What types of tare may be used to determine the net weight of packaged goods? – Used Dry Tare	WWMA recommends changing the note. Note: When testing frozen foods with the Used Dry Tare approach, the frost found inside frozen food packages is included as part of the net contents**, except in instances in which glazed or frozen foods are tested according to Section 2.6. Drained Weight for Glazed or Frozen Foods.**	Note: from WWMA There seems to be a conflict between this note and Section 2.6. Drained Weight for Glazed and frozen Food. If 2.6. applies to frozen food, when would there be an instance to use used dry tare? Please see our comment on Section 2.6.

Line item #	Section # & Page #	Title	Action	Comments
15	2.3.5.(3) B17	What types of tare may be used to determine the net weight of packaged goods? – Wet Tare	**Wet tare procedures must not be used to verify the labeled net weight of packages of meat and poultry packed at an official United States Department of Agriculture facility and bearing a USDA seal of inspection. The Food Safety and Inspection Service (FSIS) adopted specific sections of the 2005 4th Edition of NIST HB 133 by reference but not the "wet tare" method for determining net weight compliance. FSIS considers the free-flowing liquids in packages of meat and poultry products, including single-ingredient, raw poultry products, to be integral components of these products (see Federal Register, September 9, 2008 [Volume 73, Number 175] [Final Rule – pages 52189-52193]).**	Amended this section to reflect the USDA's decision not to adopt the section on wet tare when it updated its regulations on net quantity of contents testing in September 2008.
16	2.3.5.(3) B17	What types of tare may be used to determine the net weight of packaged goods? – Wet Tare	Paragraph 2, sentence 2 – change the following: If Wet Tare is used to verify the net weight of packages ~~**of fresh poultry, hot dogs, and franks that are subject to the USDA regulations**~~, the inspector must allow for moisture loss.	
17	2.3.5.(3) B18	How is Tare weight determined?	Does the inspection of aerosol containers require special procedures? How is the tare of vacuum-packed coffee determined?	WWMA recommends that the following two questions and answers appear out of place. We suggest moving them behind the next two questions (see line item 19)
18	2.3.5.(3)f. B19	How are the tare sample and the tare weight of the packaging material determined?	Step 2: For sample sizes of 12 or more, subtract the individual tare weights from the **respective package** gross weights (Block a, minus Block b, on the report form) to obtain the net weight for each package and record ~~**these**~~ each value~~s~~ in Block c, "Net Wt.," on the report form.	
19	2.3.5.(3) B19	How are the tare sample and the tare weight of the packaging material determined?	Place information from line item 17 in this section after Step 6.	Recommendation from WWMA
Determine Nominal Gross Weight and Package Errors for Tare Sample				
20	2.3.6.a. B20	What is a nominal gross weight?	a. ~~**What is**~~ **How do I compute** a nominal gross weight?	

Line item #	Section # & Page #	Title	Action	Comments
21	2.3.6.a. B20	What is nominal gross weight?	To compute the nominal gross weight, add the average tare weight (recorded in Box 13) to the labeled weight (recorded in Box 1).~~To obtain the package error, subtract a package's gross weight from the nominal gross weight.~~	
22	2.3.6.a. B20	What is nominal gross weight?	Add the following: **How do I compute the package error?** **To obtain the package error, subtract the nominal gross weight from each package's gross weight. The package error is represented by the formula:** **Package error = gross weight − nominal gross weight**	
23	2.3.6.e. B21	How is the total package error computed?	Be sure to subtract the minus package errors from the plus package errors and to record the total net error in Box 15**, indicating the positive or negative value of the error.**	
Moisture Allowances				
24	2.3.8.b. B22	What are the moisture allowances for flour, and dry pet food?	What are the moisture allowances for flour, ~~and~~ dry pet food **and other products**? (See Table 2-3. Moisture Allowances.)	Revised this section to include a table that collects the moisture allowances in one location in the handbook. Added guidance and examples explaining that allowances can be applied before or after the packages are tested.
25	2.3.8.b. B22	What are the moisture allowances for flour, and dry pet food?	Have the Table title read as: Table 2-3. Moisture Allowances **for Product in Distribution**	Recommendation from WWMA This will help the inspector from incorrectly applying an incorrect test procedure at a production facility

Table 2-3. Moisture Allowances		
If you are verifying the labeled net weight of packages of:	**The Moisture Allowance is:**	**Notes**
Flour	**3 %**	
Dry pet food	**3 %**	**Dry pet food means all extruded dog and cat foods and baked treats packaged in Kraft paper bags and/or cardboard boxes with a moisture content of 13 % or less at time of pack.**
Borax	**See Section 2.4.**	
Wet Tare Only		
If you are using Wet Tare in verifying the net weight of packages of one of the products	**The Moisture Allowance is:**	**Notice: Wet Tare must not be used in testing packages of meat and poultry subject to USDA**

Line item #	Section # & Page #	Title	Action	Comments

listed below:		**regulations.**
Fresh poultry	**3 %**	**Fresh poultry is defined as poultry at a temperature of 3 °C (26 °F) that yields or gives when pushed with the thumb.**
Franks or hot dogs	**2.5 %**	
Bacon, fresh sausage, and luncheon meats	**0 %**	**For packages of bacon, fresh sausage, and luncheon meats, there is no moisture allowance if there is no free-flowing liquid or absorbent materials in contact with the product and the package is cleaned of clinging material. Luncheon meats are any cooked sausage product, loaves, jellied products, cured products, and any sliced sandwich-style meat. This does not include whole hams, briskets, roasts, turkeys, or chickens requiring further preparation to be made into ready-to-eat sliced product. When there is no free-flowing liquid inside the package and there are no absorbent materials in contact with the product, Wet Tare and Used Dry Tare are equivalent.**

Line item #	Section # & Page #	Title	Action	Comments
26	2.3.8.b. B23 & B24	What are the moisture allowances for flour, and dry pet food?	Delete: ~~**The moisture allowance for flour and dry pet food is 3 % of the labeled net weight.**~~ ~~**Note: Dry pet food means all extruded dog and cat foods and baked treat products packaged in Kraft paper bags and/or cardboard boxes with a moisture content of 13 % or less at the time of pack.**~~	
27	2.3.8.d. B24	What moisture allowance is used with wet tare when testing packages bearing a USDA seal of inspection?	d. What moisture allowance is used with wet tare**?** ~~**when testing packages bearing a USDA seal of inspection?**~~ **Wet tare procedures must not be used to verify the labeled net weight of packages of meat and poultry packed at an official United States Department of Agriculture facility and bearing a USDA seal of inspection. The Food Safety and Inspection Service (FSIS) adopted specific sections of the 2005 4th Edition of NIST HB 133 by reference but not the "wet tare" method for determining net weight compliance. FSIS considers the free-flowing liquids in packages of meat and poultry products, including single-ingredient, raw poultry products, to be integral components of these products (see Federal Register, September 9, 2008 [Volume 73, Number 175] [Final Rule –**	Comment from CWMA: Two questions remain. 1. What guidance can be provided for manufacturers with products other than those listed for moisture loss? 2. What methodology is necessary for manufacturers to demonstrate the data needed for moisture allowance? (see follow- up on line item 30)

Line item #	Section # & Page #	Title	Action	Comments
			pages 52189-52193]).	
28	2.3.8.d. B24	What moisture allowance is used with wet tare when testing packages bearing a USDA seal of inspection?	**See Table 2-3 Moisture Allowances – Wet Tare Only**. • ~~**Use the following guideline when testing meat and poultry from any USDA inspected plant using Wet Tare and a Category A sampling plan.**~~ • ~~**For packages of fresh poultry that bear a USDA seal of inspection, the moisture allowance is**~~ • ~~**3 5 of the labeled net weight. For net weight determinations, only, fresh poultry is defined as poultry above – 3 ºC (26 ºF). This is a product that yields or gives when pushed with the thumb.**~~ • ~~**For packages of franks or hotdogs that bear a USDA seal of inspection, the moisture allowance is 2.5 % of the labeled net weight.**~~ ~~**For packages of bacon, fresh sausage, and luncheon meats that bear a USDA seal of inspection, there is no moisture allowance if there is no free-flowing liquid or absorbent materials in contact with the product and the package is cleaned of clinging material. Luncheon meats are any cooked sausage product, loaves, jellied products, cured products, and any sliced sandwich-style meat. This does not include whole hams, briskets, roasts, turkeys, or chickens requiring further preparation to be made into ready-to-eat sliced product. When there is no free-flowing liquid inside the package and there are no absorbent materials in contact with the product, Wet Tare and Dried Used Tare are equivalent.**~~	
29	2.3.8.d. B24	What moisture allowance is used with wet tare when testing packages bearing a USDA seal of inspection?	When there is free-flowing liquid **and liquid** ~~**or absorbent**~~ **absorbed by** packaging materials in contact with the product, all free liquid is part of the wet tare.	

Line item #	Section # & Page #	Title	Action	Comments
30	2.3.8.d. B24	What moisture allowance is used with wet tare when testing packages bearing a USDA seal of inspection?	When there is free-flowing liquid **and liquid** ~~or absorbent~~ **absorbed by** packing materials in contact with the products, all free liquid **and the absorbed liquid** is part of the wet tare.	Recommendation from the WWMA 2009 Annual Meeting
31	2.3.8.e. B25	How is moisture loss handled for products not listed in NIST Handbook 133	**How is moisture loss handled for products not listed in NIST Handbook 133?** **Officials can test products for which no moisture loss guidance has been provided. If studies are a necessity they should be a collaborative effort between officials and industry. Because of the potential impact on interstate commerce, studies should be completed on a nationwide basis and not by individual jurisdictions unless circumstances justify only local consideration.** **The amount of moisture loss from a package is a function of many factors, not the least of which is the product itself (e.g., moisture content, texture and density), packaging, storage conditions (e.g., temperature, humidity, and air flow), time, handling and others. If a packaged product is subject to moisture loss, officials must allow for "reasonable" variations caused by moisture either evaporating or draining from the product. Officials cannot set arbitrary moisture allowances based solely on their experience or intuition. Moisture allowances must be based on scientific data and must be "reasonable." Reasonable does not mean that all of the weight loss caused by moisture evaporation or draining from the product must be allowed. As a result of product and moisture variability, the approach used by an official must be developed on a case-by-case basis depending on many factors to include, but not be limited to, the manufacturing process, packaging materials, distribution, environmental influence and the anticipated shelf life of the product.** **NIST Handbook 130 provides a starting point for developing a workable procedure in the Interpretation and Guideline Section 2.5.6. regarding "Resolution for Requests for Recognition of Moisture Loss in Other Packaged Products." Most**	

Line item #	Section # & Page #	Title	Action	Comments
			studies involving nationally distributed products will require that products be tested during different seasons of the year and in different geographic locations to develop a nationally recognized moisture allowance. Some studies may require the development of laboratory tests used for inter-laboratory comparisons to establish moisture content in products at time of pack or at the time of inspection. **Moisture loss or gain is a critical consideration for any net content enforcement effort and one that, in most cases, cannot be addressed solely by a field official. If moisture loss issues are to be deliberated, it is the regulatory official's responsibility to resolve the packer's concern utilizing available resources and due process procedures. To fulfill this obligation the official may be required to utilize specialized test equipment and specific laboratory procedures. Additionally, the collection of adequate test data may require product examination over a broad geographical area and consideration of a wide range of environmental factors. If a national effort is required, a coordinated effort involving industry, trade associations, weights and measures officials, and federal agencies may be required. NIST will provide technical support upon request. If studies are a necessity they should be a collaborative effort between officials and industry and can be very time consuming depending on the product. Because of the potential impact on interstate commerce, studies must be completed on a nationwide basis and not by individual jurisdictions unless circumstances justify only local consideration.**	
32	2.3.8.e B25	**How is moisture loss handled for products not listed in NIST Handbook 133**		WWMA 2009 Annual meeting recommends that this section not be added. This should be retained as developmental with future work to be done by the MLWG
33	2.3.8.e. B25		e. **Moisture loss must be considered even when no formal allowance for the specific product is found in HB 133.**	Recommend change from Paul Hoffman, Kraft

Line item #	Section # & Page #	Title	Action	Comments
Calculations				
34	2.3.9.a. B26	How is moisture allowance computed and applied to the average error?	a. How is moisture allowance computed and applied ~~to the average error~~?	
35	2.3.9.b. B26 & B27	**How is a Moisture Allowance made prior to determining package errors?**	**b. How is a Moisture Allowance made prior to determining package errors?** **If the Moisture Allowance is known in advance (e.g., flour and dry pet food) it can be applied by adjusting the Nominal Gross Weight (NGW) used to determine the sample package errors. The Moisture Allowance (MA) in Box 13a is subtracted from the NGW. The NGW which is the sum of the Labeled Net Quantity of Contents (LNQC e.g., 907 g) and the Average Tare Weight from Box 13 (for this example use an ATW of 14 g (0.03 lb)) to obtain an Adjusted Nominal Gross Weight (ANGW) which is entered in Box 14.** **The calculation is:** **LNQC 907 g (2 lb) + ATW 14 g (0.03 lb) = 921 g (2.03 lb) - MA 27 g (0.06 lb) = ANGW of 918 g (1.97 lb)** **which is entered in Box 14.** **Package errors are determined by subtracting the ANGW from the Gross Weights of the Sample Packages (GWSP).** **The calculation is:** **GWSP – ANGW = Package Error** **Note: When the NGW is adjusted by subtracting the Moisture Allowance value(s) the Maximum Allowable Variation(s) is not changed. This is because the errors that will be found in the sample packages have been adjusted by subtracting the Moisture Allowance (e.g., 3 %) from the NGW. That increases the individual package errors by the amount of the moisture allowance (e.g., 3 %). If the value(s) of the MAV(s) were also adjusted it would result in doubling the allowance.**	Comment from WWMA: Based on previous comments we suggest entirely removing the question – 2.3.9.b. **How is a Moisture Allowance made prior to determining the package errors?**

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			c. How is a Moisture Allowance made after determining package errors? **You can make adjustments when the value of the Moisture Allowance is determined following the test (e.g., after the sample fails or if a packer provides a reasonable moisture allowance based on data obtained using a scientific method) using the following approach:** **If the sample failed the Average and/or the Individual Package Requirements both of the following steps are applied.** **If the sample failed the Average Requirement but has no unreasonable package errors, only step 1 is used. If the sample passes the Average Requirement but fails because the sample included one or more Unreasonable Minus Errors (UMEs), only step 2 is used.** **Step:** **1. Use the following approach to apply a Moisture Allowance to the sample after the test is completed. The Moisture Allowance (MA) is computed (e.g., 3 % x 907 g (2 lb) = 27 g (0.06 lb) and added to the Sample Error Limit (e.g., if the SEL is 0.023 add 0.06 to obtain an Adjusted SEL of 0.083). The ASEL (Adjusted Sample Error Limit) is then compared to the Average Error of the Sample and:** • **If the average error (disregarding sign) in Box 18 is smaller than the ASEL, the sample passes.** **HOWEVER,** • **If the average error (disregarding sign) in Box 18 is larger than the ASEL, the sample fails.** **2. If a Moisture Allowance is to be**	

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			applied to the Maximum Allowable Variation(s), the following method is recommended: **The Moisture Allowance (MA) is computed (e.g., 3 % x 907 g (2 lb) = 27 g (0.06 lb) and added to the value of the Maximum Allowable Variation(s) for the labeled net quantity of the package (e.g., MAV for 907 g (2 lb) is 31.7 g (0.07 lb) + 27 g (0.06 lb) = AMAV of 58.7 g). Compare each minus package error to the AMAV. Mark package errors that exceed the AMAV and record the number of UMEs found in the sample. If this number exceeds the number of unreasonable errors allowed, the sample fails.** ~~**How is the Maximum Allowable Variation corrected for the moisture allowance?**~~ • ~~**Adjust the MAV by adding the moisture allowance to the MAV.**~~ ~~**Example: 907 g (2 lb) package of flour: moisture allowance added to the MAV = 31.7 g (0.07 lb) (MAV for 907 g [2 lb] package) + 27 g (0.06 lb) moisture allowance = a corrected MAV of 58.7 g (0.13 lb)**~~ • ~~**Correct MAV in dimensionless units by converting the moisture allowance to dimensionless units = 0.06 lb ÷ 0.001 lb = 60. Go to Box 4 and add the moisture allowance in dimensionless units to the MAV in dimensionless units.**~~ ~~**Example: MAV = 70 (MAV for 2 lb where the unit of measure = 0.001 lb) + 60 (moisture allowance in dimensionless units) = 130.**~~	

Line item #	Section # & Page #	Title	Action	Comments
			~~**Minus package errors must exceed the MAV ± gray area before they are declared "unreasonable errors."**~~ • ~~**If the number of unreasonable errors exceeds the allowed number (recorded in Box 8), the inspection lot fails.**~~ ~~**How is the average error for the moisture allowance corrected?**~~ ~~**If the minus average error (Box 18) is larger (disregarding the sign) than the SEL (Box 23) and moisture loss applies, compare the difference between Box 18 and Box 23 with the moisture allowance recorded in Box 13a. (Make sure that all the values are in units of weight or in dimensionless units before making this comparison.) If Box 13a is larger than the difference between Box 18 and 23, then the lot is considered to be in the gray area.**~~ ~~**Example: Box 13a for 2 lb flour is 60 (dimensionless units); Box 18 is 2 (dimensionless units); Box 23 is 0.550 (dimensionless units). The difference between Box 18 and Box 23 is 1.450 (dimensionless units). Since Box 13a is 60 (dimensionless units), Box 13a is larger than the difference between Box 18 and Box 23, the lot is considered to be in the gray area and further investigation is necessary before ruling out moisture loss as the reason for shortweight.**~~	
36	2.3.9.d. B28	What should you do when a sample is in the moisture allowance (gray) area?	Add the following title **<u>d. What should you do when a sample is in the moisture allowance (gray) area?</u>** When the average error of a lot of fresh poultry, franks, or hot dogs ~~**from a USDA-inspected plant**~~ is minus, but does not exceed the established "moisture allowance"	

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			or "gray area," contact the ~~**appropriate USDA official and/or**~~ **packer or** plant management personnel to determine what information is available on the lot in question. Questions to the ~~**USDA official and/or**~~ **plant management representative** may include: Change the note to read: **Note:** If ~~**USDA or**~~ the plant management has data on the lot, such data may help to substantiate that the "lot" **had** met **the** net content requirements at the point of manufacture.	
37	2.3.9.d. B29	What should you do when a sample is in the moisture allowance (gray) area?	**Reasonable** deviations from net quantity of contents caused by the loss or gain of moisture from the package are permitted when caused by ordinary and customary exposure to conditions that occur under good distribution practices.	
Borax				
38	2.4.b. B30	How is the volume determined?	Step 3. Compare the net volume of the commodity in the package with the volume declared on the package. The volume declaration **must not** ~~**is not located**~~ **appear** on the principal display panel. **Instead, it will appear on the back or side of the package and may appear as:** ~~**The following example is how the declaration of volume should appear.**~~	Deleted 2530 cm^3 because that example caused confusion. The actual values on boxes of borax vary with the package size, which may change frequently for marketing reasons.
The Determination of Drained Weight				
39	2.5. B31	Equipment	➢ **For canned tomatoes a U.S. Standard test sieve with 11.2 mm ($^{7}/_{16}$ in) openings must be used**	The AOAC (Association of Official Analytical Chemists) test procedure that the FDA uses for drained weight determinations requires a different sieve size from what is required in the handbook to be used for canned tomatoes. A note was added to HB 133 so that the requirement matches the sieve size for canned tomatoes in AOAC 968.30 "Canned Vegetables Drained Weight Procedure."
Drained Weight for Glazed or Frozen Foods				
40	2.6. B32	Drained Weight for Glazed or Frozen Foods	2.6. **Determining the net weight of ice-encased frozen foods and ice glazed products**. ~~**Drained Weight for Glazed or Frozen Foods**~~	Comment from WWMA: We believe this procedure is truly intended for all frozen foods as indicated by the existing title. We have made extensive amendments to include additional foods and freezing methods and believe it more closely reflects the intent of the section and the current marketplace.

Line item #	Section # & Page #	Title	Action	Comments
41	2.6. B32	Drained Weight for Glazed or Frozen Foods		Comment from NEWMA: Section 2.6. specifically references the use of glaze with frozen seafood. Glazed chicken wings are being seen in the marketplace. It was suggested that wording be added to include other glazed products such as frozen (glazed?) chicken.
42	2.6.a. B32	How is the drained weight of frozen shrimp and crabmeat determined?	a. How is the drained weight of frozen shrimp **(e.g., 2.27 kg (5 lb) frozen block of shrimp)** and crabmeat determined?	
43	2.6.a. B32	How is the drained weight of frozen shrimp and crabmeat determined?	a. How ~~is~~ **should** the ~~drained~~ **net** weight of frozen shrimp ~~(e.g., 2.27 kg (5 lb) block of shrimp), and~~ crabmeat**, meat or poultry, and similar products encased in ice and frozen into blocks or solid masses (i.e., not individually glazed) be** determined?	Comment from WWMA: Is this procedure truly intended for all frozen foods as indicated by the title or only SEAFOOD, as indicated by the example? We believe this section needs clarification.
44	2.6.a. B32	How is the drained weight of frozen shrimp and crabmeat determined?	First paragraph, second sentence: Immerse the product **(e.g., a block of frozen shrimp)** directly in water in a mesh basket or open container to thaw (e.g., it is not placed in a plastic bag).	
45	2.6.a. B32	How is the drained weight of frozen shrimp and crabmeat determined?	When determining the net weight of frozen shrimp**, crabmeat, meat or poultry products, or similar products that are encased in ice and frozen into blocks or solid masses**, use the test equipment and procedure provided below.	Recommendation from WWMA
46	2.6.a. B33	How is the drained weight of frozen shrimp and crabmeat determined? – Test Equipment	• Water source and hose with a**n approximate flow rate of** 4 L to 15 L (1 gal to 4 gal) per minute **for thawing blocks and other products** ~~flow rate~~ • Sink or other receptacle [i.e., **bucket with a capacity of approximately** 15 L (4 gal) ~~bucket~~] **for thawing blocks and other products** • A wire mesh basket **(used for testing large frozen blocks of shrimp)** or other container that is large enough to hold the contents of 1 package (e.g., 2.27 kg or [5 lb] box of shrimp) and has openings small enough to retain all pieces of the product (e.g., an expanded metal test tube basket lined with standard 16-mesh screen)	

Line item #	Section # & Page #	Title	Action	Comments
47	2.6.a. B33	How is the drained weight of frozen shrimp and crabmeat determined? – Test Equipment	• A wire mesh basket **(used for testing large frozen blocks of shrimp or other products)** or other container that is large enough to hold the contents of 1 package (e.g., 2.27 kg or [5 lb] box of shrimp) and has openings small enough to retain all pieces of the product (e.g., an expanded metal test tube basket lined with standard 16-mesh screen)	Recommendation from WWMA
48	2.6.a. B33	How is the drained weight of frozen shrimp and crabmeat determined? – Test Procedure	Step 1: Place the unwrapped frozen shrimp, ~~or~~ crabmeat**, or meat, poultry, or seafood product** in the wire mesh basket and immerse in a 15 L (4 gal) or larger container of fresh water at a temperature between 23 °C to 29 °C (75 °F to 85 °F).	Recommendation from WWMA
49	2.6.b. B33	How is the net weight of glazed raw seafood and fish determined?	b. How is the net weight of **frozen,** glazed ~~raw~~ seafood**,** ~~and~~ fish**, poultry, meat, or similar products** determined?	
50	2.6.b. B34	How is the net weight of glazed raw seafood and fish determined?		Comment from NEWMA: Section 2.6. specifically references the use of glaze with frozen seafood. Glazed chicken wings are being seen in the marketplace. It was suggested that wording be added to include other glazed products such as frozen (glazed?) chicken.
51	2.6.b. B34	How is the net weight of glazed raw seafood and fish determined?	For **frozen,** glazed seafood**,** ~~and~~ fish, **poultry, or meat products, or similar products,** determine the net weight after removing the glaze using the following procedure.	Recommendation from WWMA
52	2.6.b. B34	How is the net weight of glazed raw seafood and fish determined? – Equipment	Use the equipment listed in Section 2.6. **Determining the net weight of frozen, ice-glazed products** ~~Drained Weight for Glazed or Frozen Foods~~	Recommendation from WWMA Title change if agreed upon in Section 2.6
53	2.6.b. B34	How is the net weight of glazed raw seafood and fish determined? – Test procedures	Step 2: Weigh ~~sieve and~~ receiving pan. Record this weight on a worksheet as “~~sieve~~ **pan** weight.”	

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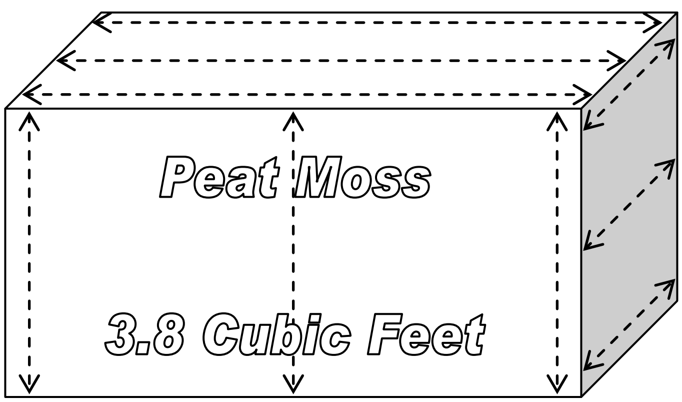
54	2.6.b. B35	How is the net weight of glazed raw seafood and fish determined? – Test procedures	Step 3: Remove each package from low temperature storage; open it immediately and place the contents under a gentle spray of cold water. **Handle the product with care** to avoid ~~breaking~~ **breakage** ~~the product~~. Continue the spray**ing** **process** until all ice glaze, that is seen or felt is removed. In general, the product should remain rigid; however, the ice glaze on certain products, usually smaller sized commodities, sometimes cannot be removed without ~~defrosting~~ **partial thawing of** the product. Nonetheless, remove **all** ~~the~~ **ice** glaze, because it **may be** ~~is~~ a substantial part of the package weight.	
55	2.6.b. B35	How is the net weight of glazed raw seafood and fish determined? – Test procedures	Step 4: ~~**Transfer the product to the weighed sieve.**~~	
56	2.6.b. B35	How is the net weight of glazed raw seafood and fish determined? – Test procedures	Step 5: **At the end of the drain time immediately transfer the entire product to the tared pan for weighing to determine the net weight.** Place the product and ~~sieve~~ **pan** on ~~receiving pan~~ **the scale** and weigh. Record this weight on a worksheet as the "~~sieve~~ **pan** + product weight."	
57	2.6.b. B35	How is the net weight of glazed raw seafood and fish determined? – Test procedures	Step 6: The net weight of the product is equal to the weight of the pan ~~plus the sieve~~ plus the product (record in Step 5) minus the "~~sieve~~ **pan** weight" (recorded in step 2).	
58	2.6.b. B35	How is the net weight of glazed raw seafood and fish determined? – Test procedures	Step 7: Repeat steps 3 through 6 for each package in the sample, cleaning ~~and drying~~ the sieve and **cleaning and drying** the receiving pan between package measurements.	

<table>
<tr><th>Line item #</th><th>Section # & Page #</th><th>Title</th><th>Action</th><th>Comments</th></tr>
<tr><td colspan="5">Chapter 3</td></tr>
<tr><td colspan="5">Gravimetric Test Procedure for Liquids</td></tr>
<tr><td>59</td><td>3.1.f.
B37</td><td colspan="3">
<table>
<tr><th colspan="3">Table 3-1. Reference Temperatures for Liquids</th></tr>
<tr><th>If the Liquid Commodity is</th><th>The reference temperature is</th><th>Reference</th></tr>
<tr><td>Frozen food labeled by volume (e.g., fruit juice)</td><td>−18 °C (0 °F)</td><td></td></tr>
<tr><td>Food that must be kept refrigerated (e.g., milk and other dairy products. Usually labeled “Keep Refrigerated”)</td><td></td><td></td></tr>
<tr><td>Beer</td><td>~~3.9~~ **4** °C (39.1 °F)</td><td>27 CFR, part 7.10</td></tr>
<tr><td>Distilled spirits or petroleum</td><td>~~15~~ **15.56** °C (60 °F)</td><td>27 CFR, part 5.11</td></tr>
<tr><td>Unrefrigerated products (e.g., includes liquids sold un-chilled, such as soft-drinks and wine)</td><td>20 °C (68 °F)</td><td>27 CFR, part 4.1(b)</td></tr>
</table>
</td></tr>
<tr><td>60</td><td>3.2.
B39</td><td>Test Procedure</td><td>Step 4:

Tilt the flask gradually so the flask walls are splashed as little as possible as the flask is emptied.</td><td></td></tr>
<tr><td colspan="5">Other Volumetric Test Procedures</td></tr>
<tr><td>61</td><td>3.4.a.
B42</td><td>What other methods can be used to determine the net contents of packages labeled by volume? – Test Equipment</td><td>Plastic disks… change the second to last sentence and add the last sentence.

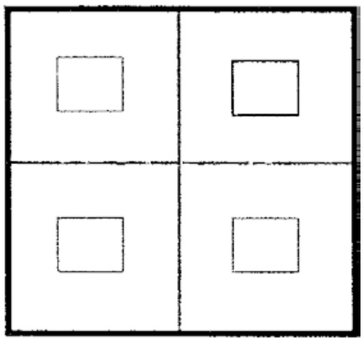
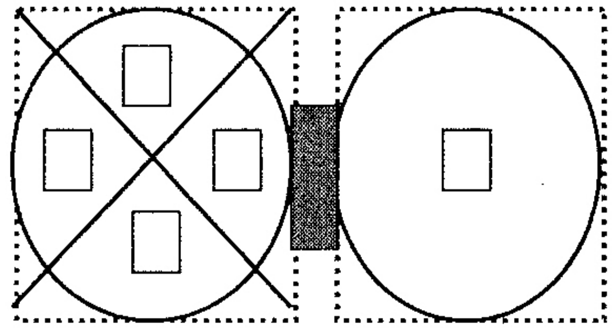
• Each disk must have a 20 mm (¾ in) diameter hole through its center and a series of 1.5 mm (1/16 in) diameter holes 25 mm (1 in) apart around the periphery of the disk and 3 mm (1/8 in) from the outer edge. All edges must be smooth.</td><td></td></tr>
<tr><td>62</td><td>3.4.b.
B42</td><td>How is the volume of oils, syrups, and other viscous liquids that have smooth surfaces determined?</td><td>2. Bring the temperature of both the liquid and the water to be used to measure the volume of the liquid to the reference temperature specified in Table 3-1. Reference Temperatures for Liquids. Verify with a thermometer that product has maintained the reference temperature.</td><td></td></tr>
<tr><td colspan="5">Mayonnaise and Salad Dressing</td></tr>
<tr><td>63</td><td>3.5
B43</td><td>New</td><td>3.5 How is the volume of mayonnaise, salad dressing, and other water immiscible products that do not have smooth and level surfaces determined?</td><td></td></tr>
<tr><td colspan="5">Peat Moss</td></tr>
<tr><td>64</td><td>3.10.a.
B55</td><td>How are packages of peat and peat moss labeled by compressed volume testing?</td><td>Take three measurements (both ends and middle) of each dimension and calculate their average. Multiply the averages to obtain the compressed cubic volume.</td><td></td></tr>
</table>

Line item #	Section # & Page #	Title	Action	Comments
	3.10.a B25	How are packages of peat and peat moss labeled by compressed volume testing?	Modify the second sentence to add the double-underlined word and graphic: **For each dimension (length, width, height) take three equidistant measurements, take the average of each respective dimension and multiply to determine the cubic measure as follows:** **Average height x average width x average length = cubic measurement**	Recommendation from the WWMA 2009 Annual meeting
				
Ice Cream Novelties				
65	3.12. B58	Ice Cream Novelties	**Note: The following procedure can be used to test packaged products that are solid or semisolid and that will not dissolve in, mix with, absorb, or be absorbed by the fluid into which the product will be immersed. For example, ice cream labeled by volume can be tested using ice water or kerosene as the immersion fluid.**	
66	3.12. B58	Ice Cream Novelties	**Exception – Pelletized ice cream are beads of ice cream which are quick frozen with liquid nitrogen. The beads are relatively small, but can vary in shape and size. On April 17, 2009 the FDA issued a letter stating that this product is considered semisolid food, in accordance with 21 CFR 101.105(a). The FDA also addresses that the appropriate net quantity of content declaration for pelletized ice cream products be in terms of net weight.**	Recommendation from WWMA

Line item #	Section # & Page #	Title	Action	Comments
Fresh Oysters Labeled by Volume				
67	3.13.a. B64	Test Equipment	Area: 1935 cm^2 (300 in^2) or more for each 3.78 L (1 gal) of oysters (**Note: Strainers of smaller area dimensions are permitted to facilitate testing smaller containers.)**	

The following items are corrections made by NIST during editorial review of the currently published Handbook 133.

Line item #	Section # & Page #	Title	Action	Comments
Good Measurement Practices				
1a	1.7.(2) B7	Certification Requirements for Standards and Test Equipment	This must be done according to the **calibration procedures and other instructions found on NIST's Laboratory Metrology and Calibration Procedures website at http://ts.nist.gov/WeightsAndMeasures/CalibrationProcedures.cfm** ~~**in NIST Handbook 145, "Handbook for the Quality Assurance of Metrological Measurements,"**~~ or **using** other recognized procedures (e.g., those adopted for use by a state weights and measures laboratory).	Amended this section to refer users to NIST's Calibration Procedures website which provides information on laboratory test procedures. Many of those on the website supersede those in NIST Handbook 145 which is cited in current text. The information presented at this URL is regularly updated by the Weights and Measures Division Metrology Group. State laboratories use this as a primary source for calibration information.
Measurement Standards and Test Equipment				
2a	2.2.f.(3) B11	Which performance tests should be conducted to ensure the accuracy of a scale? – Shift Test	**Bench Scales or Balance** use a test load equal to one-~~**half**~~ **third** of the "maximum test load" used for the "increasing-load test." For bench scales (see Diagram 1. **"Bench Scales or Balance"),** ~~**place**~~ **apply** the test load **as nearly as possible at the center of each quadrant of the load receiving element as shown in Diagram 1. "Bench Scale or Balance."** ~~**in the center of four separate quadrants, equidistant between the center and edge of the load-receiving element and**~~ **For Equal Arm Balances use a test load equal to one-half capacity centered successively at four points positioned equidistance between the center and the front, left, back, and right edges of each pan as shown** ~~**determine the accuracy in each quadrant for**~~ **(see Diagram 2.** "**Equal-Arm Balance**)." For example, where the load-receiving element is a rectangular or circular shape, place the test load in the center of the area represented by the shaded boxes ~~**in the following diagrams**~~.	Amended this section to reflect the changes made in 2007 to the shift test procedures in NIST HB 44, Section 2.20. Scales under N.1.3.7. All Other Scales…. The change in HB 44 reduced the test-load to $^{1}/_{3}$ maximum nominal capacity and amended the requirement on placement of the test load on the load receiving element. The test pattern in Diagram 1 has been changed to reflect the new requirement.

Line item #	Section # & Page #	Title	Action	Comments
Diagram 1. Bench Scales or Balance 			**Diagram 2. Equal-Arm Balance** 	
Measurement Standards and Test Equipment				
3a	2.2.(3)g. B12	Which Standards Apply to Other test Equipment.	Add the URL: These publications may be obtained from the Weights and Measures Division **(https://www.nist.gov/owm)** or the U.S. Government Printing Office.	
Basic Inspection Procedure and Recordkeeping				
4a	2.3.3.b. B15	Where are Maximum Allowable Variations found?	Added a missing bullet and reference to "Table 2-9." • packages bearing a USDA seal of inspection – Meat and Poultry "See Table 2-9."	NIST in error missed this during editorial review of published HB 133.
Tare Procedures				
5a	2.3.5.a.(1) B17	Used Dry Tare	Note: When testing frozen foods with the Used Dry Tare approach, the frost found inside frozen food packages is included as part of the net contents.	Within HB 133 3rd Edition, Section 3.12. Frozen Food and Other Frozen Products the following note was omitted from the 4th Edition print.
Moisture Allowances				
6a	2.3.8.b. B23	Table 2-3 Moisture Allowances	Corrected a misprint in the moisture allowance for packages of fresh poultry to read 3 %.	NIST in error missed this during editorial review of currently published HB 133.
Other Volumetric Test Procedures				
7a	3.4. B42	What other methods can be used to determine the net contents of packages labeled by volume?	Updated standards ➢ Class A 500 mL buret that conforms to ASTM E 287~~94~~ **2(2007)**, "Standard Specification for Laboratory Glass Graduated Burets" ➢ Class A Pipets, calibrated "to deliver" that conform to ASTM E969~~95~~ **02(2007)**, "Standard Specification for Glass Volumetric (Transfer) Pipets"	

Line item #	Section # & Page #	Title	Action	Comments
Test Viscous Materials				
8a	3.9 B53	Such as Caulking Compounds and Pastes	Update Standard: Calibrate the density cup gravimetrically with respect to the contained volume using the procedure in ASTM E **5**42~~-94~~**01(2007)**, "Standard Practice for Calibration of Laboratory Volumetric Apparatus."	Update standard
Peat Moss				
9a	3.10.b. B55	How are packages of peat and peat moss labeled by compressed volume tested?	Update the standard in the second question. The procedure is based on ASTM D2978-~~90~~ **03**, "Standard Method of Test for Volume of Processed Peat Materials."	Update ASTM standard
Mulch and Soils Labeled by Volume				
10a	3.11.b. B57	Mulch and Soils Labeled by Volume	Modify table – The table format was simplified and the SI units were changed to millimeters.	

Table 3-4. Specifications for Test Measures for Mulch and Soils

Nominal Volume of Test Measure	Interior Wall Dimensions *			Marked Intervals on Interior Walls ***	Volume Equivalent of Marked Intervals
	Length	Width	Height **		
30.2 L (1.07 ft^3) for testing packages that contain less than 28.3 L (1 ft^3 or 25.7 dry qt)	203.2 mm (8 in)		736.6 mm (29 in)	**12.7 mm (½ in)**	524.3 mL (32 in^3)
28.3 L (1 ft^3)	**304.8 mm (12 in)**				1 179.8 mL (72 in^3)
56.6 L (2 ft^3)	**406.4 mm (16 in)**	**228.6 mm (9 in)**	**1 219.2 mm (48 in)**		
84.9 L (3 ft^3)					
Measures are typically constructed of **12.7 mm** ~~1.27 cm~~(½ in) marine plywood. A transparent sidewall is useful for determining the level of fill, but must be reinforced if it is not thick enough to resist distortion. If the measure has a clear front, place the level gage at the back (inside) of the measure so that the markings are read over the top of the mulch.					

Line item #	Section # & Page #	Title	Action	Comments
11a	3.11.d. B58	Mulch and Soils Labeled by Volume – How are package errors determined?	Package Error = Package Net Volume– Labeled volume	NIST in error left out the "–" during the editorial review of the currently published HB 133.
Test Procedure for Cylinders Labeled by Volume				
12a	3.14.2.a. B68	How is it determined if the containers meet the package requirements using the volumetric test procedure?	Change #5 to read as follows: Using NIST Technical Note 1079 "Tables of Industrial Gas Container Contents and Density for Oxygen, Argon, Nitrogen, Helium, and Hydrogen" **(available on -line**	Added website information

Line item #	Section # & Page #	Title	Action	Comments
			at (www.nist.gov\owm), determine the value (SCF/CF) from the content tables at the temperature and pressure of the cylinder under test.	
13a	3.15. B69	Firewood	Editorial: Make 3.15. Main Title, subtitle firewood categories.	
Chapter 4				
Packages Labeled by Count of More than 50 Items				
14a	4.4. B76	Packages Labeled by Count of More than 50 Items – Audit Procedure	Step 9: Added a minus symbol to the equation between Actual Package Gross Weight and Nominal Gross Weight.	NIST in error left out the "–" during the editorial review of the currently published HB 133
Special Test Requirements for Packages Labeled by Linear or Square Measure (Area)				
15a	4.6. B80	Are there special measurement requirements for packages labeled by dimensions?	Updated Standard: When testing yarn and thread apply tension and use the specialized equipment specified in ASTM D 1907-~~9~~**07**, "Standard Test Method for Linear Density of Yarn (Yarn Number) by the Skein Method," in conjunction with the sampling plans and package requirements described in this handbook.	Updated ASTM Standard
Polyethylene Sheeting				
16a	4.7. B82	Which procedures are used to verify the declarations on polyethylene sheeting and bags? – Test Procedure	Step 3: Updated the year (98) of approval referenced in ASTM Standard D 1505 ~~98~~-**03**, "Standard Method of Test for Density of Plastics by the Density Gradient Technique."	Updated ASTM Standard
Packages Labeled by Linear or Square (Area) Measure				
17a	4.8. B87	Packages Labeled by Linear or Square (Area) Measure. – Test Procedure	Step 11: Added a minus symbol to the equation between Package Gross Weight and Nominal Gross Weight.	NIST in error left out the "-" during the editorial review of the currently published HB 133.
Baler Twine – Test Procedure for Length				
18a	4.9. B89	Equipment	Step 5: Added a minus symbol to the equation between (Package Gross Weight and Nominal Gross Weight.)	NIST in error left out the "–" during the editorial review of the currently published HB 133.

Line item #	Section # & Page #	Title	Action	Comments
Appendix A. Table				
Table 1-1. Agencies Responsible for Package Regulations and Applicable Requirements				
19a	A2	Alcohol, Tobacco, Products	U.S. Bureau of Alcohol, Tobacco, and Firearms and state and local weights and measures ~~**http://www.atf.treas.gov**~~ **http:// www.atf.gov**	
20a		Table 2-1 (see below)		

Table 2-1. Sampling Plans for Category A

1	2	3	4	5	6
Inspection Lot Size	**Sample Size**	**Sample Correction Factor**	**Number of Minus Package Errors Allowed to Exceed the MAV ***	**Initial Tare Sample Size ****	
				Glass and Aerosol Packages	**All Other Packages**
1	1	Apply MAV	0*	2	2
2	2	8.9845			
3	3	2.484			
4	4	1.591			
5	5	1.24~~1~~2			
6	6	1.0~~50~~49			
7	7	0.925			
8	8	0.836			
9	9	0.769			
10	10	0.715			
11	11	0.672			
12 to 250	12	0.635			
251 to 3 200	24	0.422		3	
More than 3 200	48	0.29~~1~~0	1*		

* For mulch and soils packaged by volume, see Table 2-10. Exceptions to the Maximum Allowable Variations – 1 package may exceed the MAV for every 12 packages in the sample.

** If sample size is 11 or fewer, the initial tare sample size and the total tare sample size is 2 samples.

(Amended 2001)

Line item #	Section # & Page #	Title	Action	Comments
Appendix B. Random Numbers Tables				
21a	B115	The Random Number Table	The random number tables in Appendix B are composed of the digits from 0 through 9, with approximately equal frequency of occurrence. This appendix consists of 8 pages. On each page digits are printed in blocks of ~~five~~ columns and blocks of ~~five~~ rows. The printing of the table in blocks is intended only to make it easier to locate specific columns and rows	

Line item #	Section # & Page #	Title	Action	Comments
Appendix C. Glossary				
22a	B127	Glossary	**sample correction factor.** ~~Students' "t" value for a one sided test at the 3 % confidence level and n is the sample size~~. **The factor as computed is the ratio of the 97.5th quantile of the student's t-distribution with (n-1) degrees of freedom and the square root of n where n is the sample size.** **sample error limit (SEL).** A statistical value computed by multiplying the sample standard deviation times the sample correction factor from Column 3 of Table 2-1. Category A – Sampling Plans for the appropriate sample size. The SEL value allows for the uncertainty between the average error of the sample and the average error of the inspection lot with an approximately 97**.5** % level of confidence.	

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Appendix B

Draft of Handbook 133
Checking the Net Contents of Packaged Goods, 4th Edition
with Proposed Amendments and Editorial Changes

(Proposed changes for 2011 printing)

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Table of Contents

Chapter 1. General Information

1.1. Scope

Routine verification of the net contents of packages is an important part of any weights and measures program to facilitate value comparison and fair competition. Consumers have the right to expect packages to bear accurate net content information. Those manufacturers whose products are sold in such packages have the right to expect that their competitors will be required to adhere to the same **laws and regulations**. ~~**standards.**~~

The procedures in this handbook are recommended for use to verify the net quantity of contents of packages kept, offered, or exposed for sale, or sold by weight, measure (including volume, and dimensions), or count at any location (e.g., at the point-of-pack, in storage warehouses, retail stores, and wholesale outlets).

a. ~~Where and when~~ When and where to use package checking procedures?

An effective program will typically include testing at each of the following levels.

(1) Point-of-pack

Testing packages at the "point-of-pack" has an immediate impact on the packaging process. Usually, a large number of packages of a single product are available for testing at one place. This allows the inspector to verify that the packer is following current good packaging practices. Inspection at the point-of-pack also provides the opportunity to educate the packer about the legal requirements that products must meet and may permit resolution of any net content issues or other problems that arise during the testing. Point-of-pack testing is not always possible because packing locations can be in other states or countries. Work with other state, county, and city jurisdictions to encourage point-of-pack inspection on products manufactured in their geographic jurisdictions. Point-of-pack inspections cannot entirely replace testing at wholesale or retail outlets, because point-of-pack inspections do not include imported products or the possible effects of product distribution and moisture loss. Point-of-pack inspections only examine the manufacturing process. Therefore, an effective testing program will also include testing at wholesale and retail outlets.

(2) Wholesale

Testing packages at a distribution warehouse is an alternative to testing at the point-of-pack with respect to being able to test large quantities of and a variety of products. Wholesale testing is a very good way to monitor products imported from other countries and to follow up on products suspected of being underfilled based on consumer complaints or findings made during other inspections, including those done at retail outlets.

(3) Retail

Testing packages at retail outlets evaluates the soundness of the manufacturing, distributing, and retailing processes of the widest variety of goods at a single location. It is an easily accessible, practical means for state, county and city jurisdictions to monitor packaging procedures and to detect present or potential problems. Generally, retail package testing is not conducive to checking large quantities of individual products of any single production lot. Therefore, follow-up inspections of a particular brand or lot code number at a number of retail and wholesale outlets, and ultimately at the point-of-pack are extremely important aspects in any package-checking scheme. After the evaluation of an inspection lot is completed, the jurisdiction should consider what, if any, further investigation or follow-up is warranted. At the point-of-sale, a large number of processes may affect the quality or quantity of the product. Therefore, there may be many reasons for any inspection lot being out of compliance. A shortage in weight or measure may result from mishandling the product in the store, or the retailer's failure to rotate stock. Shortages may also be caused through mishandling by a distributor, or failure of some part of the packaging process. Shortages may also be caused by moisture loss (desiccation) if the product is packaged in permeable media. Therefore, being able to determine the cause of an error in order to correct defects is more difficult when retail testing is used.

(Amended 2002)

b. What products can be tested?

Any commodity sold by weight, measure, or count may be tested. The product to be tested may be chosen in several ways. The decision may be based on different factors, such as (1) marketplace surveys (e.g., jurisdiction-wide surveys of all soft drinks or breads), (2) surveys based on sales volume, or (3) audit testing (see Section 1.3. "Sampling Plans") to cover as large a product variety as possible at food, farm, drug, hardware stores, or specialty outlets, discount and department stores. Follow-up of possible problems detected in audit testing or in review of past performance tends to concentrate inspection resources on particular commodity types, brand names, retail or wholesale locations, or even particular neighborhoods. The expected benefits for the public must be balanced against the cost of testing. Expensive products should be tested because of their cost per unit. However, inexpensive items should also be tested because the overall cost to individual purchasers may be considerable over an extended period. Store packaged items, which are usually perishable and not subject to other official monitoring, should be routinely tested because they are offered for sale where they are packed. Products on sale and special products produced for local consumption should not be overlooked because these items sell quickly in large amounts.

Regardless of where the test occurs, remember that it is the inspector's presence in the marketplace through routine unannounced testing that ensures equity and fair competition in the manufacturing and distribution process. Finally, always follow up on testing to ensure that the problems are corrected; otherwise, the initial testing may be ineffective.

1.2. Package Requirements

The net quantity of content statement must be "accurate," but reasonable variations are permitted. Variations in package contents may be a result of deviations in filling. The limits for acceptable variations are based on current good manufacturing practices in the weighing, measuring, and packaging process. The first requirement is that accuracy is applied to the average net contents of the packages in the lot. The second requirement is applied to negative errors in individual packages. These requirements apply simultaneously to the inspection of all lots of packages except as specified in "Exceptions to the Average and Individual Package Requirements" in this section.

(1) Inspection Lot

An "inspection lot" (called a "lot" in this handbook) is defined as a collection of identically labeled (except for quantity or identity in the case of random packages) packages available for inspection at one time. The collection of packages will pass or fail as a whole based on the results of tests on a sample drawn from ~~this collection~~ **the lot**. This handbook describes procedures to determine if the packages in an "inspection lot" contain the declared net quantity of contents and if the individual packages' variations are within acceptable limits.

(2) Average Requirement

In general, the average net quantity of contents of packages in a lot must at least equal the net quantity of contents declared on the label. Plus or minus variations from the declared net weight, measure, or count are permitted when they are caused by unavoidable variations in weighing, measuring, or counting the contents of individual packages that occur in current good manufacturing practice. Such variations must not be permitted to the extent that the average of the quantities in the packages of a particular commodity or a lot of the commodity that is kept, offered, exposed for sale, or sold, is below the stated quantity. (See Section 3.7. "Pressed and Blown Glass Tumblers and Stemware" and Section 4.3. "Packages Labeled by Count of 50 Items or Fewer" for exceptions to this requirement.)

(3) Individual Package Requirement

The variation of individual package contents from the labeled quantity must not be "unreasonably large." In this handbook, packages that are underfilled by more than the Maximum Allowable Variation specified for the package are considered unreasonable errors. Unreasonable shortages are not generally permitted, even when overages in other packages in the same lot, shipment or delivery compensate for such shortage. This handbook does not specify limits of overfilling **(with the exception of textiles)**, which is usually controlled by the packer **for economic, compliance, and other reasons.**

(4) Maximum Allowable Variation

The limit of **the** "reasonable **minus** variation" for an individual package is called a "Maximum Allowable Variation" (MAV). An MAV is a deviation from the labeled weight, measure, or count of an individual package beyond which the deficiency is considered **an** unreasonable **minus error**. Each sampling plan limits the number of negative package errors permitted to be greater than the MAV.

(5) Deviations Caused by Moisture Loss or Gain

Deviations from the net quantity of contents caused by the loss or gain of moisture from the package are permitted when they are caused by ordinary and customary exposure to conditions that normally occur in good distribution practice and that unavoidably result in change of weight or measure. According to regulations adopted by the U.S. Environmental Protection Agency, no moisture loss is recognized on pesticides. (See Code of Federal Regulations 40 CFR Part 156.10.)

a. Why and when do we allow for moisture loss or gain?

Some packaged products may lose or gain moisture and, therefore, lose or gain weight or volume after packaging. The amount of ~~lost~~ moisture **loss** depends upon the nature of the product, the packaging material, the length of time it is in distribution, environmental conditions, and other factors. Moisture loss may occur even when manufacturers follow good distribution practices. Loss of weight "due to exposure" may include solvent evaporation, not just loss of water. For loss or gain of moisture, ~~apply~~ the moisture allowances **may be applied before or after the package errors are determined**.

WWMA	Change last sentence above to read as follows
For loss or gain of moisture**, apply** the moisture allowances after the package errors are determined.~~**may be applied before or after the package errors are determined**~~~~.~~	

To apply an allowance before determining package errors, adjust the Nominal Gross Weight (see Section 2.3. "Basic Test Procedure") – Determine Nominal Gross Weight and Package Errors for Tare Sample, so the package errors are increased by an amount equal to the moisture allowance. This approach is used to account for moisture loss in both the average and individual package errors.

CWMA	Change paragraph above, first sentence
To apply ~~**an**~~**a moisture allowance** before determining package errors, adjust the Nominal Gross Weight. (See Section 2.3. "Basic Test Procedure")	

WWMA	
Note: California officials question the need for accommodating both methods (before or after). This only presents opportunities for confusion. Recorded package errors should be ACTUAL values. Adjusted package errors on an inspection report cause concern for prosecutors when presenting the report in evidence. The MLA should be applied to the MAV and the SEL only after determining package and average errors. ***We suggest removing the first paragraph (To apply an allowance...) and rewording the second paragraph (It is also permissible to apply...) as follows:*** Apply the moisture allowance after individual package and average errors are determined. For example, a sample of a product subject to moisture loss might fail because the errors in several of the sample packages are determined to be unreasonable (i.e., the package error is greater than the Maximum Allowable Variation permitted for the package's labeled quantity) or the average error is minus and outside the Sample Error Limit. Adjust the MAV after the individual package errors are determined and adjust the SEL after average error is determined. Compare individual package errors to the adjusted MLA and the average error to the adjusted SEL.	

It is also permissible to apply the moisture allowances after individual package errors and average errors are determined. For example, a sample of a product that could be subject to moisture loss might fail because the average error is minus or the error in several of the sample packages are found to be unreasonable errors (i.e., the package error is greater than the Maximum Allowable Variation permitted for the package's labeled quantity).~~**to both the maximum allowable variations permitted for individual packages and the average net quantity of contents before determining the conformance of a lot**~~ **You can apply an allowance after determining the errors by adding an amount equal to the moisture allowance to adjust the average error** ~~so the adjusted average error~~ **and individual package errors.** ~~provide for loss of moisture from the sample packages.~~

This handbook provides "moisture allowances" for some meat and poultry products, flour, and dry pet food. (See Chapter 2, Table 2-3. "Moisture Allowances") These allowances are based on the premise that when the average net weight of a sample is found to be less than the labeled weight, but not by an amount that exceeds the allowable limit, either the lot is declared to be within the moisture allowance or more information must be collected before deciding lot compliance or noncompliance.

Test procedures for flour, some meat, and poultry are based on the concept of a "moisture allowance" also known as a "gray area" or "no decision" area. (See Section 2.3, "Basic Test Procedure – Calculations") When the average net weight of a sample is found to be less than the labeled weight, but not more than the boundary of the "gray area," the lot is said to be in the "gray" or "no decision" area. The gray area is not a tolerance. More information must be collected before lot compliance or noncompliance can be decided. Appropriate enforcement should be taken on packages found short weight and outside of the "moisture allowance" or "gray area."

(Amended 2002)

(6) Exceptions to the Average and Individual Package Requirements

There is an exemption from the average requirement for packages labeled by count of 50 or fewer items. The reason for this exemption is that the package count does not follow a "normal" distribution even if the package is designed to hold the maximum count indicated by the label declaration (e.g., egg cartons and packages of chewing gum). Another exception permits an "allowable difference" in the capacity of glass tumblers and stemware because mold capacity doesn't follow a normal distribution.

1.3. Sampling Plans

This handbook contains two sampling plans to use to inspect packages: "Category A" and "Category B." Use the "Category B" Sampling Plans to test meat and poultry products at point-of-pack locations that are subject to U.S. Department of Agriculture Food Safety and Inspection Service (FSIS) requirements. When testing all other packages, use the "Category A" Sampling Plan.

a. Why is sampling used to test packages?

Inspections by weights and measures officials must provide the public with the greatest benefit at the lowest possible cost. Sampling reduces the time to inspect a lot of packages, so a greater number of items can be inspected. Net content inspection, using sampling plans for marketplace surveillance, protects consumers who cannot verify the net quantity of contents. This ensures fair trade practices and maintains a competitive marketplace. It also encourages manufacturers, distributors, and retailers to follow good manufacturing and distribution practices.

b. Why is the test acceptance criteria statistically corrected and what are the confidence levels of the sampling plans?

Testing a "sample" of packages from a lot instead of every package is efficient, but the test results have a "sampling variability" that must be corrected before determining if the lot passes or fails. The "Category A" sampling plans give acceptable lots a 97 % or better probability of passing. An "acceptable" lot is defined as one in which the "average" net quantity of contents of the packages equals or exceeds the labeled quantity. The "Category B" sampling plans give acceptable lots at least a 50 % probability of passing. The sampling plans used in this handbook are statistically valid. That means the test acceptance criteria are statistically adjusted, so they are both valid and legally defensible. This handbook does not discuss the statistical basis, risk factors, or provide the operating characteristic curves for the sampling plans. For information on these subjects, see explanations on "acceptance sampling" in statistical reference books.

c. Why random samples?

A randomly selected sample is necessary to ensure statistical validity and reliable data. This is accomplished by using random numbers to determine which packages are chosen for inspection. Improper collection of sample packages can lead to bias and unreliable results.

d. May audit tests and other shortcuts be used to identify potentially violative lots?

Shortcuts may be used to speed the process of detecting possible net content violations. These audit procedures may include the following: using smaller sample sizes, spot checks using tare lists provided by manufacturers, selecting samples without collecting a random sample. These and other shortcuts allow spot checking of more products than is possible with the more structured techniques, but do not take the place of "Category A" or "Category B" testing.

e. Can audit tests and other shortcuts be used to take enforcement action?

No. Do not take enforcement action using audit test results.

If, after an audit test, there is suspicion that a lot of packages is not in compliance, use the appropriate "Category A" or "Category B" sampling plan to determine if the lot complies with the package requirements.

1.4. Other Regulatory Agencies Responsible for Package Regulations and Applicable Requirements

In the United States, several federal agencies issue regulations regarding package labeling and net contents. The U.S. Department of Agriculture regulates meat and poultry. The Food and Drug Administration (FDA) regulates food, drugs, cosmetic products, and medical devices under the Food, Drug, and Cosmetic Act (FDCA) and the Fair Packaging and Labeling Act (FPLA). The Federal Trade Commission (FTC) regulates most non-food consumer packaged products as part of the agency's responsibility under the FPLA. The Environmental Protection Agency (EPA) regulates pesticides. The Bureau of Alcohol, Tobacco, and Firearms (ATF) in the U.S. Department of the Treasury promulgates regulations for packaged tobacco and alcoholic beverages as part of its responsibility under the Federal Alcohol Administration Act.

Packaged goods produced for distribution and sale also come under the jurisdiction of state and local weights and measures agencies that adopt their own legal requirements for packaged goods. Federal statutes set requirements that pre-empt state and local regulations that are or may be less stringent or not identical to federal regulation depending on the federal law that authorizes the federal regulation. The application of Handbook 133 procedures occurs in the context of the concurrent jurisdiction among federal, state, and local authorities. Therefore, all agencies using this handbook should keep abreast of the revisions to federal agency regulations that may contain sampling or testing information not in the regulations at the time of publication of this handbook. See Appendix A, Table 1-1. "Agencies Responsible for Package Regulations and Applicable Requirements" for information on the responsible agencies for package regulations and the requirements of this handbook must be used when testing products concurrently subject to pre-emptive federal regulations.

1.5. Assistance in Testing Operations

If the storage, display, or location of any lot of packages requires special equipment or an abnormal amount of labor for inspection, the owner or the operator of the business must supply the equipment and/or labor as required by the weights and measures official.

1.6. Health and Safety

This handbook cannot address all of the health and safety issues associated with its use. The inspector is responsible for determining the appropriate safety and health practices and procedures before starting an inspection (e.g., contact the establishment's health and safety official). Comply with all handling, health, and safety warnings on package labels and those contained in any associated material safety data sheets. The inspector must also comply with federal, state, or local health and safety laws or other appropriate requirements in effect at the time and location of the inspection. Contact your supervisor to obtain information regarding your agency's health and safety policies and to obtain appropriate safety equipment.

1.7. Good Measurement Practices

The procedures in this handbook are designed to be technically sound and represent good measurement practices. To assist in documenting tests, we have included "model" inspection report forms designed to record the information.

(1) Traceability Requirements for Measurement Standards and Test Equipment

Each test procedure presented in this handbook includes a list of the equipment needed to perform the inspection. The scales and other measurement standards used (e.g., balances, mass standards, volumetric, and linear measures) to conduct any test must be traceable to the National Institute of Standards and Technology (NIST). Standards must be used in the manner in which they were designed and calibrated for use.

(2) Certification Requirements for Standards and Test Equipment

All measurement standards and test equipment identified in this handbook or associated with the test procedures must be calibrated or standardized before initial use. This must be done according to the calibration procedures and other instructions found on NIST's Laboratory Metrology and Calibration Procedures website at http://ts.nist.gov/WeightsAndMeasures/CalibrationProcedures.cfm or using other recognized procedures (e.g., those adopted for use by a state weights and measures laboratory). After initial certification, the standards must be routinely recertified according to your agency's measurement assurance policies.

Chapter 2. Basic Test Procedure – Gravimetric Testing

2.1. Gravimetric Test Procedure for Checking the Net Contents of Packaged Goods

The gravimetric test method uses weight measurement to determine the net quantity of contents of packaged goods. This handbook includes general test methods to determine the net quantity of contents of packages labeled in terms of weight and special test methods for packages labeled in terms of fluid measure or count. Gravimetric testing is the preferred method of testing most products because it reduces destructive testing while maximizing inspection resources.

2.2. Measurement Standards and Test Equipment

a. What type of scale is required to perform the gravimetric test method?

Use a scale (for this handbook the term "scale" includes balances) that has at least 100 scale divisions. It must have a load-receiving element of sufficient size and capacity to hold the packages during weighing. It also requires a scale division no larger than $^{1}/_{6}$ of the Maximum Allowable Variation (MAV) for the package size being weighed. The MAV/6 requirement is crucial to ensure that the scale has adequate resolution to determine the net contents of the packages. Subsequent references to product test criteria agreeing within one scale division are based on scale divisions that are equal to or only slightly smaller than the MAV/6.

Example: The MAV for packages labeled 113 g (0.25 lb) is 7.2 g (0.016 lb)

(See Appendix A, Table 2-5. "Maximum Allowable Variations (MAVs) for Packages Labeled by Weight."**)**

MAV/6 is 1.2 g (0.002 lb). In this example, a 1 g (0.002 lb) scale division would be the largest unit of measure appropriate for weighing these packages.

b. How often should I verify the accuracy of a scale?

Verify the accuracy of a scale before each initial daily use, each use at a new location, or when there is any indication of abnormal equipment performance (e.g., erratic indications). Recheck the scale accuracy if it is found that the lot does not pass, so there can be confidence that the test equipment is not at fault.

c. Which accuracy requirements apply?

Scales used to check packages must meet the acceptance tolerances specified for their accuracy class in the current edition of NIST Handbook 44 (HB 44) "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices." The tolerances for Class II and Class III digital scales are presented in HB 44, Section 2.20. "Scales."

Note: If the package checking scale is not marked with a "class" designation, use Table 2-1. "Class of Scale" to determine the applicable tolerance.

d. What considerations affect measurement accuracy?

Always use good weighing and measuring practices. For example, be sure to use weighing and measuring equipment according to the manufacturer's instructions and make sure the environment is suitable. Place scales and other measuring equipment (e.g., flasks and volumetric measures) on a rigid support and maintain them in a level condition if being level is a requirement to ensure accuracy.

e. In testing, which tolerances apply to the scale?

Do not use a scale if it has an error that exceeds the specified tolerance in any of the performance tests described in the following section.

Step:

1. Determine the total number of divisions (i.e., the minimum increment or graduation indicated by the scale) of the scale by dividing the scale's capacity by the minimum division.

   Example: A scale with a capacity of 5000 g and a minimum division of 0.1 g has 50 000 divisions.

2. From Table 2-1. "Class of Scale", determine the class of the scale using the minimum scale division and the total number of scale divisions.

   Example: On a scale with a minimum division of 0.1 g and 50 000 total scale divisions the appropriate class of scale is "II."

Note: If a scale is used where the number of scale divisions is between 5001 and 10 000 and the division size is 0.1 g or greater and is not marked with an accuracy Class II marking, Class III scale tolerances apply.

Table 2-1. Class of Scale		
Value of Scale Division[1]	**Minimum and Total Number of Divisions**	**Class of Scale**
1 mg to 0.05 g	At least 100, but not more than 100 000	II
0.1 g or more	More than 5000, but not more than 100 000	II
0.1 g to 2 g 0.000 2 lb to 0.005 lb 0.005 oz to 0.125 oz	More than 100, but not more than 10 000	III
5 g or more 0.01 lb or more 0.25 oz or more	More than 500, but not more than 10 000	III

[1]On some scales, manufacturers designated and marked the scale with a verification division (e) for testing purposes (e = 1 g and d = 0.1 g). For scales marked Class II, the verification division is larger than the minimum displayed division. The minimum displayed division must be differentiated from the verification scale division by an auxiliary reading means such as a vernier, rider, or at least a significant digit that is differentiated by size, shape, or color. Where the verification division is less than or equal to the minimum division, use the verification division instead of the minimum division. Where scales are made for use with mass standards (e.g., an equal arm balance without graduations on the indicator), the smallest mass standard used for the measurement is the minimum division.

Step:

3. Determine the tolerance from Table 2-2. "Acceptance Tolerances for Class of Scale Based on Test Load in Divisions" in divisions appropriate for the test load and class of scale.

   Example: Determine the number of divisions for any test load by dividing the value of the mass standard being applied by the minimum division indicated by the scale. For example, if the scale has a minimum division of 0.1 g and a 1500 g mass standard is applied, the test load is equal to 15 000 divisions (1500/0.1). On a Class II scale with a test load between 10 000 and 20 000 divisions, Table 2-2. "Acceptance Tolerances for Class of Scale Based on Test Load in Divisions" indicates the tolerance is plus or minus one division.

Table 2-2. Acceptance Tolerances for Class of Scale Based on Test Load in Divisions

Test Load in Divisions		
Class II Scale	**Class III Scale**	**Tolerance**
0 to 5000	0 to 500	Plus or Minus 0.5 Division
5001 to 20 000	501 to 2 000	Plus or Minus 1 Division
20 001 or more	2001 to 4000	Plus or Minus 1.5 Divisions
Not Applicable	4001 or more	Plus or Minus 2.5 Divisions

f. Which performance tests should be conducted to ensure the accuracy of a scale?

Use the following procedures to verify the scale. The following procedures, based on those required in NIST Handbook 44, have been modified to reduce the amount of time required for testing scales in field situations.

(1) Increasing-Load Test

Use certified mass standards to conduct an "increasing-load test" with all test loads centered on the load-receiving element. Start the test with the device on zero and progress with increasing test loads to a "maximum test load" of at least 10 percent more than the gross weight of the packages to be tested. Use at least three different test loads of approximately equal value to test the device up to the "maximum test load." Verify the accuracy of the device at each test load. Include the package tare weight as one of the test points.

(2) Decreasing-Load Test

For all types of scales, other than one with a beam indicator or equal-arm balance, conduct a "decreasing-load test" with all test loads centered on the load-receiving element. Use the same test loads used in the "increasing-load test" of this section, and start at the "maximum test load." Remove the test loads in the reverse order of the increasing-load test until all test loads are removed. Verify the accuracy of the scale at each test load.

(3) Shift Test

Bench Scales or Balance use a test load equal to one-~~half~~ **third** of the "maximum test load" used for the "increasing-load test." For bench scales (see Diagram 1. "**Bench Scales or Balance")** ~~place~~ **apply** the test load **as nearly as possible at the center of each quadrant of the load receiving element as shown in Diagram 1. "Bench Scale or Balance."** ~~in the center of four separate quadrants, equidistant between the center and edge of the load-receiving element and~~

For Equal Arm Balances use a test load equal to one-half capacity centered successively at four points positioned equidistance between the center and the front, left, back, and right edges of each pan as shown ~~determine the accuracy in each quadrant for~~**(see Diagram 2.** "**Equal-Arm Balance)**." For example, where the load-receiving element is a rectangular or circular shape, place the test load in the center of the area represented by the shaded boxes in the following diagrams.

Diagram 1. Bench Scales or Balance

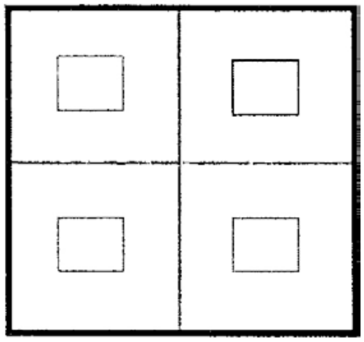
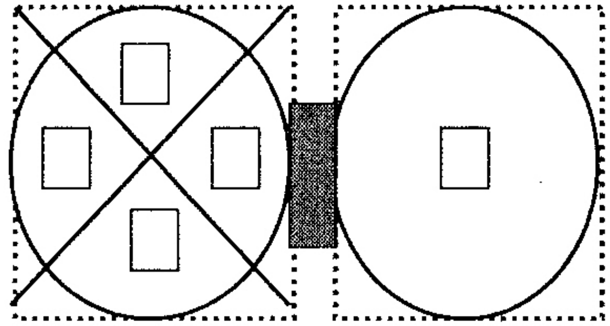


Diagram 2. Equal-Arm Balance



(4) Return to Zero

Conduct the return to zero test whenever all the test weights from the scale are removed; check to ensure that it returns to a zero indication.

g. Which standards apply to other test equipment?

Specifications, tolerances, and other technical requirements for the other measurement standards and test equipment cited in this handbook are specified in the following NIST publications. These publications may be obtained from the Weights and Measures Division (http://www.nist.gov/owm) or the U.S. Government Printing Office.

- Mass Standards – Use NIST Handbook 105-1, “Specifications and Tolerances for Reference Standards and Field Standard Weights and Measures – Field Standard Weights (NIST Class F)” (1990)
- Volumetric Flasks and Cylinders – Use NIST Handbook 105-2, “Specifications and Tolerances for Reference Standards and Field Standard Weights and Measures – Field Standard Measuring Flasks” (1996)
- Stopwatches – Use NIST Handbook 105-5, “Specifications and Tolerances for Reference Standards and Field Standard Weights and Measures – Field Standard Stopwatches” (1997)
- Thermometers – Use NIST Handbook 105-6, “Specifications and Tolerances for Reference Standards and Field Standard Weights and Measures – Specifications and Tolerances for Thermometers” (1997)

2.3. Basic Test Procedure

The following steps apply when gravimetrically testing any type of packaged product except Borax and glazed or frozen foods. If the tested products contain Borax, refer to Section 2.4, “Borax.” If glazed or frozen food is tested, refer to Section 2.6. “Drained Weight for Glazed or Frozen Foods.”

Step:

1. Identify and define the inspection lot.
2. Select the sampling plan.
3. Select the random sample.
4. Measure the net contents of the packages in the sample.
5. Evaluate compliance with the Maximum Allowable Variation (MAV) requirement.
6. Evaluate compliance with the average requirement.

2.3.1. Define the Inspection Lot

The official defines which packages are to be tested and the size of the inspection lot. The lot may be smaller or larger than the production lot defined by the packer. Only take action on the packages contained in the lot that has been defined.

Note: Normally, there will never be access to the entire "production lot" from a manufacturer. The "inspection lot" is selected from packages that are available for inspection/test at any location in the distribution chain.

> **Example:** An inspection lot should consist of all of the cans of a single brand of peach halves, labeled with a net quantity of 453 g (1 lb). When packages are tested in retail stores, it is not necessary to sort by lot code. If lot codes are mixed during retail testing, be sure to record the lot codes for all of the packages included in the sample so that the inspector and other interested parties can follow up on the information. For special reasons, such as a large number of packages or the prior history of problems with the product or store, the inspector may choose to define a lot as only one type of packaged product (e.g., ground beef). Another reason to narrowly define the lot is if the results of an audit test indicate the possibility of a shortage in one particular lot code within a particular product.

h. What is the difference between standard and random weight packages?

Standard packages are those with identical net content declarations such as containers of soda in 2 L bottles and 2.26 kg (5 lb) packages of flour. "Random packages" are those with differing or no fixed patterns of weight, such as packages of meat, poultry, fish, or cheese.

2.3.2. Sampling Plans

a. Where are sampling plans located for "Category A" inspections?

Use Appendix A, Table 2-1. "Sampling Plans for Category A," to conduct "Category A" inspections.

b. Where are sampling plans located for "Category B" inspections?

Use Appendix A, Table 2-2. "Sampling Plans for Category B," to conduct "Category B" inspections.

2.3.3. Basic Inspection Procedure and Recordkeeping

a. How are the specific steps of the Basic Test Procedure documented?

Use an official inspection report to record the inspection information. Attach additional worksheets, test notes, and other information as needed. This handbook provides random and standard packaged products model inspection report forms in Appendix E, "Model Inspection Report Forms." Refer to Appendix E for sample instructions to the complete the forms box numbers. Modify the model reports and the box numbers to meet your agency's needs. Other formats that contain more or less information may be acceptable.

Note: Inspection reports should be legible and complete. Good recordkeeping practices typically include record retention for a specified period of time (e.g., 1 to 3 years).

Step:

1. Record the product identity, packaging description, lot code, location of test, and other pertinent data.

2. Record the labeled net quantity of contents in Box 1. Record both metric and inch-pound declarations if they are provided on the package label.

   Example: If the labeled weight is 453 g (1 lb), record this in Box 1.

3. When the declaration of net quantity on the package includes both the International System of Units (SI) (metric) and inch-pound units, the larger of the two declarations must be verified. The rounding rules in NIST Handbook 130, "Uniform Packaging and Labeling Regulations" permit packers to round declarations up or down based on their knowledge of their package filling targets and the accuracy of packaging equipment.

   Determine the larger of the values by converting the SI declaration to inch-pound units, or vice versa, using conversion factors that are accurate to at least six places. Compare the values, and use the larger value in computing the nominal gross weight (see later steps). Indicate on the report which of the declarations is being verified when packages labeled with two units of measure are encountered.

   Example: If the net weight declared on a package is 1 lb, the metric equivalent (accurate to six significant digits) is 453.592 g. Do not round down or truncate values in the calculations until the nominal gross weight is determined and recorded. If the package is also labeled 454 g, then the metric declaration is larger than the inch-pound declaration and should be used to verify the net contents of the package. The Basic Test Procedure does not prohibit the use of units of weight instead of dimensionless units when recording package errors, nor does it prohibit the use of net content computer programs to determine product compliance. Record the unit of measure in Box 2. The unit of measure is the minimum division of the unit of measurement used to conduct the test. If a scale is used that reads to

Step:

thousandths of a pound, the unit of measure is 0.001 lb even if the scale division is 0.002 lb or 0.005 lb.

Example: If the scale has a scale division of 0.5 g, the unit of measure is 0.1 g. If a weighed package that has an error of "−0.5 g," record the error as "−5" using "dimensionless units." If the scale indicates in increments of 0.002 lb, the unit of measure is 0.001 lb. If a weighed package has an error of "+0.016," record the error as "+16" using "dimensionless units." When using dimensionless units, multiply package errors by the unit of measure to obtain the package error in weight.

4. Enter the appropriate MAV value in Box 3 for the type of package (weight, volume, etc.), the labeled net contents, and the unit of measure.

b. Where are Maximum Allowable Variations found?

Find the MAV values for packages labeled by weight, volume, count, and measure in the tables listed below in Appendix A.

- packages labeled by weight — See Table 2-5.
- packages labeled by volume, liquid or dry — See Table 2-6.
- packages labeled by count — See Table 2-7.
- packages labeled by length, (width), or area — See Table 2-8.
- packages bearing a USDA seal of inspection – Meat and Poultry — See Table 2-9.
- textiles, polyethylene sheeting and film, mulch and soil labeled by volume, packaged firewood, and packages labeled by count with fewer than 50 items — See Table 2-10.

c. How is the value of an MAV found?

Refer to the appropriate table of MAVs and locate the declared quantity that is on the package label in the column marked "Labeled Quantity." Read across the table to find the value in the column titled "Maximum Allowable Variation." Record this number in Box 3. Determine the MAV in dimensionless units and record in Box 4 on the Standard Package Report Form (a dimensionless unit is obtained by dividing the MAV recorded in Box 3 by the unit of measure recorded in Box 2). Refer to Appendix C. "Glossary," for the definition of dimensionless units.

d. How many ~~MAVs~~ <u>unreasonable minus errors (UME's)</u> are permitted in a sample?

To find out how many minus package errors are permitted to exceed the MAV**<u>, (errors known as unreasonable minus errors or UME's),</u>** ~~(refer to Appendix A)~~ see Column 4 in either Table 2-1. "Sampling Plans for Category A" or Table 2-2. "Sampling Plans for Category B." **<u>(refer to Appendix A)</u>** Record this number in Box 8.

2.3.4. Random Sample Selection

a. How are sample packages selected?

Randomly select a sample from the inspection lot. Random number tables (see Appendix B. "Random Number Tables") or a calculator that is able to generate random numbers may be used to identify the sample. If the packages for the sample are not randomly selected, the test results may not be statistically valid.

Note: If the inspector and the party that is ultimately responsible for the packing and declaration of net weight for the product agree to an alternative method of sample selection, document how the sample packages were selected as part of the inspection record.

b. How is the size of the "Lot" determined?

Count the number of packages comprising the inspection lot or estimate the size to within 5 % and record the inspection lot size in Box 5.

c. How is the sample size determined?

Refer to Appendix A. Table 2-1. "Sampling Plans for Category A" or Table 2-2. "Sampling Plans for Category B" to determine the sample size. In Column 1, find the size of the inspection lot (the number recorded in Box 5 of the report form). Read across from Column 1 to find the appropriate sample size in Column 2 and record this number in Box 6 of the report form.

2.3.5. Tare Procedures

a. What types of tare may be used to determine the net weight of package goods?

This handbook defines three types of tare for the inspection of packaged goods. The tare weight may vary considerably from package to package as compared with the variability of the package net contents, even for packages in the same production lot. Although this is not common for most packaging, the basic test procedure in this handbook considers the variation for all tare materials.

(1) Used Dry Tare

Used Dry Tare is defined as follows: Used tare material that has been air dried, or dried in some manner to simulate the unused tare weight. It includes all packaging materials that can be separated from the packaged product, either readily (e.g., by shaking) or by washing, scraping, ambient air drying, or other techniques involving more than "normal" household recovery procedures, but not including laboratory procedures like oven drying. Labels, wire closures, staples, prizes, decorations, and such are considered tare. Used Dry Tare is available regardless of where the packages are tested. The net content procedures described in this handbook reference Used Dry Tare.

Note: When testing frozen foods with the Used Dry Tare approach, the frost found inside frozen food packages is included as part of the net contents.

WWMA	Change note above
Note: When testing frozen foods with the Used Dry Tare approach, the frost found inside frozen food packages is included as part of the net contents, **excepting instances in which glazed or frozen foods are tested according to Section 2.6. Drained Weight for Glazed or Frozen Foods.**	
Note from California: There seems to be a conflict between this note and Section 2.6. Drained Weight for Glazed and frozen Food. If 2.6. applies to frozen food, when would there be an instance to use used dry tare? Please see our comment on Section 2.6.	

(2) Unused Dry Tare

If testing packages in retail store locations where they are packaged, and sold in small quantities to the ultimate consumers, the basic test procedure may be modified by using samples of the packaging material available in the store. Unused dry tare is defined as:

All unused packaging materials (including glue, labels, ties, etc.) that contain or enclose a product. It includes prizes, gifts, coupons, or decorations that are not part of the product.

(3) Wet Tare

Wet tare procedures must not be used to verify the labeled net weight of packages of meat and poultry packed at an official United States Department of Agriculture (USDA) facility and bearing a USDA seal of inspection**. The Food Safety and Inspection Service (FSIS) adopted specific sections of the 2005 4th Edition of NIST HB 133 by reference but not the "wet tare" method for determining net weight compliance. FSIS considers the free-flowing liquids in packages of meat and poultry products, including single-ingredient, raw poultry products, to be integral components of these products (see Federal Register, September 9, 2008 [Volume 73, Number 175] [Final Rule – pages 52189-52193]).**

If the jurisdiction uses wet tare to determine net weight, follow the procedures described below that reference Used Dry Tare, except make no effort to dry the tare material. If Wet Tare is used to verify the net weight of packages ~~of fresh poultry, hot dogs, and franks that are subject to the USDA regulations~~, the inspector must allow for moisture loss. Wet Tare is defined as: Used tare material where no effort is made to dry the tare material. Free-flowing liquids are considered part of the tare weight.

b. How is a tare weight determined?

Except in the instance of applying unused dry tare, select the packages for the initial tare sample from the sample packages. Mark the first two (three or five) packages in the order the random numbers were selected; these packages provide the initial tare sample. Determine the gross weight of each package and record it in Block a, "Gross Wt," under the headings "Pkg. 1," "Pkg. 2," "Pkg. 3," etc. on the report form. Except for aerosol or other pressurized packages, open the sample packages, empty, clean, and dry them as appropriate for the packaging material.

WWMA	The following two questions and answers appear out of place. We suggest moving them behind the next two questions.
Does the inspection of aerosol containers require special procedures? How is the tare of vacuum-packed coffee determined?	

c. Does the inspection of aerosol containers require special procedures?

Yes, aerosol containers are handled differently for two reasons. First, regulations under the Uniform Packaging and Labeling Regulation (UPLR) in NIST HB 130 require that packages designed "to deliver" the product under pressure, "must state the net quantity of the contents that will be expelled when the instructions for use as shown on the container are followed." This means that any product retained in aerosol containers after full dispersion is included in the tare weight. Second, aerosol containers must not be opened because they are pressurized; for safety reasons they should not be punctured or opened. When emptying aerosol containers to determine a tare weight, exhaust them in a well-ventilated area (e.g., under an exhaust hood or outdoors) at least 15 m (50 ft) from any source of open flame or spark.

To ensure that the container properly dispenses the product, read and follow any dispensing instructions on the package. If shaking during use is specified in the instructions, periodically shake (at least two or three times during expulsion of the product). If directions are not given, shake the container five times with a brisk wrist twisting motion. If the container has a ball agitator, continue the shaking procedure for one minute after the ball has shaken loose.

d. How is the tare of vacuum-packed coffee determined?

The gross weight of a can of vacuum-packed coffee will be more after the seal is broken and air enters the can. In the procedure to determine the tare weight of the packaging material, correct the gross weight determined for unopened cans as follows. Use the initial tare sample packages, weigh, and record the gross weight of the product-filled cans before and after breaking the vacuum seal. Compute the average gross weight difference (open weight minus sealed weight) and record this in Box 13a of the report form. The nominal gross weight equals the average tare weight minus the average difference in gross weights plus the labeled weight (Box 14): Box 13 − Box 13a + Box 1.

e. How is it determined <u>on</u> how many packages to select for the initial tare sample?

For the initial tare sample size, see Column 5 under initial tare sample size in Appendix A. Table 2-1. "Sampling Plans for Category A" or Column 3 under initial tare sample size in Appendix A, Table 2-2. "Sampling Plans for Category B**.**" Record the initial tare sample size in Box 7 on the report form.

Note: The initial tare sample size is considered the total tare sample size when the sample size is less than 12.

f. How are the tare sample and the tare weight of the packaging material determined?

Step:

1. Except for unused dry tare at the point-of-pack, first determine the tare weight for each package in the initial tare sample and record the value in Row b, "Tare Wt." under the appropriate package number column.

Step:

2. For sample sizes of 12 or more, subtract the individual tare weights from the **respective package** gross weights (Block a, minus Block b, on the report form) to obtain the net weight for each package and record ~~these~~ **each** value~~s~~ in Block c, "Net Wt.," on the report form.

   Determine and record the "range of package errors" (called Rc) for the initial tare sample in Box 9 on the report form. (The range is the difference between the package errors.) (Amended 2002)

3. Determine and record the "range of tare weights" (called Rt) in Box 10.

4. Compute the ratio Rc/Rt by dividing the value in Box 9 by the value in Box 10. Record the resulting value in Box 11. (Rc and Rt must both be in the same unit of measure or both in dimensionless units.)

5. Determine and record in Box 12 the total number of packages to be opened for the tare determination from either Appendix A. Table 2-3. "Category A – Total Number of Packages to be Opened for or Table 2-4. "Determination – Number Include those Packages Opened for Initial Tare Sample."

   - In the first column (titled Ratio of R_c/R_t), locate the range in which the computed R_c/R_t falls. Then, read across to the column headed with the appropriate sample size.
   - If the total number of packages to open equals the number already opened, go to step 6.
   - If the total number of packages to open is greater than the number of packages already opened, compute the number of additional packages to open for the tare determination and go to step 6. Enter the total number of tare samples in Box 12.

6. Determine the average tare weight using the tare weight values for all the packages opened and record the average tare weight in Box 13.

WWMA	
The following two questions and answers that appear above should be placed here. {*Does the inspection of aerosol containers require special procedures?* *How is the tare of vacuum-packed coffee determined?*}	

g. When and where is unused dry tare used, and how is it used to determine an average tare weight?

You may determine the average tare weight using samples of unused dry tare when testing meat, poultry, or any other products that are not subject to regulation of the Food and Drug Administration (FDA). You may use unused dry tare samples when conducting inspections at locations where the point-of-pack and sale are identical (e.g., store-packed products in a supermarket meat case). To determine unused dry tare at the point-of-sale, randomly select two (2) samples of unused dry tare, and weigh each separately. If there is no measurable variation in weight between the samples, proceed with the test using the weight of one of the samples. If the weight of the two (2) initial samples, randomly select three (3) additional tare samples and determine the average weight of all five (5) samples. Use this value as the average tare weight.

(Amended 2002)

2.3.6. Determine Nominal Gross Weight and Package Errors for Tare Sample

a. ~~What is~~ <u>How do I compute</u> a nominal gross weight?

A nominal gross weight is used to simplify the calculation of package errors. To compute the nominal gross weight, add the average tare weight (recorded in Box 13) to the labeled weight (recorded in Box 1). ~~To obtain the package error, subtract a package's gross weight from the nominal gross weight.~~

The nominal gross weight is represented by the formula:

Nominal gross weight = average tare + labeled weight

b. How do I compute the package error?

<u>**To obtain the package error, subtract the nominal gross weight from each package's gross weight. The package error is represented by the formula:**</u>

<u>**Package error = gross weight − nominal gross weight**</u>

c. How are individual package errors determined for the tare sample packages?

Determine the errors of the packages opened for tare by subtracting the nominal gross weight recorded in Box 14 from the individual package gross weights recorded for each package (Pkg 1, Pkg 2, etc.) in Block a, "Gross Wt." The nominal gross weight must be used, rather than the actual net weight, for each package to determine the package error. This ensures that the same average tare weight is used to determine the error for every package in the sample, not just the unopened packages.

- **Standard Packages.** – Record the package error in the appropriate plus or minus column on the report form for each package opened for tare.

- **Random Packages.** – Determine the package error for the tare sample using a nominal gross weight for each package so that all of the package errors are determined with the same tare weight value. Record the package error on the Random Package Report Form in the appropriate plus or minus column under Package Errors.

  Note: Converting the package error to dimensionless units allows the inspector to record the package errors as whole numbers disregarding decimal points and zeroes in front and unit of measure after the number.

  Example: If weighing in 0.001 lb increments, the unit of measure is also 0.001 lb. If the package error for the first package opened for tare is +0.008 lb, instead of recording 0.008 lb in the plus column, record the error as "8" in the plus column. If the second package error is +0.060 lb, record the package error as "60" in the plus column, and so on. (This section does not prohibit the use of units of weight or computer programs instead of dimensionless units.)

d. How are individual package errors determined for the other packages in the sample?

Compare the gross weight of each of the unopened sample packages with the nominal gross weight (Box 14). Record the package errors in the "Package Errors" section of the report form using either units of weight (lb or g) or dimensionless units.

e. How is the total package error computed?

Add all the package errors for the packages in the sample. Be sure to subtract the minus package errors from the plus package errors and to record the total net error in Box 15**, indicating the positive or negative value of the error.**

2.3.7. Evaluating Results

a. How is it determined if a sample passes or fails?

The following steps lead the inspector through the process to determine if a sample passes or fails. If the product is subject to moisture allowance, follow the procedures under "Moisture Allowances" in this chapter to correct the MAV.

b. How is it determined if packages exceed the Maximum Allowable Variation?

Compare each minus package error with the MAV recorded in Box 3 or Box 4 (if using dimensionless units). Circle the package errors that exceed the MAV. These are "unreasonable errors." Record the number of unreasonable minus errors found in the sample in Box 16.

c. How is it determined if the negative package errors in the sample exceed the number of MAVs allowed for the sample?

Compare the number in Box 16 with the number of unreasonable errors allowed (recorded in Box 8). If the number found exceeds the allowed number, the lot fails. Record in Box 17 whether the number of unreasonable errors found is less or more than allowed.

Note: If the total error recorded in Box 15 is a plus value and Box 17 is "No," then the number of unreasonable errors is equal to or less than the number allowed (recorded in Box 8) and the lot passes.

d. How is the average error of the sample determined and does the inspected lot pass or fail the average requirement?

Determine the average error by dividing the total error recorded in Box 15 by the sample size recorded in Box 6. Record the average error in Box 18 if using dimensionless units or in Box 19 if using units of weight. Compute the average error in terms of weight (if working in dimensionless units up to this time) by multiplying the average error in dimensionless units by the unit of measure and record the value in Box 19.

Step:

1. If the average error is positive, the inspection lot passes the average requirement.

2. If the average error is negative, the inspection lot fails under a "Category B" test. Record in Box 20.

3. If the average error is a negative value when testing under the Sampling Plans for "Category A," compute the Sample Error Limit (SEL) as follows:

   - Compute the Sample Standard Deviation and record it in Box 21.

   - Obtain the Sample Correction Factor from Column 3 of Appendix A. Table 2-1. "Sampling Plans for Category A" ~~test~~. Record this value in Box 22.

   - Compute the Sample Error Limit using the formula:

     Sample Error Limit (Box 23)
     = Sample Standard Deviation (Box 21) x Sample Correction Factor (Box 22)

4. Compliance Evaluation of the Average Error:

   - If the value of the Average Error (Box 18) is smaller than the SEL (Box 23), the inspection lot passes.

   - If the value of the Average Error (disregarding the sign) (Box 18) is larger than the SEL (Box 23), the inspection lot fails. However, if the product is subject to moisture loss, the lot does not necessarily fail. Follow the procedures under "Moisture Allowances" in this chapter.

2.3.8. Moisture Allowances

a. How is reasonable moisture loss allowed?

If the product tested is subject to moisture loss, provide for the moisture allowance by following the steps listed below.

Determine the value of the moisture allowance if the product is listed below.

b. What are the moisture allowances for flour, ~~and~~ dry pet food, <u>and other products?</u> (See Table 2-3. "Moisture Allowances.")

WWMA	Change the title of Table 2-3.
Table 2-3. Moisture Allowances **<u>for Product in Distribution</u>**	

Table 2-3. Moisture Allowances		
If you are verifying the labeled net weight of packages of:	**The Moisture Allowance is:**	**Notes**
Flour	**3 %**	
Dry pet food	**3 %**	**Dry pet food means all extruded dog and cat foods and baked treats packaged in Kraft paper bags and/or cardboard boxes with a moisture content of 13 % or less at time of pack.**
Borax	**See Section 2.4.**	
Wet Tare Only		
If you are using Wet Tare in verifying the net weight of packages of one of the products listed below:	**The Moisture Allowance is:**	**Notice: Wet Tare must not be used in testing packages of meat and poultry subject to USDA regulations.**
Fresh poultry	**3 %**	**Fresh poultry is defined as poultry at a temperature of 3 °C (26 °F) that yields or gives when pushed with the thumb.**
Franks or hot dogs	**2.5 %**	
Bacon, fresh sausage, and luncheon meats	**0 %**	**For packages of bacon, fresh sausage, and luncheon meats, there is no moisture allowance if there is no free-flowing liquid or absorbent materials in contact with the product and the package is cleaned of clinging material. Luncheon meats are any cooked sausage product, loaves, jellied products, cured products, and any sliced sandwich-style meat. This does not include whole hams, briskets, roasts, turkeys, or chickens requiring further preparation to be made into ready-to-eat sliced product. When there is no free-flowing liquid inside the package and there are no absorbent materials in contact with the product, Wet Tare and Used Dried Tare are equivalent.**

~~**The moisture allowance for flour and dry pet food is 3 % of the labeled net weight.**~~

~~**Note: Dry pet food means all extruded dog and cat foods and baked treat products packaged in Kraft paper bags and/or cardboard boxes with a moisture content of 13 % or less at the time of pack.**~~

c. What moisture allowance is used with Used Dry Tare when testing packages that bear a USDA Seal of Inspection?

There is no moisture allowance when inspecting meat and poultry from a USDA inspected plant when Used Dry Tare and a "Category A" sampling plan are used.

d. What moisture allowance is used with wet tare? ~~when testing packages bearing a USDA seal of inspection?~~

Wet tare procedures must not be used to verify the labeled net weight of packages of meat and poultry packed at an official United States Department of Agriculture and bearing a USDA seal of inspection. The Food Safety and Inspection Service (FSIS) adopted specific sections of the 2005 4th Edition of NIST HB 133 by reference but not the "wet tare" method for determining net weight compliance. FSIS considers the free-flowing liquids in packages of meat and poultry products, including single-ingredient, raw poultry products, to be integral components of these products (see Federal Register, September 9, 2008 [Volume 73, Number 175] [Final Rule – pages 52189-52193]).

See Table 2-3. "Moisture Allowances – Wet Tare Only."

- ~~**Use the following guideline when testing meat and poultry from any USDA inspected plant using Wet Tare and a Category A sampling plan.**~~
- ~~**For packages of fresh poultry that bear a USDA seal of inspection, the moisture allowance is**~~
- ~~**3 5 of the labeled net weight. For net weight determinations, only, fresh poultry is defined as poultry above -3 ºC (26 ºF). This is a product that yields or gives when pushed with the thumb.**~~
- ~~**For packages of franks or hotdogs that bear a USDA seal of inspection, the moisture allowance is 2.5 % of the labeled net weight.**~~
- ~~**For packages of bacon, fresh sausage, and luncheon meats that bear a USDA seal of inspection, there is no moisture allowance if there is no free-flowing liquid or absorbent materials in contact with the product and the package is cleaned of clinging material. Luncheon meats are any cooked sausage product, loaves, jellied products, cured products, and any sliced sandwich-style meat. This does not include whole hams, briskets, roasts, turkeys, or chickens requiring further preparation to be made into ready-to-eat sliced product. When there is no free-flowing liquid inside the package and there are no absorbent materials in contact with the product, Wet Tare and Dried Used Tare are equivalent.**~~

When there is free-flowing liquid **and liquid** ~~or absorbent~~ **absorbed by** packaging materials in contact with the product, all free liquid is part of the wet tare.

WWMA	Change the title to read as follows:
When there is free-flowing liquid **and liquid** ~~or absorbent~~ **absorbed by** packing materials in contact with the products, all free liquid **and the absorbed liquid** is part of the wet tare.	

e. How is moisture loss handled for products not listed in NIST Handbook 133

Kraft: Paul Hoffman (7/09)	Change the title to read as follows:
e. How is moisture loss… "Moisture loss must be considered even when no formal allowance for the specific product is found in HB 133."	

WWMA	Remove Section 2.3.8.e. in its entirety
Remove line item 30 Section 2.3.8.e. "How is moisture loss handled for products not listed in HB 133" in its entirety and retain as a developmental item with future work to be done by the MLWG.	

Officials can test products for which no moisture loss guidance has been provided. If studies are a necessity they should be a collaborative effort between officials and industry. Because of the potential impact on interstate commerce, studies should be completed on a nationwide basis and not by individual jurisdictions unless circumstances justify only local consideration.

The amount of moisture loss from a package is a function of many factors, not the least of which is the product itself (e.g., moisture content, texture and density), packaging, storage conditions (e.g., temperature, humidity, and air flow), time, handling and others. If a packaged product is subject to moisture loss, officials must allow for "reasonable" variations caused by moisture either evaporating or draining from the product. Officials can not set arbitrary moisture allowances based solely on their experience or intuition. Moisture allowances must be based on scientific data and must be "reasonable." Reasonable does not mean that all of the weight loss caused by moisture evaporation or draining from the product must be allowed. As a result of product and moisture variability, the approach used by an official must be developed on a case-by-case basis depending on many factors to include, but not be limited to, the manufacturing process, packaging materials, distribution, environmental influence and the anticipated shelf life of the product.

NIST Handbook 130 provides a starting point for developing a workable procedure in the Interpretation and Guideline Section 2.5.6. regarding "Resolution for Requests for Recognition of Moisture Loss in Other Packaged Products." Most studies involving nationally distributed products will require that products be tested during different seasons of the year and in different geographic locations to develop a nationally recognized moisture allowance. Some studies may require the development of laboratory tests used for inter-laboratory comparisons to establish moisture content in products at time of pack or at the time of inspection.

Moisture loss or gain is a critical consideration for any net content enforcement effort and one that, in most cases, cannot be addressed solely by a field official. If moisture loss issues are to be deliberated, it is the regulatory official's responsibility to resolve the packer's concern utilizing available resources and due process procedures. To fulfill this obligation the official may be required to utilize specialized test equipment and specific laboratory procedures. Additionally, the collection of adequate test data may require product examination over a broad geographical area and consideration of a wide range of environmental factors. If a national effort is required, a coordinated effort involving industry, trade associations, weights and measures officials, and federal agencies may be required. NIST will provide technical support upon request. If studies

are a necessity, they should be a collaborative effort between officials and industry and can be very time consuming depending on the product. Because of the potential impact on interstate commerce, studies must be completed on a nationwide basis and not by individual jurisdictions unless circumstances justify only local consideration.

2.3.9. Calculations

a. How is moisture allowance computed and applied~~ to the average error~~?

To compute moisture allowance, multiply the labeled quantity by the decimal percent value of the allowance.

Example: Labeled net quantity of flour is 907 g (2 lb)

Moisture Allowance is 3 % (0.03)

Moisture Allowance = 907 g (2 lb) x 0.03 = 27 g (0.06 lb)

Record this value in Box 13a.

WWMA	Based on previous comments, we suggest removing the question and answer below.
{How is a Moisture Allowance made prior to determining the package errors?}	

b. How is a Moisture Allowance made prior to determining package errors?

If the Moisture Allowance is known in advance (e.g., flour and dry pet food), it can be applied by adjusting the Nominal Gross Weight (NGW) used to determine the sample package errors. The Moisture Allowance (MA) in Box 13a is subtracted from the NGW. The NGW which is the sum of the Labeled Net Quantity of Contents (LNQC e.g., 907 g) and the Average Tare Weight from Box 13 (for this example use an ATW of 14 g (0.03 lb)) to obtain an Adjusted Nominal Gross Weight (ANGW) which is entered in Box 14.

The calculation is:

LNQC 907 g (2 lb) + ATW 14 g (0.03 lb) = 921 g (2.03 lb) - MA 27 g (0.06 lb) = ANGW of 918 g (1.97 lb)

which is entered in Box 14.

Package errors are determined by subtracting the ANGW from the Gross Weights of the Sample Packages (GWSP).

The calculation is:

GWSP – ANGW = Package Error

Note: When the NGW is adjusted by subtracting the Moisture Allowance value(s) the Maximum Allowable Variation(s) is not changed. This is because the errors that will be found in the sample

packages have been adjusted by subtracting the Moisture Allowance (e.g., 3 %) from the NGW. That increases the individual package errors by the amount of the moisture allowance (e.g., 3 %). If the value(s) of the MAV(s) were also adjusted it would result in doubling the allowance.

c. How is a Moisture Allowance made after determining package errors?

You can make adjustments when the value of the Moisture Allowance is determined following the test (e.g., after the sample fails or if a packer provides a reasonable moisture allowance based on data obtained using a scientific method) using the following approach:

If the sample fails the Average and/or the Individual Package Requirements, both of the following steps are applied.

If the sample fails the Average Requirement but has no unreasonable package errors, only step 1 is used. If the sample passes the Average Requirement but fails because the sample included one or more Unreasonable Minus Errors (UMEs), only step 2 is used.

Step:

1. **Use the following approach to apply a Moisture Allowance to the sample after the test is completed. The Moisture Allowance (MA) is computed (e.g., 3 % x 907 g (2 lb) = 27 g (0.06 lb) and added to the Sample Error Limit (e.g., if the SEL is 0.023 add 0.06 to obtain an Adjusted SEL of 0.083). The ASEL (Adjusted Sample Error Limit) is then compared to the Average Error of the Sample and:**

   - **If the average error (disregarding sign) in Box 18 is smaller than the ASEL, the sample passes.**

   HOWEVER,

   - **If the average error (disregarding sign) in Box 18 is larger than the ASEL, the sample fails.**

2. **If a Moisture Allowance is to be applied to the Maximum Allowable Variation(s), the following method is recommended:**

   The Moisture Allowance (MA) is computed (e.g., 3 % x 907 g (2 lb) = 27 g (0.06 lb) and added to the value of the Maximum Allowable Variation(s) for the labeled net quantity of the package (e.g., MAV for 907 g (2 lb) is 31.7 g (0.07 lb) + 27 g (0.06 lb) = AMAV of 58.7 g). Compare each minus package error to the AMAV. Mark package errors that exceed the AMAV and record the number of UME's found in the sample. If this number exceeds the number of unreasonable errors allowed, the sample fails.

~~**How is the Maximum Allowable Variation corrected for the moisture allowance?**~~

- ~~**Adjust the MAV by adding the moisture allowance to the MAV.**~~

  ~~**Example: 907 g (2 lb) package of flour: moisture allowance added to the MAV = 31.7 g (0.07 lb) (MAV for 907 g [2 lb] package) + 27 g (0.06 lb) moisture allowance = a corrected MAV of 58.7 g (0.13 lb)**~~

- ~~**Correct MAV in dimensionless units by converting the moisture allowance to dimensionless units = 0.06 lb ÷ 0.001 lb = 60. Go to Box 4 and add the moisture allowance in dimensionless units to the MAV in dimensionless units.**~~

  ~~**Example: MAV = 70 (MAV for 2 lb where the unit of measure = 0.001 lb) + 60 (moisture allowance in dimensionless units) = 130. Minus package errors must exceed the MAV ± gray area before they are declared "unreasonable errors."**~~

- ~~**If the number of unreasonable errors exceeds the allowed number (recorded in Box 8), the inspection lot fails.**~~

~~**How is the average error for the moisture allowance corrected?**~~

~~**If the minus average error (Box 18) is larger (disregarding the sign) than the SEL (Box 23) and moisture loss applies, compare the difference between Box 18 and Box 23 with the moisture allowance recorded in Box 13a. (Make sure that all the values are in units of weight or in dimensionless units before making this comparison.) If Box 13a is larger than the difference between Box 18 and 23, then the lot is considered to be in the gray area.**~~

> ~~**Example: Box 13a for 2 lb flour is 60 (dimensionless units); Box 18 is 2 (dimensionless units); Box 23 is 0.550 (dimensionless units). The difference between Box 18 and Box 23 is 1.450 (dimensionless units). Since Box 13a is 60 (dimensionless units), Box 13a is larger than the difference between Box 18 and Box 23, the lot is considered to be in the gray area and further investigation is necessary before ruling out moisture loss as the reason for shortweight.**~~

d. What should you do when a sample is in the moisture allowance (gray) area?

When the average error of a lot of fresh poultry, franks, or hot dogs ~~**from a USDA-inspected plant**~~ is minus, but does not exceed the established "moisture allowance" or "gray area," contact the ~~**appropriate USDA official and/or**~~ **packer or** plant management personnel to determine what information is available on the lot in question. Questions to the ~~**USDA official and/or**~~ plant management representative may include:

- Is a quality control program in place?
- What information is available concerning the lot in question?
- If net weight checks were completed, what were the results of those checks?
- What adjustments, if any, were made to the target weight?

Note: If ~~**USDA or**~~ the plant management has data on the lot, such data may help to substantiate that the "lot" **had** met **the** net content requirements at the point of manufacture.

This handbook provides "moisture allowances" for some meat and poultry products, flour, and dry pet food. These allowances are based on the premise that when the average net weight of a sample is found to be less than the labeled weight, but not by an amount that exceeds the allowable limit, either the lot is declared to be within the moisture allowance or further investigation can be conducted.

Reasonable deviations from net quantity of contents caused by the loss or gain of moisture from the package are permitted when caused by ordinary and customary exposure to conditions that occur under good distribution practices. If evidence is obtained and documented to prove that the lot was shipped from the packaging plant in a short-weight condition or was distributed under inappropriate or damaging distribution practices, appropriate enforcement action should be taken.

(Amended 2002)

2.4. Borax

a. How is it determined if the net weight labeled on packages of borax is accurate?

Use the following procedures to determine if packages of borax are labeled correctly. This procedure applies to packages of powdered or granular products consisting predominantly (more than 50 %) of borax. Such commodities are labeled by weight, but borax can lose more than 23 % of its weight due to moisture loss. However, it does not lose volume upon moisture loss, and this property makes possible a method of volume testing based on a density determination in the event that the net weight of the product does not meet the average or individual package requirements. This method may be used for audit testing to identify possible short-filling by weight at point-of-pack. Since the density of these commodities can vary at point-of-pack, further investigation is required to determine whether, such short-filling has occurred.

Test Equipment

- Metal density cup with a capacity of 550.6 mL or (1 dry pint)
- Metal density funnel with slide-gate and stand
- Scale or balance having a scale division not larger than 1 g or (0.002 lb)
- Rigid straightedge or ruler
- Pan suitable for holding overflow of density cup

Test Procedure

Follow Section 2.3. "Basic Test Procedures – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following test procedure to determine product compliance.

Step:

1. If the lot does not comply by weight with the sampling plan requirements (either the average or individual package requirements), select the lightest package and record the net weight of this package.

2. Determine the weight of the density cup.

3. Place the density cup in the pan and put the funnel on top of the density cup. Close the funnel slide-gate.

Step:

4. Pour sufficient commodity into the funnel so that the density cup can be filled to overflowing.

5. Quickly remove the slide-gate from the funnel, allowing the commodity to flow into the density cup.

6. Carefully, without agitating the density cup, remove the funnel and level off the commodity with the ruler or straightedge. Hold the ruler or straightedge at a right angle to the rim of the cup, and carefully draw it back across the top of the density cup to leave an even surface.

7. Weigh the filled density cup. Subtract the weight of the density cup from the gross weight of the commodity plus the density cup to obtain the net weight of commodity in the cup.

b. How is the volume determined?

Step:

1. Multiply the net weight (in pounds) as found for the package under test by 550.6.

2. Divide the answer just obtained by the weight of the commodity in the density cup, step 7. The result is the net volume of commodity in the package in milliliters.

3. Compare the net volume of the commodity in the package with the volume declared on the package. The volume declaration **must not** ~~is not located~~ **appear** on the principal display panel. **Instead, it will appear on the back or side of the package and may appear as:** ~~**The following example is how the declaration of volume should appear.**~~

Volume ____ cm^3 per NIST
Handbook 133

Note: (1 mL = 1 cm^3)

c. What action can be taken based on the results of the density test?

If the net volume of commodity in the lightest package equals or exceeds the declared volume on the package, treat the lot as being in compliance based on volume and take no further action. If the net volume of borax in the lightest package is less than the declared volume on the package, further compliance testing will be necessary. Take further steps to determine if the lot was in compliance with net weight requirements at point-of-pack or was short-filled by weight. To determine this, perform a laboratory moisture loss analysis to ascertain the weight of the original borax product when it was fully hydrated; obtain additional data at the location of the packager; and/or investigate the problem with the packager of the commodity.

2.5. The Determination of Drained Weight

Since the weight per unit volume of a drained product is of the same order of magnitude as that of the packaging liquid that is drained off, an "average nominal gross weight" cannot be used in checking packages of this type. The entire sample must be opened. The procedure is based upon a test method accepted by the U.S. Food and Drug Administration.

A tare sample is not needed because all the packages in the sample will be opened and measured.

The weight of the container plus drained-away liquid is determined. This weight is then subtracted from the gross weight to determine the package error.

Test Equipment

- Scales and weights recommended in Section 2.2. "Measurement Standards and Test Equipment" are suitable for the determination of drained weight.

- Sieves

  - For drained weight of 1.36 kg or (3 lb) or less, one 20 cm or (8 in) No. 8 mesh U.S. Standard Series sieve, receiving pan, and cover

  <u>HOWEVER</u>

  - For drained weight greater than 1.36 kg or (3 lb), one 30 cm or (12 in) sieve, with same specifications as above
  - <u>**For canned tomatoes a U.S. Standard test sieve with 11.2 mm ($^{7}/_{16}$ in) openings must be used**</u>

- Stopwatch

Test Procedure

Follow the Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" or a "Category B" sampling plan in the inspection (depending on the location of test); select a random sample; then use the following test procedure to determine lot compliance.

Step:

1. Use Appendix E. "Standard Pack Inspection Report." Fill out Boxes 1 through 8. Select the random sample. Determine and record on a worksheet the weight of the receiving pan.

2. Determine and record on a worksheet the gross weight of each individual package comprising the sample.

3. Pour the contents of the first package into the dry sieve with the receiving pan beneath it, incline sieve to an angle between 17°to 20° from horizontal to facilitate drainage, and allow the liquid from the product to drain into receiving pan for 2 minutes. (Do not shake or shift material on the sieve.) Remove sieve and product.

4. Weigh the receiving pan, liquid, wet container, and any other tare material. (Do not include sieve and product.) Record this weight as tare and receiving pan.

5. Subtract the weight of the receiving pan, determined in step 1, from the weight obtained in step 4 to obtain the package tare weight (which includes the weight of the liquid).

Step:

6. Subtract the tare weight, found in step 5, from the corresponding package gross weight determined in step 2 to obtain the drained weight of that package. Determine the package error (drained weight - labeled drained weight).

7. Repeat steps 3 through 6 for the remaining packages in the sample, cleaning and drying the sieve and receiving pan between measurements of individual packages.

8. Transfer the individual package errors to the Standard Pack Report form.

9. To determine lot conformance, return to Section 2.3. "Basic Test Procedures – Evaluating Results."

2.6. Drained Weight for Glazed or Frozen Foods

WWMA	
2.6. Determining the net weight of ice-encased frozen foods and ice glazed products~~**Drained Weight for Glazed or Frozen Foods**~~	

a. How is the drained weight of frozen shrimp (e.g., 2.27 kg (5 lb) block of shrimp) and crabmeat determined?

WWMA	Change the above heading to:
a. How ~~is~~ **should** the ~~drained~~ **net** weight of frozen shrimp~~(e.g., 2.27 kg (5 lb) block of shrimp), and~~ crabmeat**, meat or poultry, and similar products encased in ice and frozen into blocks or solid masses (i.e., not individually glazed) be** determined?	

When determining the net weight of frozen shrimp and crabmeat, use the test equipment and procedure provided below.

Step:

1. Immerse the product **(e.g., a block of frozen shrimp)** directly in water in a mesh basket or open container to thaw (e.g., it is not placed in a plastic bag).

   Direct immersion does not result in the product absorbing moisture because the freezing process causes the tissue to lose its ability to hold water.

2. Maintain the water temperature between 23 °C to 29 °C (75 °F to 85 °F).

   This is accomplished by maintaining a constant flow of warm water into the container holding the product (e.g., place a bucket in a sink to catch the overflow, and feed warm water into the bottom of the bucket through a hose).

3. After thawing, drain the product on a sieve for 2 minutes and then weigh it.

WWMA	Change above paragraph, first two sentences:
When determining the net weight of frozen shrimp**, crabmeat, meat or poultry products, or similar products that are encased in ice and frozen into blocks or solid masses,** use the test equipment and procedure provided below.	

Test Equipment

- Partial immersion thermometer or equivalent with 1 °C (2 °F) graduations and a -35 °C to +50 °C (-30 °F to +120 °F) accurate to ±1 °C (±2 °F)
- Water source and hose with a**n approximate flow rate of** 4 L to 15 L (1 gal to 4 gal) per minute **for thawing blocks and other products** ~~**flow rate**~~
- Sink or other receptacle [i.e., **bucket with a capacity of approximately** 15 L (4 gal) ~~**bucket**~~] **for thawing blocks and other products**
- A wire mesh basket **(used for testing large frozen blocks of shrimp)** or other container that is large enough to hold the contents of 1 package (e.g., 2.27 kg or [5 lb] box of shrimp) and has openings small enough to retain all pieces of the product (e.g., an expanded metal test tube basket lined with standard 16-mesh screen)

WWMA	Change above item, first sentence
(used for testing large frozen blocks of shrimp **or other products**)	

- Number 8 mesh, 20 cm (8 in) or 30 cm (12 in) sieve
- Stopwatch

Test Procedure

Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" or a "Category B" sampling plan in the inspection (depending on the location of test); select a random sample; then use the following test procedure to determine lot compliance.

Step:

1. Place the unwrapped frozen shrimp or crabmeat in the wire mesh basket and immerse in a 15 L (4 gal) or larger container of fresh water at a temperature between 23 °C to 29 °C (75 °F to 85 °F). Submerge the basket so that the top of the basket extends above the water level.

WWMA	Change the above 1st sentence to read:
Place the unwrapped frozen shrimp, ~~**or**~~ crabmeat**, or meat, poultry, or seafood product** in the wire mesh basket and immerse in a 15 L (4 gal) or larger container of fresh water at a temperature between 23 °C to 29 °C (75 °F to 85 °F).	

Step:

2. Maintain a continuous flow of water into the bottom of the container to keep the temperature within the specified range.

Step:

3. As soon as the product thaws, determined by loss of rigidity, transfer all material to a sieve (20 cm [8 in] for packages less than 453 g [1 lb] or 30 cm [12 in] for packages weighing more than 453 g [1 lb]) and distribute it evenly over the sieve.

4. Without shifting the product, incline the sieve 30° from the horizontal position to facilitate drainage, and drain for 2 minutes.

5. At the end of the drain time, immediately transfer the product to a tared pan for weighing to determine the net weight.

b. How is the net weight of glazed ~~raw~~ seafood and fish determined?

WWMA	Change the above question to read:
*How is the net weight of **frozen,** glazed ~~raw~~ seafood**,** ~~and~~ fish**, poultry, meat, or similar products** determined?*	

NEWMA	Comment
Section 2.6. specifically references the use of glaze with frozen seafood. Glazed chicken wings are being seen in the marketplace. It was suggested that wording be added to include other glazed products such as frozen (glazed?) chicken.	

For glazed seafood and fish, determine the net weight after removing the glaze using the following procedure. Use this method for any frozen glazed food product.

WWMA	Change the above sentence to read:
For **frozen,** glazed seafood**,** ~~and~~ fish, **poultry or meat products, or similar products,** determine the net weight after removing the glaze using the following procedure.	

Test Equipment

Use the equipment listed in Section 2.6. "Drained Weight for Glazed or Frozen Foods."

WWMA	Change the above sentence to read:
Use the equipment listed in Section 2.6. **Determining the net weight of frozen, ice-glazed products** ~~**Drained Weight for Glazed or Frozen Foods**~~	

Test Procedures

Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; and use the following test procedure to determine lot compliance.

Step:

1. Fill out a report form and select the random sample. A tare sample is not needed.

2. Weigh ~~sieve and~~ receiving pan. Record this weight on a worksheet as "~~sieve~~ **pan** weight."

Step:

3. Remove each package from low temperature storage; open it immediately and place the contents under a gentle spray of cold water. **Handle the product with care** to avoid ~~**breaking**~~ **breakage**. ~~**the product**~~. Continue the spray**ing** **process** until all ice glaze, that is seen or felt is removed. In general, the product should remain rigid; however, the ice glaze on certain products, usually smaller sized commodities, sometimes can not be removed without ~~defrosting~~ **partial thawing of** the product. Nonetheless, remove **all** ~~the~~ice glaze, because it **may be** ~~is~~ a substantial part of the package weight.

   (Amended 2002)

4. ~~Transfer the product to the weighed sieve.~~ Without shifting the product, incline the sieve to an angle of 17° to 20° to facilitate drainage and drain (into waste receptacle or sink) for exactly 2 minutes.

5. **At the end of the drain time immediately transfer the entire product to the tared pan for weighing to determine the net weight.** Place the product and ~~sieve~~ pan on the ~~receiving pan~~ **scale** and weigh. Record this weight on a worksheet as the "~~sieve~~ **pan** + product weight."

6. The net weight of product is equal to the weight of the pan ~~plus the sieve~~ plus the product (recorded in step 5) minus the "~~sieve~~ **pan** weight" (recorded in step 2). Record the product net weight on the worksheet. The package error is equal to the net weight of the product as measured minus the labeled weight. Record the package error on the worksheet and transfer it to the report form.

7. Repeat steps 3 through 6 for each package in the sample, cleaning ~~and drying~~ the sieve and **cleaning and drying** the receiving pan between package measurements.

Evaluation of Results

Follow the procedures in Section 2.3. "Basic Test Procedure – Evaluating Results."

Chapter 3. Test Procedures – For Packages Labeled by Volume

3.1. Scope

a. What types of packaged goods can be tested using these procedures?

Use this procedure to determine the net contents of packaged goods labeled in fluid volume such as milk, water, beer, oil, paint, distilled spirits, soft drinks, juices, liquid cleaning supplies, or liquid chemicals. This chapter also includes procedures for testing the capacities of containers such as paper cups, bowls, glass tumblers, and stemware.

b. What types of packages are not covered by these procedures?

These procedures do not cover berry baskets and rigid-dry measures that are covered by specific code requirements in NIST Handbook 44. "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices."

c. When can the gravimetric test procedure be used to verify the net quantity of contents of packages labeled by volume?

The gravimetric procedure may be used to verify the net quantity of contents of packages labeled in volume when the density (density means the weight of a specific volume of liquid determined at a reference temperature) of the product being tested does not vary excessively from one package to another.

d. What procedure is followed if the gravimetric test procedure cannot be used?

Test each package as described in Section 3.3. "Volumetric Test Procedure for Liquids."

e. What considerations besides density affect measurement accuracy?

In addition to possible package-to-package variations in product density, the temperature of the liquid will affect the volume of product. The product will expand or contract based on a rise or fall in product temperature.

> **Example:** The volume of a liquid cleaning product might be 5 L (1.32 gal) at 20 °C (68 °F) and 5.12 L (1.35 gal) at 25 °C (77 °F), which represents a 2.2 % change in volume.
>
> **Note:** This extreme example is for illustrative purposes, a 2.2 % volume change will not occur in normal testing.

f. What reference temperature should be used to determine the volume of a liquid?

Use the reference temperature specified in Table 3-1. "Reference Temperatures for Liquids" to determine volume. When checking liquid products labeled by volume using the gravimetric procedure, maintain the packages used to determine product densities at reference temperatures. If testing the packages in a sample volumetrically, each package in the sample must be maintained at or corrected to the reference temperature when its volume is determined.

Note: When checking liquid products using a volumetric or gravimetric procedure, the temperature of the samples must be maintained at the reference temperature ±2 °C (±5 °F).

Table 3-1. Reference Temperatures for Liquids

If the Liquid Commodity is	The reference temperature is	Reference
Frozen food labeled by volume (e.g., fruit juice)	−18 °C (0 °F)	
Food that must be kept refrigerated (e.g., milk and other dairy products. Usually labeled "Keep Refrigerated")		
Beer	4 °C (39.1 °F)	27 CFR, part 7.10
Distilled spirits or petroleum	15.56 °C (60 °F)	27 CFR, part 5.11
Unrefrigerated products (e.g., includes liquids sold un-chilled, such as soft-drinks and wine)	20 °C (68 °F)	27 CFR, part 4.1(b)

3.2. Gravimetric Test Procedure for Liquids

Test Equipment

- A scale that meets the requirements in Chapter 2, Section 2.2. "Measurement Standards and Test Equipment."

  Note: To verify that the scale has adequate resolution for use, it is first necessary to determine the density of the liquid; next verify that the scale division is no larger than MAV/6 for the package size under test. The smallest graduation on the scale must not exceed the weight value for MAV/6.

  Example: Assume the inspector is using a scale with 1 g (0.002 lb) increments to test packages labeled 1 L (33.8 fl oz) that have an MAV of 29 mL (1 fl oz). Also, assume the inspector finds that the weight of 1 L of the liquid is 943 g (2.078 lb). This will result in an MAV/6 value in weight of 4.715 g (0.010 lb):

  29 mL/6 = 4.8 mL (1 fl oz/6 = 0.166 6 fl oz)

  943 g/1000 mL= 0.943 g/mL (2.07 8 lb/33.6 fl oz = 0.061 8 lb/fl oz)

  4.8 mL x 0.943 g/mL = 4.5264 g (0.166 6 fl oz x 0.061 8 lb/fl oz = 0.010 lb)

  In this example, the 1 g (0.002 lb) scale division is smaller than the MAV/6 value of 4.5264 g (0.010 lb) so the scale is suitable for making a density determination.

- A partial immersion thermometer (or equivalent) with a range of −35 °C to +50 °C (30 °F to 120 °F), at least 1 °C (1 °F) graduations, and with a tolerance of ±1 °C (±2 °F)

- Volumetric measures

  Example: When checking packages labeled in SI units, flask sizes of 100 mL, 200 mL, 500 mL, 1 L, 2 L, 4 L, and 5 L and a 50 mL cylindrical graduate with 1 mL divisions may be used. When checking packages labeled in inch-pound units the use of measuring flasks and graduates with capacities of gill, half-pint, pint, quart, half-gallon, gallon, and a 2 fl oz cylindrical graduate, graduated to ½ fl dr is recommended.

- Defoaming agents may be necessary for testing liquids such as beer and soft drinks that effervesce or are carbonated. Two such products are Hexanol or Octanol (Capryl Alcohol).

  Note: The mention of trade or brand names does not imply that these products are endorsed or recommended by the U.S. Department of Commerce over similar products commercially available from other manufacturers.

- Bubble level at least 15.24 cm (6 in) in length

- Stopwatch

Test Procedure

Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection. Select a random sample; then use the following procedure to determine lot compliance.

Step:

1. Bring the sample packages and their contents to the reference temperature as specified in Table 3-1. "Reference Temperatures for Liquids." To determine if the liquid is at its reference temperature, immerse the thermometer in the liquid before starting the test. Verify the temperature again immediately after the flask and liquid is weighed. If the product requires mixing for uniformity, mix it before opening in accordance with any instructions specified on the package label. Shaking liquids, such as flavored milk, often entraps air that will affect volume measurements, so use caution when testing these products. Often, less air is entrapped if the package is gently rolled to mix the contents.

2. For milk, select a volumetric measure equal to or one size smaller than the label declaration. For all other products, select a volumetric measure that is one size smaller than the label declaration. For example, if testing a 1 L bottle of juice or a soft drink, select a 500 mL volumetric measure.
   (Amended 2004)

   Note: When determining the density of milk, if the product from the first container does not fill the volumetric measure to the nominal capacity graduation, product may be added from another container as long as product integrity is maintained (i.e., brand, identity, lot code, and temperature).

3. Prepare a clean volumetric measure to use according to the following procedures:

Step:

- Because flasks are ordinarily calibrated on a "to deliver" basis, they must be "wet down" before using. Immediately before use, fill the volumetric flask(s) or graduate with water. The water should be at the reference temperature of the product being tested. Fill the flask(s) with water to a point slightly below the top graduation on the neck. The flask should be emptied in 30 seconds (± 5 seconds). Tilt the flask gradually so the flask walls are splashed as little as possible <u>**as the flask**</u> is emptied. When the main flow stops, the flask should be nearly inverted. Hold the flask in this position for 10 seconds more and touch off the drop of water that adheres to the tip. If necessary, dry the outside of the flask. The flask or graduate is then ready to fill with liquid from a package. This is called the "wet down" condition.

Note: When using a volumetric measure that is calibrated "to contain," the measure must be dry before each measurement.

- If the liquid effervesces or foams when opened or poured (such as carbonated beverages), add two drops of a defoaming agent to the bottom of the volumetric measure before filling with the liquid. If working with a carbonated beverage, make all density determinations immediately upon placing the product into the standard. This reduces the chance of volume changes occurring from the loss of carbonization.

- Before making additional measurements of a liquid, use water to wash or rinse and prepare the volumetric measure. Between each two measurements of liquid from the sample packages, prepare the volumetric measure as described above, dry the outside of the flask, and drain the volumetric measure as described in earlier paragraphs of this section, as appropriate.

4. If the flask capacity is equal to the labeled volume, pour the liquid into the volumetric measure tilting the package to a nearly vertical position. If the flask capacity is smaller than the package's labeled volume, fill the flask to its nominal capacity graduation. If conducting a volumetric test, drain the container into the volumetric measure for 1 minute after the stream of liquid breaks into drops.

5. Position the volumetric measure on a level surface at eye level. For clear liquids, place a material of some dark color outside the flask immediately below the level of the meniscus. Read the volume from the lowest point of the meniscus. For opaque liquids, read volume from the center top rim of the liquid surface.

6. Use the gravimetric procedure to determine the volume if the limit specified for the difference in density is not exceeded.

- Select a volumetric measure equal to or one size smaller than the labeled volume (depending on the product) and prepare it as described in step 4 of this section. Then determine and record its empty weight.

- Determine acceptability of the liquid density variation, using two packages selected for tare according to Section 2.3. "Basic Test Procedure – Tare Procedures" as follows:

Step:

- Determine the gross weight of the first package.
- Pour the liquid from the first package into a volumetric measure exactly to the nominal capacity marked on the neck of the measure.
- Weigh the filled volumetric measure and subtract its empty weight to obtain the weight of the liquid. Determine density by dividing the weight of the liquid by the capacity of the volumetric measure.
- Determine the weight of the liquid from a second package using the same procedure.
- If the difference between the densities of the two packages exceeds one division, use the volumetric procedure in Section 3.3. "Volumetric Test Procedure for Liquids."

a. How is "nominal gross weight "determined?

Determine the "nominal gross weight" as follows:

Step:

1. Determine the Average Used Dry Tare Weight of the sample according to provisions of Section 2.3. "Basic Test Procedure – Tare Procedures."
2. Calculate the Average Product Density by adding the densities of the liquid from the two packages and dividing the sum by two.
3. Calculate the "nominal gross weight" using the following formula if the flask capacity is equal to the labeled volume:

Nominal Gross Weight = (Average Product Density [in weight units]) +
(Average Used Dry Tare Weight)

Note: If the flask size is smaller than the labeled volume, the following formula is used:

Nominal Gross Weight = (Average Product Density x
[Labeled Volume/Flask Capacity]) + (Average Used Dry Tare Weight)

b. How are the errors in the sample determined?

Step:

1. Weigh the remaining packages in the sample.
2. Subtract the nominal gross weight from the gross weight of each package to obtain package errors in terms of weight. All sample packages are compared to the nominal gross weight.

Step:

3. To convert the average error or package error from weight to volume, use the following formula:

Package Error in Volume = Package Error in Weight/Average Product Density Per Volume Unit of Measure

Evaluation of Results

Follow the procedures in Chapter 2, Section 2.3. "Basic Test Procedure – Evaluating Results" to determine lot conformance.

3.3. Volumetric Test Procedure for Liquids

a. How is the volume of liquid contained in a package determined volumetrically?

Follow steps 1 through 6 in Section 3.2. "Gravimetric Test Procedure for Liquids" for each package in the sample.

b. How are the errors in the sample determined?

Read the package errors directly from the graduations on the measure. The reference temperature must be maintained within ± 2 °C (± 5 °F) for the entire sample.

Evaluation of Results

Follow the procedures in Chapter 2, Section 2.3. "Basic Test Procedure – Evaluating Results" to determine lot conformance.

3.4. Other Volumetric Test Procedures

a. What other methods can be used to determine the net contents of packages labeled by volume?

Depending on how level the surface of the commodity is, use one of two headspace test procedures. Use the first headspace test procedure to determine volume where the liquid has a smooth surface (e.g., oils, syrups, and other viscous liquids). Use the second procedure to determine volume where the commodity does not have a smooth surface (e.g., mayonnaise and salad dressing).

Test Procedure

Before conducting any of the following volumetric test procedures follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following procedure to determine lot compliance.

Test Equipment

- Micrometer depth gage (ends of rods fully rounded) 0 mm to 225 mm (0 in to 9 in) or longer
- Level (at least 15 cm (6 in) in length)
- Laboratory pipets and/or buret
  - Class A 500 mL buret that conforms to ASTM E 287-2(2007), "Standard Specification for Laboratory Glass Graduated Burets"
  - Class A pipets, calibrated "to deliver" that conform to ASTM E 969-02(2007), " Standard Specification for Glass Volumetric (Transfer) Pipets"
- Volumetric measures
- Water
- Rubber bulb syringe
- Plastic disks that are 3 mm ($^1/_8$ in) thick with diameters equal to the seat diameter or larger than the brim diameter of each container to be tested. The diameter tolerance for the disks is 50 µm (± 0.05 mm [± 0.002 in]). The outer edge should be smooth and beveled at a 30° angle with the horizontal to 800 µm (0.8 mm [$^1/_{32}$ in]) thick at the edge. Each disk must have a 20 mm (¾ in) diameter hole through its center and a series of 1.5 mm ($^1/_{16}$ in) diameter holes 25 mm (1 in) **apart around the periphery of the disk and 3 mm ($^1/_8$ in)** from the outer edge. **All edges must be smooth.**
- Stopwatch
- **Partial immersion thermometer (or equivalent) with a range of −35 °C to +50 °C (30 °F to 120 °F), at least 1 °C (1 °F) graduations, and with a tolerance of ± 1 °C (± 2 °F)**

b. How is the volume of oils, syrups, and other viscous liquids that have smooth surfaces determined?

Step:

1. Make all measurements on a level surface.
2. Bring the temperature of both the liquid and the water to be used to measure the volume of the liquid to the reference temperature specified in Table 3-1. "Reference Temperatures for Liquids." **Verify with a thermometer that product has maintained the reference temperature.**
3. Measure the headspace of the package at the point of contact with the liquid using a depth gauge with a fully rounded, rather than a pointed, rod end. If necessary, support the package to prevent the bottom of the container from distorting.
4. Empty, clean, and dry the package.

Step:

5. Refill the container with water measured from a volumetric standard to the original liquid headspace level measured in step 3 of this section until the water touches the depth gauge.

6. Determine the amount of water used in step 5 of this section to obtain the volume of the liquid and calculate the "package error" based on that volume.

Evaluation of Results

Follow the procedures in Section 2.3. "Basic Test Procedure – Evaluating Results" to determine lot conformance.

3.5. <u>How is the volume of</u> mayonnaise and salad dressing<u>, and water immiscible products that do not have smooth and level surfaces determined?</u>

(1) Volumetric Headspace Test Procedure

Use the volumetric headspace procedure described in this section to determine volume when the commodity does not have a smooth surface (e.g., mayonnaise, salad dressing, and other water immiscible products without a level liquid surface). The procedure guides the inspector to determine the amount of headspace above the product in the package and the volume of the container. Determine the product volume by subtracting the headspace volume from the container volume. Open every package in the sample.

Step:

1. Make all measurements on a level surface.

2. Bring the temperature of both the commodity and the water used to measure the volume to the appropriate temperature designated in Table 3-1. "Reference Temperatures for Liquids."

3. Open the first package and place a disk larger than the package container opening over the opening.

4. Measurement Procedure

   - Deliver water from a flask (or flasks), graduate, or buret, through the central hole in the disk onto the top of the product until the container is filled. If it appears that the contents of the flask may overfill the container, do not empty the flask. Add water until all of the air in the container has been displaced and the water begins to rise in the center hole of the disk. Stop the filling procedure when the water fills the center disk hole and domes up slightly due to the surface tension. Do not add additional water after the level of the water dome has dropped.

   - If the water dome breaks on the surface of the disk, the container has been overfilled and the test is void; dry the container and start over.

5. To obtain the headspace capacity, record the volume of water used to fill the container

Step:

and subtract 1 mL (0.03 fl oz), which is the amount of water held in the hole in the disk specified.

6. Empty, clean, and dry the package container.

7. Repeat steps 4 and 5 of this section. Refill the package container with water measured from a volumetric measure to the maximum capacity of the package, subtract 1 mL (0.03 fl oz), and record the amount of water used as the container volume; and

8. From the container volume determined in step 7 of this section, subtract the headspace capacity in step 5 of this section to obtain the measured volume of the product and calculate the "package error" for that volume where "package error" equals labeled volume minus the measured volume of the product.

Evaluation of Results

Follow the procedures in Section 2.3. "Basic Test Procedure – Evaluating Results" to determine lot conformance."

3.6. Goods Labeled by Capacity – Volumetric Test Procedure

a. What type of measurement equipment is needed to perform the headspace test procedures?

Use the test equipment in Section 3.4. "Other Volumetric Test Procedures" (except for the micrometer depth gage) to perform these test procedures.

b. How is it determined if goods labeled by capacity meet the average and individual requirements?

Before conducting any of the following volumetric test procedures, refer to Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following test procedure to determine lot compliance.

Step:

1. Make all measurements on a level surface.

2. When testing goods labeled by capacity, use water at a reference temperature of 20 °C ± 2 °C (68 °F ± 5 °F).

3. Select a sample container and place a disk larger than the container opening over the opening.

4. Measurement Procedure

    - Add water to the container using flask (or flasks), graduate, or buret corresponding to labeled capacity of the container. If it appears that the contents of the flask may overfill the container, do not empty the flask. Add water until all of the air in the container has been displaced and the water begins to rise in

Step:

the center hole of the disk. Stop filling the container when the water fills the center disk hole and domes up slightly due to the surface tension.

- If the water dome breaks on the surface of the disk, the container has been overfilled and the test is void; dry the container and start over.
- Record the amount of water used to fill the container and subtract 1 mL (0.03 fl oz) (this is the amount of water held in the hole in the disk specified) to obtain the total container volume.

5. Test the other containers in the sample according to the procedures in step 4 of this section.

6. To determine package errors, subtract the total container volume obtained in steps 4 and 5 of this section from the labeled capacity of the container.

Evaluation of Results

Follow the procedures in Section 2.3. "Basic Test Procedure – Evaluating Results" to determine lot compliance.

3.7. Pressed and Blown Glass Tumblers and Stemware

a. What requirements apply to pressed and blown glass tumblers and stemware?

This handbook provides a tolerance to the labeled capacity of glass tumblers and stemware. The average requirement does not apply to the capacity of these products. See Table 3-2. "Allowable Differences for Pressed and Blown Glass Tumblers and Stemware."

b. How is it determined if tumblers and stemware meet the individual package requirement?

Follow **Section 2.3.** "Basic Test Procedure – Define the Inspection Lot" and determine which sampling plan to use in the inspection, select a random sample, and then use the following volumetric test procedure to determine container capacity and volume errors.

c. What type of measuring equipment is needed to perform the test procedures?

Use the equipment specified in Section 3.4. "Other Volumetric Test Procedures," (except for the micrometer depth gage) to perform these test procedures.

d. What are the steps of the test procedure?

Follow steps 1 through 6 in Section 3.6. "Goods Labeled by Capacity – Volumetric Test Procedure."

e. How is it determined if the samples conform to the allowable difference?

Compare the individual container error with the allowable difference that applies in Table 3-2. "Allowable Differences for Pressed and Blown Glass Tumblers and Stemware." If a package contains more than one container, all of the containers in the package must meet the allowable difference requirements in order for the package to pass.

Table 3-2. Allowable Differences for Pressed and Blown Glass Tumblers and Stemware	
Unit of measure	
If the capacity in metric units is:	**Then the allowable difference is:**
200 mL or less	± 10 mL
More than 200 mL	± 5 % of the labeled capacity
If the capacity in inch-pound units is:	**Then the allowable difference is:**
5 fl oz or less	± ¼ fl oz
More than 5 fl oz	± 5 % of the labeled capacity

Evaluation of Results

Count the packages in the sample with volume errors greater than the allowable difference and compare the resulting number with the number given in Column 3.

- If the number of containers in the sample with errors exceeding the allowable difference exceeds the number allowed in Column 3, the lot fails.

HOWEVER

- If the number of packages with errors exceeding the allowable difference is less than or equal to the number in Column 3, the lot passes.

Note: The average capacity error is not calculated because the lot passes or fails based on the individual volume errors. Act on the individual units containing errors exceeding the allowable difference individually even though the lot passes the requirement.

3.8. Volumetric Test Procedure for Paint, Varnish, and Lacquers – Non-aerosol

a. How is the volume of paint, varnish, and lacquers contained in a package determined?

Use one of three different test methods depending upon the required degree of accuracy and the location of the inspection. The procedures include both retail and in-plant audits and a "possible violation" method, which is designed, for laboratory or in plant use because of cleanup and product collection requirements. The procedures are suitable to use with products labeled by volume and packaged in cylindrical containers with separate lids that can be resealed.

Test Equipment

- A scale that meets the requirements in Section 2.2. "Measurement Standards and Test Equipment"
- Volumetric measures

- Micrometer depth gage (ends of rods fully rounded), 0 mm to 225 mm (0 in to 9 in)
- Diameter (Pi) tape measure, 5 cm to 30 cm (2 in to 12 in)
- Spanning bar, 2.5 cm by 2.5 cm by 30 cm or (1 in by 1 in by 12 in)
- Rule, 30 cm (12 in)
- Paint solvent or other solvent suitable for the product being tested
- Cloth, 30 cm (12 in) square
- Wood, 5 cm (2 in) thick, by 15 cm (6 in) wide, by 30 cm (12 in) long
- Rubber mallet
- Metal disk, 6.4 mm (¼ in) thick and slightly smaller than the diameter of package container bottom
- Rubber spatula
- Level at least 15 cm (6 in) in length
- Micrometer (optional)
- Stopwatch

b. What test procedure is used to conduct a retail audit test?

Conduct a retail audit using the following test procedure that is suitable for checking cylindrical containers up to 4 L (1 gal) in capacity. Use step 2 in the retail audit test procedure with any size container, but step 3 must be used for containers with capacities of 4 L (1 gal). The method determines the volume of a single can in the sample selected as most likely to contain the smallest volume of product. Do not empty any containers because only their critical dimensions are being measured.

c. How accurate is the dimensional test procedure?

The configuration of the bottom of the can, paint clinging to the lid, and slight variations in the wall and label thicknesses of the paint container may produce an uncertainty estimated to be at least 0.6 % in this auditing procedure. Therefore, this method is recommended solely to eliminate from more rigorous testing those packages that appear to be full measure. Use the violation procedures when the volume determined in step 10 is less than the labeled volume or in any case where short measure is suspected.

d. What worksheets make data recording easier?

Use the following format to develop worksheets to perform audits and determine the volume when checking paint. Follow the procedure and it will indicate the column in which the various measurements made can be recorded.

Example: Audit Worksheet for Checking Paint (add additional rows as needed)									
1. Can Height	**Can Diameter**				**6. Avg Liquid Diameter**	**7. Avg Liquid Level**	**8. Avg Container Depth**	**9. Avg Liquid Depth**	**10. Volume***
	2. Top	**3. Middle**	**4. Bottom**	**5. Average**					
*10. Volume = 0.7854 x 6 x 6 x 9									

Note: When the following instructions require recording a measurement, refer to the numbered columns in the "Audit Worksheet for Checking Paint" shown above.

e. How is a retail audit test performed?

Step:

1. Select a random sample. A tare sample is not needed.

2. For containers less than 4 L or (1 gal):

   - Measure the outside diameter of each container near its middle to the closest 0.02 mm (0.001 in).

   - Use a diameter tape measure to record the measurements in Column 3.

   - Place the containers on a level surface and using the micrometer depth gage, record their heights in Column 1 on the worksheet.

   - If the range of outside diameters exceeds 0.125 mm (0.005 in) or the range in heights exceeds 1.58 mm (0.0625 in), do not use this procedure. If the ranges are within the specified limits, weigh all cans in the sample, select the container with the lightest gross weight, and remove its lid. Continue with step 4 below.

3. For 4 L (1 gal) containers:

   - Gross weigh each package in the sample.

   - Select the package with the lightest gross weight and remove its lid.

4. Use a direct reading diameter tape measure to measure the outside diameter of the selected container near its top, middle (already measured if step 2 was followed), and bottom to the closest 0.02 mm (0.001 in). Record these measurements in Columns 2, 3, and 4. Add the three diameter values and divide by three to obtain the average diameter and record this value in Column 5.

5. If a micrometer is available, measure the wall and the paper label thickness of the container; otherwise, assume the wall and label thicknesses given in Table 3-3. "Thickness of Paint Can Walls and Labels" below:

Table 3-3. Thickness of Paint Can Walls and Labels	
Can Size	**Wall Thickness**
4 L (1 gal)	250 µm (0.25 mm) [0.010 in]
2 L (½ gal)	250 µm (0.25 mm) [0.010 in]
1 L (1 qt)	230 µm (0.23 mm) [0.009 in]
500 mL (1 pt)	230 µm (0.23 mm) [0.009 in]
250 mL	200 µm (0.20 mm) [0.008 in]
Label Thickness* for all can sizes: 100 µm (0.10 mm) [0.004 in] (*Paper only – ignore labels lithographed directly onto the container)	

Step:

Subtract twice the thickness of the wall of the can and paper label from the average can diameter (step 4) to obtain the average liquid diameter. Record the liquid diameter in Column 6.

6. On a level surface, place the container on the circular metal disk that is slightly smaller in diameter than the lower rim of the can so the bottom of the container nests on the disk to eliminate any "sag" in the bottom of the container.

7. Place the spanning bar and depth gage across the top of the paint can and mark the location of the spanning bar on the rim of the paint container. Measure the distance to the liquid level, to the nearest 20 µm (0.02 mm) (0.001 in), at three points in a straight line. Take measurements at points approximately 1 cm (3/8 in) from the inner rim for cans 12.5 cm (5 in) in diameter or less (and at 1.5 cm [½ in] from the rim for cans exceeding 12.5 cm [5 in]) in diameter and at the center of the can. Add the three readings and divide by three to obtain the average distance to the liquid level in the container. Record the average distance to the liquid level in Column 7.

8. Measure the distance to the bottom of the container at three points in a straight line in the same manner as outlined in step 7. Add the three readings and divide by three to obtain the average height of the container and record it in Column 8.

9. Subtract the average distance to the liquid level (Column 7) from the average height of the container (Column 8) to obtain the average height of the liquid column and record it in Column 9.

10. Determine the volume of paint in the container by using the following formula:

$$\text{Volume} = 0.7854\ D^2H$$

Where D = average liquid diameter (Column 6) and
H = average liquid height (Column 9)

11. Record this value in Column 10. If the calculated volume is less than labeled volume, go to the Violation Procedure.

f. How is an in-plant audit conducted?

Use the following procedures to conduct an in-plant audit inspection. This method applies to a container that probably contains the smallest volume of product. Duplicate the level of fill with water in a can of the same dimensions as the one under test. Use this method to check any size of package if the liquid level is within the measuring range of the depth gage. If any paint is clinging to the sidewall or lid, carefully scrape the paint into the container using a rubber spatula.

Step:

1. Follow steps 1 through 6 of the retail audit test.

2. Place the spanning bar and depth gage across the top of the paint can. Measure the liquid level at the center of the surface and record the level in Column 7.

3. Select an empty can with the same bottom configuration as the container under test and with a diameter and height equal to that of the container under test within plus or minus the following tolerances:

    a. For 500 mL or (1 pt) cans – within 25 µm (0.025 mm) (0.001 in)
    b. For 1 L or (1 qt) cans – within 50 µm (0.05 mm) (0.002 in)
    c. For 2 L or (½ gal) cans – within 75 µm (0.075 mm) (0.003 in)
    d. For 4 L or (1 gal) cans – within 100 µm (0.1 mm) (0.004 in)

4. Set the empty can on a level work surface with a circular metal disk that is slightly smaller in diameter than the bottom can rim underneath the can to eliminate sag. Set up the spanning bar and depth gage as in step 2 above. Fill the container with water from a volumetric measure of the same volume as the labeled volume. Measure the distance to the liquid level at the center of the container and record this level in Column 7 below the reading recorded in step 2. If this distance is equal to or greater than the distance determined in step 2, assume that the package is satisfactory. If the distance is less than the distance determined in step 2, the product may be short measure. Use the "Violation Procedure" in the next section when the audit test indicates that short measure is possible.

3.8.1. Violation Procedure

a. How is it determined if the containers meet the package requirements?

Use the following method if the liquid level is within the measuring range of the micrometer. The first step is to follow the "Basic Test Procedure" in Section 2.3. Define the inspection lot to determine which "Category A" sampling plan to use; select a random sample; and then use the following procedure. The steps noted with an (*) are required if there is paint adhering to the lid and it cannot removed by scraping into the can.

Step:

1. Do not shake or invert the containers selected as the sample. Determine the gross weight of these packages and record in Column 2 of the "Example Worksheet for Possible Violation in Checking Paint" below.

Example Worksheet for Possible Violation in Checking Paint (add additional rows as needed)								
1. Labeled Volume	2. Gross Weight	3. Lid Paint Weight (Wet − Dry)	4. Liquid Level	5. Tare	6. Water Volume	7. Net Wt. = 2 − 5	8. Weight of Labeled Volume = 7 x 1 ÷ 6	9. Package Volume = 6 + [(3 ÷ 7) x 6)]

Step:

Record the labeled volume of the first tare sample package in Column 1 of the worksheet. Use a circular metal disk to eliminate can "sag" and remove the lid. If paint clings to the lid of the container, scrape it off with a spatula.

2.* If paint that adheres to the lid cannot be completely removed by scraping the paint into the can, determine the weight of the lid plus any adhering paint. Clean the paint lid with solvent and weigh again. Subtract the clean lid weight from the lid weight with paint to determine the weight of the paint adhering to the lid. Record this weight in Column 3.

3. Place the spanning bar and depth gage across the top of the paint can. Mark the location of the spanning bar on the rim of the paint container. Measure the distance to the liquid level at the center of the container to the nearest 20 µm (0.02 mm) (0.001 in). Record the distance in Column 4.

4. Empty and clean the sample container and lid with solvent; dry and weigh the container and lid. Record the tare weight in Column 5.

5. Set up the container in the same manner as in step 1.

6. Place the spanning bar at the same location on the rim of the paint container as marked in step 3. With the depth gage set as described in step 3, deliver water into the container in known amounts until the water reaches the same level occupied by the paint as indicated by the depth gage. Record this volume of water (in mL or fl oz) in Column 6 of the worksheet. This is the volume occupied by the paint in the container. Follow steps, 7a, 8a, and 9a if scraping does not remove the paint from the lid. In order to determine if gravimetric testing can be used to test the other packages in the sample, follow only steps 7, 8, and 9 when no paint adheres to the lid.

7. Subtract the weight of the container (Column 5) from the gross weight (Column 2) to arrive at the net weight of paint in the selected container. Record the net weight in Column 7 of the worksheet.

   7a.* Subtract the weight of the container (Column 5) and the weight of product on the lid (Column 3) from the gross weight (Column 2) to arrive at the net weight of paint in the container. Record in Column 7 (excluding the weight of the paint on the lid).

Step:

8. Calculate the weight of the labeled volume of paint (for the first package opened for tare).

net weight (Column 7) x labeled volume (Column 1) ÷ volume of paint in can (Column 6)

Record this value in Column 8.

8a.* Calculate the package volume =

volume in can (Column 6) + (lid paint weight [Column 3] x volume in can [Column 6] / net weight [Column 7]]

Record it in Column 9 of the worksheet.

9. Calculate the package error. Use the following formula if paint does not adhere to the lid:

Package error = (Column 6 value) - (labeled volume)

9a.* Use the following formula if paint does adhere to the lid and will not come off by scraping.

Package error = (Column 9 value) - (labeled volume)

10. Repeat steps 1 through 9 for the second package chosen for tare.

b. When can a gravimetric procedure be used?

A gravimetric procedure is used if the weights of the labeled volume for the first two packages do not differ from each other by more than one division on the scale (if they meet this criterion, check the rest of the sample gravimetrically and record in Column 8).

c. How is "nominal gross weight" determined?

Determine the "Nominal Gross Weight" for use with Chapter 2, Section 2.3. "Basic Test Procedure" as follows:

The nominal gross weight equals the sum of the average weight of the labeled volume (average of values recorded in Column 8) plus the average tare (average of values recorded in Column 3) for the packages selected for tare. Note that the weight of a given volume of paint often varies considerably from container to container; therefore, volumetric measurements may prove necessary for the entire sample.

Evaluation of Results

Follow the procedures in Section 2.3. "Basic Test Procedures – Evaluating Results" to determine lot conformance.

3.9. Testing Viscous Materials – Such As Caulking Compounds and Pastes

a. How are viscous materials such as caulking compounds and paste tested?

Use the following procedure for any package of viscous material labeled by volume. It is suitable for very viscous materials such as cartridge-packed caulking compounds, glues, pastes, and other similar products. It is best to conduct this procedure in a laboratory using a hood to ventilate solvent fumes. If used in the field, use in a well ventilated area. Except for the special measurement procedures to determine the weight of the labeled volume, this procedure follows the basic test procedure. For each weight of a known volume determination, pack a portion of the packaged product into a pre-weighed cup of known volume (called a "density cup" or "pycnometer") and weigh. From the weight of the known volume, determine the weight of the labeled volume. Compare the nominal gross weight with the gross weight to determine the package error.

b. What type of measurement equipment is needed to test packages of caulk, pastes, and glues?

- A scale that meets the requirements in Section 2.2. "Measurement Standards and Test Equipment."
- Pycnometer, a vessel of known volume used for weighing semifluids. The pycnometer can be bought or made. If it is made, refer to it as a "density cup." To make a 150 mL or 5 fl oz density cup, cut off the lip of a 150 mL beaker with an abrasive saw and grind the lip flat on a lap wheel. The slicker plate is available commercially. Calibrate the density cup gravimetrically with respect to the contained volume using the procedure in ASTM E542-01(2007), "Standard Practice for Calibration of Laboratory Volumetric Apparatus."
- Appropriate solvents (water, Stoddard solvent, kerosene, alcohol, etc.)
- Caulking gun (for cartridge packed products)

c. How is a pycnometer prepared for use?

Before using, weigh and calibrate the pycnometer (or the density cup and slicker plate) with respect to volume (mL or fl oz). If applicable, comply with any special instructions furnished by the manufacturer to calibrate a pycnometer that has not been calibrated. It is not necessary to reweigh or recalibrate for each test; however, mark the pieces of each unit to prevent interchange of cups and slicker plates.

d. How is it determined if the containers meet the package requirements?

First, Follow the "Basic Test Procedure" in Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then, use the following procedure to determine lot compliance.

Step:

1. Weigh a calibrated pycnometer and slicker plate and record as "pycnometer weight" and record this weight and the volume of the pycnometer.

Step:

2. Determine the gross weight of the first package and record the weight value. Open the package and transfer the product to the pycnometer by filling it to excess. Use a caulking gun to transfer product from the caulking cartridges. If using a pycnometer, cover it with a lid and screw the cap down tightly. Excess material will be forced out through the hole in the lid, so the lid must be clean. If using a density cup, place the slicker plate over ¾ of the cup mouth, press down and slowly move the plate across the remainder of the opening. With the slicker plate in place, clean all the exterior surfaces with solvent and dry.

3. Completely remove the product from the package container; clean the package container with solvent; dry and weigh it to determine the tare weight.

4. Weigh the filled pycnometer or filled density cup with slicker plate and record this weight. Subtract the weight of the empty pycnometer from the filled weight to determine the net weight of the product contained in the pycnometer and record this weight.

5. Clean the pycnometer and repeat steps 2, 3, and 4 for the second package in the tare sample.

   Determine acceptability of the density variation on the two packages selected for tare. If the difference between the densities of both packages exceeds one division of the scale, do not use the gravimetric procedure to determine the net quantity of contents. Instead, use the procedure in steps 8 and 9.

   Note: If the gravimetric procedure can be used, perform steps 7 and 9.

6. Calculate the weight of product corresponding to the labeled volume of product according to the following formula:

   Weight of Product in Pycnometer ÷ Pycnometer Volume = Product Density

7. Test each package individually by determining the product density in each package using the pycnometer and record the gross, tare, and net weight of each package. Subtract the weight of the labeled volume (determined for each package) from the net weight of product to arrive at each individual package error in units of weight.

8. Convert the package errors to units of volume using the following formula:

   Package Error (volume) =
   (Package Error [weight] x Pycnometer Volume) ÷ (Weight of Product in Pycnometer)

9. Record the package errors on the report form using an appropriate unit of measure.

Evaluation of Results

Follow the procedures in Section 2.3. "Basic Test Procedure – Evaluation Results" to determine lot conformance.

3.10. Peat Moss

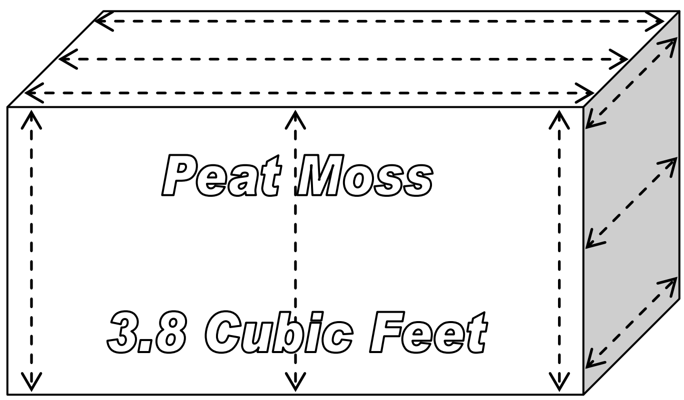
a. How are packages of peat and peat moss labeled by compressed volume tested?

Measure the dimensions of the compressed material to determine if it contains the labeled quantity. **<u>Take three measurements (both ends and middle) of each dimension and calculate their average. Multiply the averages to obtain the compressed cubic volume.</u>**

<table>
<tr><td>WWMA</td><td>modify the second sentence</td></tr>
<tr><td colspan="2">

<u>For each dimension (length, width, height) take three equidistant measurements, take the average of each respective dimension and multiply to determine the cubic measure as follows:</u>

<u>Average height X average width X average length = cubic measurement</u>



</td></tr>
</table>

b. How are packages of peat and peat moss labeled by uncompressed volume tested?

Use the following method to test peat moss sold using an uncompressed volume as the declaration of content. The procedure is based on ASTM D 2978-03, "Standard Method of Test for Volume of Processed Peat Materials."

Test Equipment

- 12.7 mm (or ½ in) sieve
- Use one of the following measures as appropriate for the package size. (Refer to Table 3-4. "Specifications for Test Measures for Mulch and Soils" for additional information on test measure construction.)
  - ➢ 28.3 L (1 ft^3) measure with inside dimensions of 30.4 cm (12 in) by 30.4 cm (12 in) by 30.4 cm (12 in). Mark the inside of the measure with horizontal lines every 1.2 cm (½ in) so that package errors can be directly determined

- 100 L (3.5 ft^3) measure with inside dimensions of 50 cm (19.68 in) by 50 cm (19.68 in) by 40 cm (15.74 in). The inside of the measure should be marked with horizontal lines every 1.2 cm (½ in) so that package errors can be directly determined

- Straightedge, 50.8 cm (20 in) in length
- Sheet for catching overflow of material
- Level (at least 15.24 cm (6 in) in length)

c. How is it determined if the packages meet the requirements in this handbook?

Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then, use the following procedure to determine lot compliance.

Step:

1. Open each package in turn, remove the contents, and pass them through the sieve directly into the measuring container (overfilling it). Use this method for particulate solids (such as soils or other garden materials) labeled in cubic dimensions or dry volume. Some materials may not pass through the sieve for peat moss; in these instances, separate the materials by hand (to compensate for packing and settling of the product after packaging) before filling the measure.

   Note: Separated material (product not passing through the sieve) must be included in the product volume.

2. Shake the measuring container with a rotary motion at one rotation per second for 5 seconds. Do not lift the measuring container when rotating it. If the package contents are greater than the measuring container capacity, level the measuring container with a straightedge using a zigzag motion across the top of the container.

3. Empty the container. Repeat the filling operations as many times as necessary, noting the partial fill of the container for the last quantity delivered using the interior horizontal markings as a guide.

4. Record the total volume.

5. To compute each package error, subtract the labeled quantity from the total volume and record it.

Evaluation of Results

Follow the procedures in Section 2.3. "Basic Test Procedure – Evaluating Results" to determine lot conformance.

3.11. Mulch and Soils Labeled by Volume

a. What products are defined as mulch and soil?

- Mulch is defined as “any product or material except peat or peat moss that is advertised, offered for sale, or sold for primary use as a horticultural, above-ground dressing, for decoration, moisture control, weed control, erosion control, temperature control, or other similar purposes.”

- Soil is defined as “any product or material, except peat or peat moss that is advertised or offered for sale, or sold for primary use as a horticultural growing media, soil amendment, and/or soil replacement.”

b. What type of measurement equipment is needed to test packages of mulch and soil?

- A test measure appropriate for the package size that meets the specifications for test measures in Table 3-4. “Specifications for Test Measures for Mulch and Soils”

<table>
<tr><th colspan="6">Table 3-4. Specifications for Test Measures for Mulch and Soils</th></tr>
<tr><th rowspan="2">Nominal Volume of Test Measure</th><th colspan="3">Interior Wall Dimensions *</th><th>Marked Intervals on Interior Walls ***</th><th>Volume Equivalent of Marked Intervals</th></tr>
<tr><th>Length</th><th>Width</th><th>Height **</th><th></th><th></th></tr>
<tr><td>30.2 L (1.07 ft^3) for testing packages that contain less than 28.3 L (1 ft^3 or 25.7 dry qt)</td><td colspan="2">203.2 mm (8 in)</td><td>736.6 mm (29 in)</td><td rowspan="4">12.7 mm (½ in)</td><td>524.3 mL (32 in^3)</td></tr>
<tr><td>28.3 L (1 ft^3)</td><td colspan="3">304.8 mm (12 in)</td><td rowspan="3">1 179.8 mL (72 in^3)</td></tr>
<tr><td>56.6 L (2 ft^3)</td><td rowspan="2">406.4 mm (16 in)</td><td rowspan="2">228.6 mm (9 in)</td><td rowspan="2">1219.2 mm (48 in)</td></tr>
<tr><td>84.9 L (3 ft^3)</td></tr>
<tr><td colspan="6">Measures are typically constructed of 12.7 mm (½ in) marine plywood. A transparent sidewall is useful for determining the level of fill, but must be reinforced if it is not thick enough to resist distortion. If the measure has a clear front, place the level gage at the back (inside) of the measure so that the markings are read over the top of the mulch.

Notes:
* Other interior dimensions are acceptable if the test measure approximates the configuration of the package under test and does not exceed a base configuration of the package cross-section.
** The height of the test measure may be reduced, but this will limit the volume of the package that can be tested.
*** When lines are marked in boxes, they should extend to all four sides of the measure if possible to improve readability. It is recommended that a line indicating the MAV level also be marked to reduce the possibility of reading errors when the level of the mulch is at or near the MAV.</td></tr>
</table>

- Dropcloth/polyethylene sheeting for catching overflow of material
- Level (at least 15 cm [6 in] in length)

c. How is it determined if the packages meet the package requirements?

Use the following procedure:

Step:

1. Follow the Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection, select a random sample, then use the following procedure to determine lot conformance.

2. Open each package in turn. Empty the contents of the package into a test measure and level the contents by hand. Do not rock, shake, drop, rotate, or tamp the test measure. Read the horizontal marks to determine package net volume.

Note: Some types of mulch are susceptible to clumping and compacting. Take steps to ensure that the material is loose and free flowing when placed into the test measure. Gently roll the bag before opening to reduce the clumping and compaction of material.

3. Exercise care in leveling the surface of the mulch/soil and determine the volume reading from a position that minimizes errors caused by parallax.

d. How are package errors determined?

Determine package errors by subtracting the labeled volume from the package net volume in the measure. Record each package error.

Package Error = Package Net Volume − Labeled Volume

Evaluation of Results

Follow the procedures in Section 2.3. "Basic Test Procedure – Evaluating Results" to determine lot conformance.

Note: In accordance with Appendix A, Table 2-10. Exceptions to the Maximum Allowable Variations for Textiles, Polyethylene Sheeting and Film, Mulch and Soil Labeled by Volume, Packaged Firewood and Packages Labeled by Count with Fewer than 50 Items, apply an MAV of 5 % of the declared quantity to mulch and soil sold by volume. When testing mulch and soil with a net quantity in terms of volume, one package out of every 12 in the sample may exceed the 5 % MAV (e.g., one in a sample of 12 packages; two in a sample of 24 packages; four in a sample of 48 packages). However, the sample must meet the average requirement of the "Category A" Sampling Plan.

3.12. Ice Cream Novelties

<u>Note: The following procedure can be used to test packaged products that are solid or semisolid and that will not dissolve in, mix with, absorb, or be absorbed by the fluid into which the product</u>

will be immersed. For example, ice cream labeled by volume can be tested using ice water or kerosene as the immersion fluid.

WWMA	Add in a statement regarding pelletized ice cream
Exception – Pelletized ice cream are beads of ice cream which are quick frozen with liquid nitrogen. The beads are relatively small, but can vary in shape and size. On April 17, 2009 the FDA issued a letter stating that this product is considered semisolid food, in accordance with 21 CFR 101.105(a). The FDA also addresses that the appropriate net quantity of content declaration for pelletized ice cream products be in terms of net weight.	

a. How are ice cream novelties inspected to see if the labeled volume meets the package requirements?

Use the following volume displacement procedure that uses a displacement vessel specifically designed for ice cream novelties such as ice cream bars, ice cream sandwiches, or cones. The procedure determines the volume of the novelty by measuring the amount of water displaced when the novelty is submerged in the vessel. Two displacements per sample are required to subtract the volume of sticks or cups.

The procedure first determines if the densities of the novelties are the same from package to package (in the same lot) so that a gravimetric test can be used to verify the labeled volume. If a gravimetric procedure is used, compute an average weight for the declared volume from the first two packages and weigh the remainder of the sample. If the gravimetric procedure cannot be used, use the volume displacement procedure for all of the packages in the sample.

Test Equipment

- A scale that meets the requirements in Section 2.2. "Measurement Standards and Test Equipment"
- Volumetric measures
- Displacement vessel with dimensions that is appropriate for the size of novelties being tested. Figure 3-1. Example of a Displacement Vessel shows an example of a displacement vessel. It includes an interior baffle that reduces wave action when the novelty is inserted and the downward angle of the overflow spout reduces dripping. Other designs may be used.

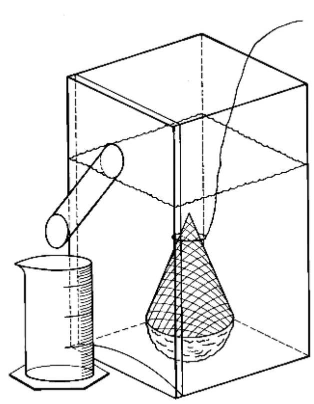


Figure 3-1. Example of a Displacement Vessel

> **Note:** This displacement vessel can be constructed or similar devices may be obtained from any Laboratory Equipment or Science Education suppliers. The U.S. Department of Commerce does not endorse or recommend any particular device over similar commercially available products from other manufacturers.

- Thin wire, clamp, or tongs
- Freezer or ice chest and dry ice
- Single-edged razor or sharp knife (for sandwiches only)
- Ice water/kerosene maintained at 1 °C (33 °F) or below
- Indelible marker (for ice pops only)
- Level, at least 15.24 cm (6 in) in length
- A partial immersion thermometer (or equivalent) with a range of −1 °C to + 50 °C (30 °F to 120 °F), at least 1 °C (1 °F) graduations, and with a tolerance of ± 1 °C (± 2 °F)
- A table-top, laboratory-type jack of sufficient size to hold the displacement vessel
- Stopwatch

Test Procedure

Follow the procedures in Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following steps to determine lot compliance.

Step:

1. Maintain the samples at the reference temperature for frozen products that is specified in Table 3-1. "Reference Temperatures for Liquids" (i.e., −18 °C [0 °F]). Place the samples in the freezer or ice chest until they are ready to be tested, and then remove packages from the freezer one at a time.

2. According to the type of novelty, prepare the sample products as follows:

   ➢ Ice-pop. Mark on the stick(s) with the indelible marker the point to which the pop will be submerged in the ice water. (After the ice-pop contents have been submerged, remove the novelty to determine the volume of the stick.)

Step:

- Cone. Make a small hole in the cone below the ice cream portion to allow air to escape.

- Sandwich. Determine whether the declared volume is (a) the total volume of the novelty (that is, including the cookie portion) or (b) the volume of the ice-cream-like portion only. If the declared volume is the volume of only the ice-cream-like portion, shave off the cookie with a razor or knife, leaving some remnants of cookie to ensure that no ice cream is accidentally shaved off. Work quickly, and return the novelty to the freezer before the sandwich softens.

- Cup. Remove the cap from the cup. (After the cup and novelty contents have been submerged, remove the novelty from the cup to determine the volume of the cup.)

b. How is it determined if the ice cream novelty packages meet the requirements in this handbook?

Step:

1. Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following procedure to determine lot compliance.

2. Fill the displacement vessel with ice water until it overflows the spout. Allow it to sit until dripping stops. Raise the displacement vessel as necessary and place the graduate beneath the spout.

3. Remove a package from the freezer, determine its gross weight and record it.

4. Submerge the novelty as suggested until it is below the surface level of the water.

   - Ice-pop. Use a clamp, tongs, or your fingers to hold the stick(s) and submerge the pop to the level marked in step 2 of the Test Procedures.

   - Cone. Shape the wire into a loop, and use it to push the cone, headfirst (ice cream portion first) into the ice water. Do not completely submerge the cone immediately: let water fill the cone through the hole made in step 2 of the Test Procedures before completely submerging the novelty.

   - Sandwich or cup. Skewer the novelty with the thin wire or form a loop on the end of the wire to push the sandwich or ice-cream portion or cup completely below the liquid level.

5. Record the total water volume in the graduate. For a cone or sandwich, record the water volume as the net volume and go to step 7. For ice-pops or cups, record the water volume in the graduate as the gross volume and go to step 6.

6. Refill the displacement vessel with water to overflowing and reposition the empty graduate under the spout.

Step:

- Ice-pop. Melt the ice pop off the stick or sticks. Submerge the stick or sticks to the line marked in step 4. Record the volume of tare material (i.e., stick) by measuring the water displaced into the graduate. The net volume for the ice-pop is the gross volume recorded in step 5 minus the volume of the tare materials in this step. Record this volume as the "volume of novelty." To determine the error in the package, subtract the labeled quantity from the volume of novelty.

- Cup. Remove the novelty from the cup. Rinse the cup, and then submerge it in the displacement vessel. Small pinholes in the base of the cup can be made to make submersion easier. Record the volume of water displaced into the graduate by the cup as the volume of tare material. The net volume for the novelty is the gross volume determined in step 5 minus the volume of the tare materials determined in this step. Record this as the net volume of the novelty. To determine the error in the package, subtract the labeled quantity from the volume of novelty.

7. Clean and air-dry the tare materials (sticks, wrappers, cup, lid, etc.). Weigh and record the weight of these materials for the package.

8. Subtract the tare weight from the gross weight to obtain the net weight and record this value.

9. Compute the weight of the labeled volume for the package using the following formula and then record the weight:

   Product Density = (weight in item 3) ÷ (the total water volume in step 5)
   Weight of labeled volume = (labeled volume) x (Product Density)

10. Repeat steps 3 through 9 for a second package.

11. If the weight of the labeled volume in steps 9 and step 10 differ from each other by more than one division on the scale, the gravimetric test procedure cannot be used to test the sample for compliance. If this is the case, steps 2 through 6 for each of the remaining packages in the sample must be used to determine their net volumes and package errors. Then go to evaluation of results.

c. How is "nominal gross weight" determined?

Step:

1. Use Section 2.3. "Basic Test Procedure – Tare Procedure" to determine the Average Used Dry tare Weight of the sample.

2. Using the weights determined in step 11 calculate the Average Product Weight by adding the densities of the liquid from the two packages and dividing the sum by two.

3. Calculate the "nominal gross weight" using the formula:

   Nominal Gross Weight = Average Product Weight + Average Used Dry Tare Weight

d. How are the errors in the sample determined?

Step:

1. Weigh the remaining packages in the sample.

2. Subtract the nominal gross weight from the gross weight of each package to obtain package errors in terms of weight.

Note: Compare the sample packages to the nominal gross weight.

3. Follow Section 2.3. "Basic Test Procedure."

   To convert the average error or package error from weight to volume, use the following formula:

   Package Error in Volume = (Package Error in Weight) ÷ (Product Density)

Evaluation of Results

Follow the procedures in Section 2.3. "Basic Test Procedure – Evaluating Results" to determine lot conformance.

3.13. Fresh Oysters Labeled by Volume

a. What requirements apply to packages of fresh oysters labeled by volume?

Packaged fresh oysters removed from the shell must be labeled by volume. The maximum amount of permitted free liquid is limited to 15 % by weight. Testing the quantity of contents of fresh oysters requires the inspector to determine total volume, total weight of solids and liquid, and the weight of the free liquid.

Test Equipment

- A scale that meets the requirements in Section 2.2. "Measurement Standards and Test Equipment"
- Volumetric measures
- Micrometer depth gage (ends of rods fully rounded), 0 mm to 228 mm (0 in to 9 in)

- Strainer for determining the amount of drained liquid from shucked oysters. Use as a strainer a flat bottom metal pan or tray constructed to the following specifications:

  - Sides: 5.08 cm (2 in)

  - Area: 1935 cm^2 (300 in^2) or more for each 3.78 L (1 gal) of oysters (**Note: Strainers of smaller area dimensions are permitted to facilitate testing smaller containers.)**

  - Perforations:
    Diameter: 6.35 mm (¼ in)
    Location: 3.17 cm (1¼ in) apart in a square pattern, or perforations of equivalent area and distribution.

- Spanning bar, 2.54 cm by 2.54 cm by 30.48 cm (1 in by 1 in by 12 in)

- Rubber spatula

- Level, at least 15.24 cm (6 in) in length

- Stopwatch

b. How is it determined if the containers meet the package requirements?

Follow the Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then, use the following test procedure to determine lot compliance.

Step:

1. Determine and record the gross weight of a sample package.

2. Set the container on a level surface and open it. Use a depth gage to determine the level of fill. Lock the depth gauge. Mark the location of the gauge on the package.

3. Weigh a dry 20.32 cm or 30.48 cm (8 in or 12 in) receiving pan and record the weight. Set strainer over the receiving pan.

4. Pour the contents from the container onto the strainer without shaking it. Tip the strainer slightly and let it drain for 2 minutes. Remove strainer with oysters. It is normal for oysters to include mucous (which is part of the product) that will not pass through the strainer, so do not force it.

5. Weigh the receiving pan and liquid and record the weight. Subtract the weight of the dry receiving pan from the weight of pan and liquid to obtain the weight of free liquid and record the value.

6. Clean, dry, and weigh the container and record the tare weight. Subtract the tare weight from the gross weight to obtain the total weight of the oysters and liquid and record this value.

Step:

7. Determine and record the percent of free liquid by weight as follows:

$$\text{Percent of free liquid by weight} = [(\text{weight of free liquid}) \div (\text{weight of oysters} + \text{liquid})] \times 100.$$

8. Set up the depth gauge on the dry package container as in step 2. Pour water from the flasks and graduate as needed to re-establish the level of fill obtained in step 2. Add the volumes delivered as the actual net volume for the container and record the value.

Note: Some containers will hold the declared volume only when filled to the brim; they may have been designed for other products, rather than for oysters. If the net volume is short measure (per step 8), determine if the container will reach the declared volume only if filled to the brim. Under such circumstance, the package net volumes will all be short measure because the container cannot be filled to the brim with a solid and liquid mixture. A small headspace is required in order to get the lid into the container without losing any liquid.

Evaluation of Results

Follow the procedures in Section 2.3. "Basic Test Procedure" Evaluating Results to determine lot conformance.

3.14. Determining the Net Contents of Compressed Gas in Cylinders

a. What type of compressed gases may be tested with these procedures?

These procedures are for industrial compressed gas. Compressed gas may be labeled by weight (for example, Liquefied Petroleum [LP] gas, or carbon dioxide) or by volume. Acetylene, liquid; oxygen, nitrogen, nitrous oxide, and argon are all filled by weight. Acetylene is sold by liters or by cubic feet. Helium, gaseous oxygen, nitrogen, air, and argon are filled according to pressure and temperature tables.

b. What type of test procedures must be used?

Checking the net contents of compressed gas cylinders depends on the method of labeling; those labeled by weight are generally checked by weight. Cylinders filled by using pressure and temperature charts must be tested using a pressure gauge that is connected to the cylinder. Determine the volume using the pressure and temperature of the cylinder.

c. Should any specific safety procedures be followed?

Yes, be aware of the hazards of the high pressure found in cylinders of compressed gas. An inspector should handle compressed gas only if the inspector has been trained and is knowledgeable regarding the product, cylinder, fittings, and proper procedures (see *Compressed Gas Association [CGA] pamphlet P-1, "Safe Handling of Compressed Gases in Containers*," for additional information). Additional precautions that are necessary for personal safety are described in the CGA Handbook of Compressed Gases. All personnel testing compressed gases should have this manual for reference and be familiar with its contents. It is essential that the inspector be certain of the contents before connecting to the cylinder. Discharging a gas or cryogenic liquid through a system for which the material is not intended could result in a fire and/or explosion or property damage due to the incompatibility of the system and the product.

Before connecting a cylinder to anything, be certain of the following:

Step:

1. Always wear safety glasses.

2. The cylinder is clearly marked or labeled with the correct name of the contents and that no conflicting marks or labels are present. Do not rely on the color of the cylinder to identify the contents of a cylinder. Be extremely careful with all gases because some react violently when mixed or when coming in contact with other substances. For example, oxygen reacts violently when it comes in contact with hydrocarbons.

3. The cylinder is provided with the correct Compressed Gas Association (CGA) connection(s) for the product. A proper connection will go together smoothly; so excessive force should not be used. Do not use an adapter to connect oxygen to non-oxygen cleaned equipment. When a cylinder valve is opened to measure the internal pressure, position the body away from the pressure gauge blowout plug or in front of the gauge if the gauge has a solid cast front case. If the bourdon tube should rupture, do not be in a position to suffer serious injuries from gas pressure or fragments of metal.

4. Thoroughly know the procedure and place emphasis on safety precautions before attempting any tests. Do not use charts referred to in the procedure until the necessary training has been completed. When moving a cylinder, always place the protective cap on the cylinder. Do not leave spaces between cylinders when moving them. This can lead to a "domino" effect if one cylinder is pushed over.

5. Open all valves slowly. A failure of the gauge or other ancillary equipment can result in injuries to nearby persons. Remember that high gas pressure can propel objects with great force. Gas ejected under pressure can also cause serious bodily injuries if someone is too close during release of pressure.

6. One of the gauges will be reserved for testing oxygen only and will be prominently labeled "For Oxygen Use Only." This gauge must be cleaned for oxygen service and maintained in that "clean" condition. The other gauge(s) may be used for testing a variety of gases if they are compatible with one another.

7. Observe special precautions with flammable gas in cylinders in addition to the several precautions necessary for the safe handling of any compressed gas in cylinders. Do not "crack" cylinder valves of flammable gas before connecting them to a regulator or test gauge. This is extremely important for hydrogen or acetylene.

d. What type of measurement equipment is needed to test cylinders of compressed gas?

Test Equipment

- Use a scale that meets the requirements in Section 2.2. "Measurement Standards and Test Equipment." Use a wooden or non-sparking metal ramp to roll the cylinders on the scale to reduce shock loading.

- Two calibrated precision bourdon tube gauges or any other approved laboratory-type pressure-measuring device that can be accurately read within plus or minus 40 kPa (5 psi). A gauge having scale increments of 200 kPa (25 psi) or smaller shall be considered as satisfactory for reading within plus or minus 40 kPa (5 psi). The range of both gauges shall be a minimum of 0 kPa to 23 MPa (0 psi to 5000 psi) when testing cylinders using standard industrial cylinder valve connections. These standardized connections are listed in "CGA Standard V-1, Standard for Compressed Gas Cylinder Valve Outlet and Inlet for use with Gas Pressures up to 21 MPa (3000 psi)." For testing cylinders with cylinder valve connections rated for over 21 MPa (3000 psi), the test gauge and its inlet connection must be rated at 14 MPa (2000 psi) over the maximum pressure that the connection is rated for in CGA V-1. **Note:** There are standard high-pressure industrial connections on the market that are being used up to their maximum pressure of 52 MPa (7500 psi).

Note: Any gauge or connectors used with oxygen cylinders must be cleaned for oxygen service, transported in a manner which will keep them clean and never used for any other gas including air or oxygen mixtures. Oxygen will react with hydrocarbons and many foreign materials that may cause a fire or explosion.

- An approved and calibrated electronic temperature measuring device or three calibrated mercury-in-glass thermometers having either a digital readout or scale division of no more than 1 °F (0.5 °C). The electronic device equipped with a surface temperature sensor is preferred over a mercury-in-glass thermometer because of its shorter response time.

- Two box-end wrenches of 29 mm ($1^1/_8$ in) for oxygen, nitrogen, carbon dioxide, argon, helium, and hydrogen and 22 mm ($^7/_8$ in) for some sizes of propane. All industrial CGA connections are limited to these two hex sizes. Avoid using an adjustable wrench because of the tendency to round the edges of the fittings, which can lead to connections not being tightened properly.

- Use a separate gauge and fitting for each gas to be tested. If adapters must be used, do not use on oxygen systems.

3.14.1. Test Procedure for Cylinders Labeled by Weight

a. How is it determined if the containers meet the package requirements using the gravimetric test procedure?

Step:

1. Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following test procedure to determine lot compliance.

2. The cylinder should be marked or stenciled with a tare weight. The marked value may or may not be used by the filling plant when determining the net weight of those cylinders sold or filled by weight. If there is a tare weight marked on the net contents tag or directly on the cylinder, then an actual tare weight was determined at the time of fill. If there is no tare weight marked on a tag or on the cylinder, then the stamped or stenciled tare weight is presumed to have been used to determine the net contents.

Note: Check the accuracy of the stamped tare weights on empty cylinders whenever possible. The actual tare weight must be within (a) ½ % of the stamped tare weight for 9.07 kg (20 lb) tare weights or less or (b) ¼ % of the stamped tare weight for greater than 9.07 kg (20 lb) tare weights. (See NIST Handbook 130, "Method of Sale Regulation.")

Step:

3. Place cylinder on scale and remove protective cap. The cap is not included in the tare weight. Weigh the cylinder and determine net weight, using either the stamped or stenciled tare weight, or the tare weight marked on the tag. Compare actual net weight with labeled net weight, or use the actual net weight to look up the correct volume declaration (for Acetylene Gas), and compare that with the labeled volume.

Note: The acetone in acetylene cylinders is included in the tare weight of the cylinder. Therefore, as acetylene is withdrawn from the cylinder, some acetone will also be withdrawn, changing the tare weight.

Most producers will replace acetone in the cylinder before the cylinder is refilled, filling the cylinder with acetone to the stamped tare weight. Other producers, although not following recommended procedures, do not replace the acetone until it drops to a predetermined weight. In the latter situation, the refilling plant must note the actual tare weight of the cylinder and show it on the tag containing the net content statement or on the cylinder itself. Refer to tables for acetylene if necessary (if the acetylene is labeled by volume).

3.14.2 Test Procedure for Cylinders Labeled by Volume

a. How is it determined if the containers meet the package requirements using the volumetric test procedure?

Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following test procedure to determine lot compliance.

Step:

1. Determine the temperature of the cylinders in the sample. Place the thermometer approximately halfway up a cylinder in contact with the outside surface. Take the temperature of three cylinders selected at random and use the average temperature of the three values.

2. Using the appropriate pressure gauge, measure the pressure of each cylinder in the sample.

3. Determine the cylinder nominal capacity from cylinder data tables or from the manufacturer. (These tables must be obtained in advance of testing.)

4. Using NIST Technical Note 1079 "Tables of Industrial Gas Container Contents and Density for Oxygen, Argon, Nitrogen, Helium, and Hydrogen" (available on-line at (http://www.nist.gov/owm), determine the value (SCF/CF) from the content tables at the temperature and pressure of the cylinder under test.

5. Multiply the cylinder nominal capacity by the value (SCF/CF) obtained from the content tables. This is the actual net quantity of gas.

6. Subtract the labeled net quantity from the actual net quantity to determine the error.

Evaluation of Results

Follow Section 2.3. "Basic Test Procedures – Evaluating Results" to determine lot conformance.

3.15. Firewood

3.15.1 Volumetric Test Procedure for Packaged Firewood with a Labeled Volume of 113 L (4 ft^3) or Less

a. How are packages of firewood tested?

Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample, then use the test procedure provided in Section 3.17. "Crosshatched Firewood" to determine lot compliance.

Test Equipment

- Linear Measure. Take all measurements in increments of 0.5 cm ($^3/_{16}$ in) or less and round up.
- Binding Straps. Binding straps are used to hold wood bundles together if the bundles need to be removed from the package/wrapping material.

b. How is it determined if the containers meet the package requirements?

Unless otherwise indicated, take all measurements without rearranging the wood or removing it from the package. If the layers of wood are crosshatched or not ranked in discrete sections in the package, remove the wood from the package, re-stack, and measure accordingly.

3.15.2. Boxed Firewood

a. How is the volume of firewood contained in a box determined?

Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following test procedure to determine lot conformance.

Step:

1. Open the box to determine the average height of wood within the box; measure the internal height of the box. Take three measurements (record as "d_1, d_2...etc.") along each end of the stack. Measure from the bottom of a straightedge placed across the top of the box to the highest point on the two outermost top pieces of wood and the center-most top piece of wood. Round measurements down to the nearest 0.5 cm ($^1/_8$ in). If pieces are obviously missing from the top layer of wood, take additional height measurements at the highest point of the uppermost pieces of wood located at the midpoints between the three measurements on each end of the stack. Calculate the average height of the stack by averaging these measurements and subtracting from the internal height of the box according to the following formula.

Step:

Average Height of Stack =
(Internal Height of Box) − (sum of measurements) ÷ (number of measurements)

2. Determine the average width of the stack of wood in the box by taking measurements at three places along the top of the stack. Measure the inside distance from one side of the box to the other on both ends and in the middle of the box. Calculate the average width.

$$\text{Average Width} = (W_1 + W_2 + W_3) \div (3)$$

3. To determine the average length of the pieces of wood, remove the wood from the box and select the five pieces with the greatest girth. Measure the length of each of the five pieces from center-to-center. Calculate the average length of the five pieces.

$$\text{Average Length} = (L_1 + L_2 + L_3 + L_4 + L_5) \div (5)$$

4. Calculate the volume of the wood within the box. Use dimensions for height, width, and length.

Volume in liters = (height in cm x width in cm x length in cm) ÷ (1000)

Volume in cubic feet = (height in inches x width in inches x length in inches) ÷ (1728)

5. For boxes of wood that are packed with the wood ranked in two discrete sections perpendicular to each other, calculate the volume of wood in the box as follows: (1) determine the average height, width, and length as in 1, 2 and 3 above for each discrete section, compute total volume, and (2) total the calculated volumes of the two sections. Take the width measurement for Volume 2 (V_2) from the inside edge of the box adjacent to V_2 to the plane separating V_1 and V_2. Compute total volume by adding Volume 1 (V_1) and V_2 according to the following formula.

$$\text{Total Volume} = V_1 + V_2$$

6. Follow Section 2.3. "Basic Test Procedure – Evaluating Results" to determine lot conformance.

3.15.3. Crosshatched Firewood

a. How must the volume of stacked or crosshatched firewood be measured?

Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; and use the following test procedure to determine lot compliance.

Step:

1. Stack the firewood in a ranked and well-stowed geometrical shape that facilitates volume calculations (i.e., rectangular). The number of measurements for each dimension given below is the minimum that should be taken.

Step:

2. Determine the average measurements of the stack:

   - Height: Start at one end of the stack; measure the height of the stack on both sides at four equal intervals. Calculate and record the average height.

   - Length: Start at the base of the stack; Measure the length of the stack in four equal intervals. Calculate and record the average length.

   - Width: Select the five pieces with the greatest girth. Measure the length of the pieces, calculate and record the average piece length.

3. Calculate Volume:

   Volume in liters = (Avg. Height [cm] x Avg. Width [cm] x Avg. Length in [cm]) ÷ 1000

   Volume in cubic feet = (Avg. Height [in] x Avg. Width [in] x Avg. Length [in]) ÷ 1728

4. Follow Section 2.3. "Basic Test Procedure – Evaluating Results" to determine lot conformance.

3.15.4. Bundles and Bags of Firewood

a. How is the volume of bundles and bags of firewood measured?

Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following test procedure to determine lot compliance.

Step:

1. Average area of ends: secure a strap around each end of the bundle or bag of wood to prevent movement during testing and to provide a definite perimeter. Use two or more straps to secure the wood.

2. Set one end of the bundle or bag on tracing paper large enough to cover the end completely. Draw a line around the perimeter of the bundle or bag on the tracing paper.

3. Transfer the tracing paper to a template graduated in square centimeters or square inches. Count the number of square centimeters or square inches that are enclosed within the perimeter line. Estimate portions of square centimeters or square inches not completely within the perimeter line to the nearest one-quarter square inch.

4. Repeat this process on the opposite end of the bundle or bag.

5. Calculate the Average Area:

$$\text{Average Area} = (\text{Area 1} + \text{Area 2}) \div 2$$

6. Average length of the pieces of wood – select the five pieces with the greatest girth and measure the length of the pieces. Calculate the average length of the pieces of wood:

$$\text{Average Length} = (L_1 + L_2 + L_3 + L_4 + L_5) \div 5$$

7. Calculate Volume:

$$\text{Volume in liters} = (\text{Average Area [cm}^2\text{] x Average Length [cm]}) \div 1000$$

$$\text{Volume in cubic feet} = (\text{Average Area [in}^2\text{] x Average Length [in]}) \div 1728$$

Evaluation of Results

Follow Section 2.3. "Basic Test Procedure – Evaluating Results" to determine lot conformance.

Note: Specified in Appendix A, Table 2-10. "Exceptions to the Maximum Allowable Variations for Textiles, Polyethylene Sheeting and Film, Mulch and Soil Labeled by Volume, Packaged Firewood, and Packages Labeled by Count with Fewer than 50 Items." – Maximum allowable variations for individual packages are not applied to packages of firewood.

Chapter 4. Test Procedures – Packages Labeled by Count, Linear Measure, Area, Thickness, and Combinations of Quantities

4.1. Scope

a. What types of packaged goods can be tested using these procedures?

Use these procedures to determine the net contents of products sold by count, area, thickness, and linear measure. If a package includes more than one declaration of quantity, each declaration must meet the package requirements.

b. Can the gravimetric test procedure be used to verify the net quantity of contents of packages labeled by count and linear measure?

Use the gravimetric procedure (below) to test products sold by measure or count if the density of the product does not vary excessively from one package to another.

c. What procedures may be used if the gravimetric test procedure cannot be used?

Open each package in the sample and measure or count the items.

4.2 Packages Labeled by Count

a. How are packages labeled by count tested?

If the labeled count is 50 items or fewer, use Section 4.3. "Packages Labeled with 50 Items or Fewer." If the labeled count is more than 50 items, see Section 4.4. "Packages Labeled by Count of More than 50 Items."

b. Can a gravimetric test procedure be used to verify the labeled count of a package?

Yes, if the scale being used is sensitive enough to determine the weight of individual items. Use the following procedures to determine if the sample packages can be tested gravimetrically.

Step:

1. For packages labeled with a count of 84 or higher, calculate the weight equivalent for the MAV/6 for the labeled count of the package. MAV/6 must be at least equal to one-half scale division on a mechanical scale or one division on a digital scale.

2. For packages with a labeled count of 83 or fewer, when each unit weighs at least 2 scale divisions, consider the scale acceptable.

Step:

Example: According to Appendix A, Table 2-7. Maximum Allowable Variations (MAVs) for Packages Labeled by Count, the MAV is 7 for a package labeled with a count of 250 items. The scale should be capable of measuring differences corresponding to MAV/6 or, in this example, the weight of one item.

- If the scale meets the appropriate requirement, gravimetric testing can be used to determine package count or,
- If the scale does not meet the criteria, count the content in each package in the sample.

4.3. Packages Labeled with 50 Items or Fewer

Test Procedure

Step:

1. Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following test procedure to determine lot compliance.
2. Open the packages and count the number of items in each. Record the number of packages that contain fewer than the labeled count.

Evaluation of Results

1. For the sample size indicated in Column 1 of Appendix A, Table 2-11. "Accuracy Requirements for Packages Labeled by Low Count of (50 or fewer) and Packages Given Tolerance (Glass and Stemware)," refer to Column 2 to determine the number of packages that are allowed to contain fewer than the labeled count.
2. If the number of packages in the sample that contain fewer than the labeled count exceeds the number permitted in Column 2, the sample and the lot fail to meet the package requirement.

Note: For statistical reasons, the average requirement does not apply to packages labeled by count of 50 or fewer items, and the MAV does not apply to the lot. It only applies to the packages in the sample.

3. Maximum Allowable Variations: The MAVs listed in Appendix A, Table 2-7. "Maximum Allowable Variations (MAVs) for Packages Labeled by Count" define the limits of reasonable variation for an individual package even though the MAV is not directly used in the sampling plan. Individual packages that are undercount by more than the MAV are considered defective. Even if the sample passes, these should be repacked, relabeled, or otherwise handled.

Example: If testing a lot of 160 packages of pencils labeled "50 pencils," choose a random sample of 12 packages from the lot. If the scale cannot discriminate between differences in count, open every package and count the pencils. For example, assume the 12 package counts are: 50, 52, 50, 50, 51, 53, 52, 50, 50, 50, 47, and 50.

Because only one package contains fewer than 50 pencils, the sample passes the test (refer to Appendix A. Table 2-11. "Accuracy Requirements for Packages Labeled by Low Count [50 or Fewer] and Packages Given Tolerances [Glass and Stemware]"). However, the package containing 47 pencils should not be introduced into commerce even though the lot complies with the package requirements because it is undercount by more than the MAV (1 item) permitted in Appendix A, Table 2-7. "Maximum Allowable Variations (MAVs) for Packages Labeled by Count."

4.4. Packages Labeled by Count of More than 50 Items

Test Procedures

There are two procedures to determine count without opening all packages in the sample. Both use the weight of a counted number of items in the package. If the weight of discrete items or numbers of items in a package varies, the packaged items must be counted rather than weighed.

Test Equipment

Use a scale that meets the requirements in Section 2.2. "Measurement Standards and Test Equipment."

Audit Procedure

Use this procedure to audit lots of packages labeled by count of more than 50 items, but the precision of this procedure is only ± 1 %. Determine the lot compliance based on actual count or the violation procedure.

Step:

1. Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following test procedure to determine lot compliance.

2. Select an initial tare sample according to Section 2.3. "Basic Test Procedure – Tare Procedures."

3. Gross weigh the first package in the tare sample and record this weight.

4. Select the number of items from the first tare package that weighs the greater:

    - 10 % of the labeled count; or

    - a quantity equal to at least 50 minimum divisions on the scale.

    Example: Using a scale with 1 g divisions, the selected count must weigh at least 50 grams. If a scale with 0.001 lb divisions is used, the selected count must weigh at least 0.05 lb. Record the count and weight.

Step:

5. Calculate the weight of the labeled count using the following formula:

   Weight of the Labeled Count =
   (labeled count x weight of items in step 4) ÷ (Count of items in step 4)

   Record the result as "labeled count weight."

6. Gross weigh the remaining packages of the tare sample and keep contents of opened packages separated in case all of the items must be counted.

7. Determine the Average Used Dry Tare Weight of the sample according to Section 2.3. "Basic Test Procedure – Tare Procedures."

8. The weight of the labeled count plus the average tare weight represents the "nominal gross weight."

9. Subtract the nominal gross weight from the gross weight of the individual packages and record the errors.

   (Package error [weight]) =
   (actual package gross weight) − (nominal gross weight)

10. Convert the package errors in units of weight to count:

    Package error (count) = (Package error [weight] x labeled count) ÷ (labeled count weight)

    Round any fractional counts up to whole items in favor of the packager. Record the package error in units of count. Compute the average error.

    - If the average error is minus, go to the "procedure to use if the inspector suspects the lot violates the package requirements" below.

    - If the average error is zero or positive, the sample is presumed to conform to the package requirements.

Procedures to use if the inspector suspects the lot violates the package requirements

If possible, use the gravimetric procedure to determine compliance. To minimize the number of packages to be opened, combine the measurement of the weight of the number of units in the package with the determination of tare. Therefore, it will not be necessary to open more packages than the tare sample. If the audit procedure in this section has been used, the possible violation procedure below can be followed with the same sample if package contents have been kept separate and can still be counted. Use the following steps to determine if the sample passes or fails.

Step:

1. Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following test procedure to determine lot compliance. Use a scale that meets the criteria specified in 4.2. "Packages Labeled by Count."

Step:

2. Select an initial tare sample according to Section 2.3. "Basic Test Procedure – Tare Procedures."

3. Gross weigh the packages selected for the tare sample and record these weights. Open these packages and determine the tare and net weights of the contents, and count the exact number of items in the packages. Record this information.

4. Calculate and record the weights of the labeled counts for the first two packages using the formula:

   Weight of labeled count = (labeled count) x (contents weight ÷ contents count)

   To avoid round off errors, carry at least two extra decimal places in the calculation until the weight of the labeled count is obtained. To use the gravimetric procedure, the difference in weights of the labeled counts of the two packages must not exceed one scale division.

   - If the difference in weights exceeds this criterion, determine the actual count per package for every package in the sample recording plus and minus errors. Then, follow the procedures in Section 2.3. "Basic Test Procedure – Evaluating Results" to determine lot conformance.

   - If the difference is within the criterion, average the weights of the labeled count and go on to step 5.

5. Determine the Average Used Dry Tare Weight of the sample according to provisions in Section 2.3. "Basic Test Procedure – Tare Procedures."

6. Determine and record the nominal gross weight by adding the average weight of the labeled count of items in the package step 4 to the average tare weight step 5.

7. Weigh the remaining packages in the sample, subtract the nominal gross weight from the gross weight of the individual packages, and record the errors.

   Package Error (weight) = (Actual Package Gross Weight) − (Nominal Gross Weight)

8. Look up the MAV for the package size from Appendix A, Table 2-7. "Maximum Allowable Variations (MAVs) for Packages Labeled by Count" and convert it to weight using the formula:

   MAV (weight) =
   (MAV (count) x Avg. Wt. of Labeled Count [from step 4]) ÷ (Labeled Count)

   Convert the MAV to dimensionless units by dividing the MAV (weight) by the unit of measure and record.

Evaluation of Results

Follow the procedures in Section 2.3. "Basic Test Procedure – Evaluation Results" to determine lot conformance.

Convert back to count when completing the report form using the following formula:

Avg. Pkg. Error (count) = (Avg. Pkg. Error [dimensionless units]) x (Unit of Measure) x (Labeled Count) ÷ (Avg. Weight of Labeled Count)

4.5. Paper Plates and Sanitary Paper Products

a. How are the labeled dimensions of paper plates and sanitary paper products verified?

Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following procedure to determine lot compliance.

The following procedures are used to verify the size of paper plates and other products. The following procedure may be used to verify the size declarations of other disposable dinnerware.

Note: Do not distort the item's shape during measurement.

The count of sanitary paper products cannot be adequately determined by weighing. Variability in sheet weight and core weight requires that official tests be conducted by actual count. However, weighing can be a useful audit method. These products often declare total area as well as unit count and sheet size. If the actual sheet size measurements and the actual count comply with the average requirements, the total area declaration is assumed correct.

Equipment

- Steel tapes and rules. Determine measurements of length to the nearest division of the appropriate tape or rule.

  - Metric Units:

    For labeled dimensions 40 cm or less, linear measure: 30 cm in length, 1 mm divisions; or a 1 m rule with 0.1 mm divisions, overall length tolerance of 0.4 mm.

    For labeled dimensions greater than 40 cm, 30 m tape with 1 mm divisions.

  - Inch-pound Units:

    For labeled dimensions 25 in or less, use a 36 in rule with $^{1}/_{64}$ in or $^{1}/_{100}$ in divisions and an overall length tolerance of $^{1}/_{64}$ in.

    For dimensions greater than 25 in, use a 100 ft tape with $^{1}/_{16}$ in divisions and an overall length tolerance of 0.1 in.

- Measuring Base

  Note: A measuring base may be made of any flat, sturdy material approximately 38 cm (15 in) square. Two vertical side pieces approximately 3 cm (1 in) high and the same length as the sides of the measuring base are attached along two adjoining edges of the measuring base to form a 90° corner. Trim all white borders from two or more sheets of graph paper (10 divisions per centimeter or 20 divisions per inch). Place one sheet on the measuring base and position it so that one corner of graph paper is snug in the corner of the measuring base and vertical sides. Tape the sheet to the measuring base. Overlap other sheets on the first sheet so that the lines of top and bottom sheet coincide, expanding the graph area to a size bigger than plates to be measured; tape these sheets to the measuring base. Number each line from the top and left side of base plates: 1, 2, 3, etc.

b. How are paper products inspected?

Step:

1. Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following test procedure to determine lot compliance.

2. Select an initial tare sample according to Section 2.3. "Basic Test Procedure – Tare Procedure."

3. Open each package and select one item from each.

Note: Some packages of plates contain a combination of different-sized plates. In this instance, take a plate of each declared size from the package to represent all the plates of that size in the package. For example, if three sizes are declared, select three different plates from each package.

c. How are paper products measured?

Note: Occasionally, packages of plates declared to be one size contain plates that can be seen by inspection to be of different sizes in the same package. In this instance, select the smallest plate and use the methods below to determine the package error. If the smallest plate is not short measure by more than the MAV, measure each size of plate in the package and calculate the average dimensions.

Example: If 5 plates measure 21.41 cm (8.43 in) and 15 measure 21.74 cm (8.56 in), the average dimension for this package of 20 plates is 21.66 cm (8.53 in).

Step:

1. For paper plates: Place each item on the measuring base plate (or use the linear measure) with the eating surface down so two sides of the plate touch the sides of the measuring base. For other products, use either the measuring base or a linear measure to determine actual labeled dimensions (e.g., packages of napkins, rolls of paper towels). If testing folded products, be sure that the folds are pressed flat so that the measurement is accurate.

Step:

2. If the measurements reveal that the dimensions of the individual items vary, select at least 10 items from each package. Measure and average these dimensions. Use the average dimensions to determine package error in step 3 below.

3. The package error equals the actual dimensions minus the labeled dimensions.

Evaluation of Results

Follow the procedures in Section 2.3. "Basic Test Procedure – Evaluating Results" to determine lot conformance.

4.6. Special Test Requirements for Packages Labeled by Linear or Square Measure (Area)

a. Are there special measurement requirements for packages labeled by dimensions?

Yes, products labeled by length (such as yarn) or area, often requires the application of tension to the ends of the product in order to straighten the product before measuring. When testing yarn and thread, apply tension and use the specialized equipment specified in ASTM D 1907-07, "Standard Test Method for Linear Density of Yarn (Yarn Number) by the Skein Method," in conjunction with the sampling plans and package requirements described in this handbook.

Evaluation of Results

Follow the procedures in Section 2.3. "Basic Test Procedure – Evaluating Results" to determine lot conformance.

4.7. Polyethylene Sheeting

a. Which procedures are used to verify the declarations on polyethylene sheeting and bags?

Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following test procedure to determine lot compliance.

Note: Most polyethylene products are sold by length, width, thickness, area, and net weight.

Test Equipment

- A scale that meets the requirements in Section 2.2. "Measurement Standards and Test Equipment."

- Steel tapes and rules determine measurements of length to the nearest division of the appropriate tape or rule.

  - Metric Units:

    For labeled dimensions 40 cm or less, linear measure: 30 cm in length, 1 mm divisions; or a 1 m rule with 0.1 mm divisions, overall length tolerance of 0.4 mm.

    For labeled dimensions greater than 40 cm, 30 m tape with 1 mm divisions.

  - Inch-pound Units:

    For labeled dimensions 25 in or less, use a 36 in rule with $^{1}/_{64}$ in or $^{1}/_{100}$ in divisions and an overall length tolerance of $^{1}/_{64}$ in.

    For dimensions greater than 25 in, use a 100 ft tape with $^{1}/_{16}$ in divisions and an overall length tolerance of 0.1 in.

- Deadweight dial micrometer (or equal) equipped with a flat anvil, 6.35 mm or (¼ in) diameter or larger, and a 4.75 mm ($^{3}/_{16}$ in) diameter flat surface on the head of the spindle. The anvil and spindle head surfaces should be ground and lapped, parallel to within 0.002 mm (0.0001 in), and should move on an axis perpendicular to their surfaces. The dial spindle should be vertical, and the dial should be at least 50.8 mm (2 in) in diameter. The dial indicator should be continuously graduated to read directly to 0.002 mm (0.0001 in) and should be capable of making more than one revolution. It must be equipped with a separate indicator to indicate the number of complete revolutions. The dial indicator mechanism should be fully jeweled. The frame should be of sufficient rigidity that a load of 1.36 kg (3 lb) applied to the dial housing, exclusive of the weight or spindle presser foot, will not cause a change in indication on the dial of more than 0.02 mm (0.001 in). The indicator reading must be repeatable to 0.001 2 mm (0.000 05 in) at zero. The mass of the probe head (total of anvil, weight 102 g or [3.6 oz], spindle, etc.) must be 113.4 g (4 oz). The micrometer should be operated in an atmosphere free from drafts and fluctuating temperature and should be stabilized at ambient room temperature before use.

- Gage blocks covering the range of thicknesses to be tested should be used to check the accuracy of the micrometer

- T-square

Test Procedure

Step:

1. Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following test procedure to determine lot compliance.

2. Be sure the product is not mislabeled. Check the label declaration to confirm that all of the declared dimensions are consistent with the required standards. The declaration on sheeting, film, and bags shall be equal to or greater than the weight calculated by using the formulas below. Calculate the final value to four digits and declare to three digits dropping the final digit (e.g., if the calculated value is 2.078 lb, then the declared net

Step:

weight is truncated to 2.07 lb).

Example Label:

Polyethylene Sheeting
1.82 m (6 ft) x 30.48 m (100 ft)
101.6 µm (4 mil)

Step:

3. Use the following formulas to compute a target net weight. The labeled weight should equal or exceed the target net weight or the package is not in compliance.

- For metric dimensions:

Target Mass in Kilograms = (T x A x D) ÷ 1 000

Where: T = nominal thickness in centimeters

A = nominal length in centimeters x nominal width (the nominal width for bags is twice the labeled width) in centimeters

D = density in grams per cubic centimeter*

- For inch-pound dimensions:

Target Weight in Pounds = T x A x D x 0.036 13

Where: T = nominal thickness in inches;

A = nominal area; that is the nominal length in inches x nominal width (the nominal width for bags is twice the labeled width) in inches;

D = density in grams per cubic centimeter; 0.036 13 is a factor for converting $^{g}/_{cm^3}$ to $^{lb}/_{in^3}$.

*Determined by ASTM Standard D 1505-03, "Standard Method of Test for Density of Plastics by the Density Gradient Technique." For the purpose of this handbook, the minimum density shall be 0.92 g/cm^3 when the actual density is not known.

Evaluation

Step:

1. Perform the calculations as shown in the following samples. If the product complies with the label declaration, go to step 2.

Step:

Sample Calculations

- For metric units:

$$(0.010\ 16\ \text{cm} \times [(1.82\ \text{m} \times 100\ {}^{\text{cm}}/_{\text{m}}) \times (30.48\ \text{m} \times 100\ {}^{\text{cm}}/_{\text{m}})] \times 0.92\ {}^{\text{g}}/_{\text{cm}^3}) \div 1000\ {}^{\text{g}}/_{\text{kg}}$$

= a target net mass of 5.18 kg

In this example, the labeled net mass of 5.03 kg does not meet the target net mass, so the product is not in compliance.

- For inch-pound units:

$$(0.004\ \text{in}) \times [(6\ \text{ft} \times 12\ {}^{\text{in}}/_{\text{ft}}) \times (100\ \text{ft} \times 12\ {}^{\text{in}}/_{\text{ft}})] \times 0.92\ {}^{\text{g}}/_{\text{cm}^3} \times 0.03613$$

= a target net weight of 11.48 lb

In this example, the labeled net weight of 11.1 lb does not meet the target net weight, so the product is not in compliance.

2. Select packages for tare samples. Determine and record the gross weights of the initial tare sample.

3. Extend the product in the sample packages to their full dimensions and remove by hand all creases and folds.

4. Measure the length and width of the product to the closest 3 mm ($^1/_8$ in). Make all measurements at intervals uniformly distributed along the length and width of the sample and record the results. Compute the average length and width, and record.

   - With rolls of product, measure the length of the roll at three points along the width of each roll and measure the width at a minimum of 10 points along the length of each roll.

   - For folded products, such as drop cloths or tarpaulins, make three length measurements along the width of the sample and three width measurements along the length of the sample.

5. Determine and record the average tare weight according to Section 2.3. "Basic Test Procedures – Tare Procedures."

4.7.1. Evaluation of Results – Length, Width, and Net Weight

Follow the procedures in Section 2.3. "Basic Test Procedure – Evaluating Results" to determine the lot conformance requirements for length, width, and weight.

Step:

1. If the sample failed to meet the package requirements for any of these declarations, no further measurements are necessary. The lot fails to conform.

HOWEVER,

Step:

2. If the sample meets the package requirements for the declarations of length, width, and weight, proceed to step 3 to verify the thickness declaration.

3. Measure the thickness of the plastic sheet with a micrometer using the following guide. Place the micrometer on a solid level surface. If the dial does not read zero with nothing between the anvil and the spindle head, set it at zero. Raise and lower the spindle head or probe several times; it should indicate zero each time. If it does not, find and correct the cause before proceeding.

4. Take measurements at five uniformly distributed locations across the width at each end and five locations along each side of each roll in the sample. If this is not possible, take measurements at five uniformly distributed locations across the width product for each package in the sample.

5. When measuring the thickness, place the sample between the micrometer surfaces and lower the spindle head or probe near, but outside, the area where the measurement will be made. Raise the spindle head or probe a distance of 0.008 mm to 0.01 mm (0.000 3 in to 0.000 4 in) and move the sheet to the measurement position. Drop the spindle head onto the test area of the sheet.

6. Read the dial thickness two seconds or more after the drop, or when the dial hand or digital readout becomes stationary. This procedure minimizes small errors that may occur when the spindle head or probe is lowered slowly onto the test area.

7. For succeeding measurements, raise the spindle head 0.008 mm to 0.01 mm (0.000 3 in to 0.000 4 in) above the rest position on the test surface, move to the next measurement location, and drop the spindle head onto the test area. Do not raise the spindle head more than 0.01 mm (0.000 4 in) above its rest position on the test area. Take measurements at least 6 mm (¼ in) or more from the edge of the sheet.

8. Repeat step 3 above on the remaining packages in the sample and record all thickness measurements. Compute and record the average thickness for the individual package and apply the following MAV requirements.

4.7.2. Evaluation of Results – Individual Thickness

- No measured thickness of polyethylene labeled 25 µm (1 mil) or greater should be less than 80 % of the labeled thickness.

- No measured thickness of polyethylene labeled less than 25 µm (1 mil) should be less than 65 % of the labeled thickness.

Count the number of values that are smaller than specified MAVs (0.8 x labeled thickness if 25 µm [1 mil] or greater or 0.65 x labeled thickness, if less than 25 µm [1 mil]). If the number of values that fail to meet the thickness requirement exceeds the number of MAVs permitted for the sample size, the lot fails to conform to requirements. No further testing of the lot is necessary. If the number of MAVs for thickness measurements is less than or equal to the number permitted for the sample size, go on to Evaluation of Results – Average Thickness.

4.7.3. Evaluation of Results – Average Thickness

The average thickness for any single package should be at least 96 % of the labeled thickness. This is an MAV of 4 %. Circle and count the number of package average thickness values that are smaller than 0.96 x labeled thickness. If the number of package average thicknesses circled exceeds the number of MAVs permitted for the sample size, the lot fails to conform to requirements. No further testing of the lot is necessary. If the number of MAVs for package average thickness is less than or equal to the number of MAVs permitted for the sample size, proceed to Section 2.3. "Basic Test Procedure – Evaluating Results" to determine if the lot meets the package requirements for average thickness.

4.8. Packages Labeled by Linear or Square (Area) Measure

Test Equipment

- Use a scale that meets the requirements in Section 2.2. "Measurement Standards and Test Equipment." Calculate the length or area of packaged product corresponding to MAV/6. If there is no suitable weighing device, all of the packages in the sample must be opened and measured.

- Steel tapes and rules – determine measurements of length to the nearest division of the appropriate tape or rule.

  - Metric Units:

    For labeled dimensions 40 cm or less, linear measure: 30 cm in length, 1 mm divisions; or a 1 m rule with 0.1 mm divisions, overall length tolerance of 0.4 mm.

    For labeled dimensions greater than 40 cm, 30 m tape with 1 mm divisions.

  - Inch-pound Units:

    For labeled dimensions 25 in or less, use a 36 in rule with $^{1}/_{64}$ in or $^{1}/_{100}$ in divisions and an overall length tolerance of $^{1}/_{64}$ in.

    For dimensions greater than 25 in, use a 100 ft tape with $^{1}/_{16}$ in divisions and an overall length tolerance of 0.1 in.

- T-square

Test Procedure

Step:

1. Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following test procedure to determine lot compliance.

2. Select an initial tare sample according to Section 2.3. "Basic Test Procedure – Tare Procedures."

Step:

3. Gross weigh the first package in the tare sample and record this weight.

4. Determine and record the measurements (to the nearest division of the appropriate tape or rule) of the packaged goods (length, width, area; depending upon which dimensions are declared on the label) and weigh the goods from the first package opened for tare determination.

   - Calculate and record the weight of the labeled measurements using the following formula:

     Weight of the labeled measurement =
     (labeled measurement) x (contents weight) ÷ (contents measurement)

   - Look up and record the MAV in units of length or area measure (given in Appendix A, Table 2-8. "Maximum Allowable Variations for Packages Labeled by Length, (Width) or Area"

Note: See Appendix A, Table 2-10. " Exceptions to the MAVs for Textiles, and Polyethylene Sheeting and Film.

5. Determine and record the tare weight of the first package opened.

6. Determine and record the measurements (length, width, area; depending upon which dimensions are declared on the label) of the product in the second package chosen for tare determination (to the nearest division of the appropriate tape or rule). Determine and record the tare weight of this package.

7. Calculate and record the weight of the labeled measurement for the second package using the following formula:

   Weight of the labeled measurement =
   (labeled measurement) x (contents weight ÷ contents measurement)

   The weights of the labeled measurement for two packages must not differ by more than one division on the scale. If they do, open all packages in the sample, measure individually, and compare them against the labeled measure to determine the package errors. If the criterion is met, go to step 8.

8. Calculate the average weight of the labeled measurement and record.

9. Determine and record the average tare weight according to Section 2.3. "Basic Test Procedure – Tare Procedures."

10. Compute and record the nominal gross weight by adding the average weight of the labeled measurements to the average tare weight.

Step:

11. Compute package errors according to the following formula:

Package error (weight) =
(actual package gross weight) − (nominal gross weight)

12. Convert the MAV to units of weight using the following formula:

MAV (weight) =
(avg. wt. of label measurements x MAV [length]) ÷ (labeled measurements)

Convert the MAV to dimensionless units by dividing the MAV (weight) by the unit of measure and record.

Evaluation of Results

Follow the procedure in Section 2.3. "Basic Test Procedure – Evaluating Results" to determine lot conformance.

Convert back to dimensions when completing the report form using following the formula:

Avg. Pkg. Error (dimension) = (Avg. Pkg. Error [dimensionless units]) x (Unit of Measure) x (Labeled unit of measure) ÷ (Avg. Weight of Labeled dimension)

4.9. Baler Twine – Test Procedure for Length

Test Equipment

- A scale that meets the requirements in Section 2.2. "Measurement Standards and Test Equipment," except a scale with 0.1 g (0.000 2 lb) increments must be used for weighing twine samples. The recommended minimum load for weighing samples is 20 divisions.

- Steel tapes and rules – Determine measurements of length to the nearest division of the appropriate tape or rule.

  - Metric Units:

    For labeled dimensions 40 cm or less, linear measure: 30 cm in length, 1 mm divisions; or a 1 m rule with 0.1 mm divisions, overall length tolerance of 0.4 mm.

    For labeled dimensions greater than 40 cm, 30 m tape with 1 mm divisions.

  - Inch-pound Units:

    For labeled dimensions 25 in or less, use a 36 in rule with $^1/_{64}$ in or $^1/_{100}$ in divisions and an overall length tolerance of $^1/_{64}$ in.

    For dimensions greater than 25 in, use a 100 ft tape with $^1/_{16}$ in divisions and an overall length tolerance of 0.1 in.

- A hand-held straight-face spring scale of at least 4.53 kg (10 lb) capacity or a cordage-testing device that applies the specified tension to the twine being measured. When measuring twine samples or total roll length, apply 4.53 kg (10 lb) of tension to the twine.

Test Procedure

Follow Section 2.3. "Basic Test Procedure – Define the Inspection Lot." Use a "Category A" sampling plan in the inspection; select a random sample; then use the following test procedure to determine lot compliance.

Step:

1. Select packages for tare samples. Determine gross weights of the initial tare sample and record. Open the tare samples. Use the procedures for tare determination in Section 2.3. "Basic Test Procedure – Tare Procedures" to compute the average tare weight and record this value.

2. Procedure for obtaining twine samples: Randomly select four balls of twine from the packages that were opened for tare.

   From each of the four balls of twine:

   - Measure and discard the first 10.05 m (33 ft) of twine from each roll. Accurate measurement requires applying tension to the ends of the twine before measuring in order to straighten the product.

   - Take two 30.48 m (100 ft) lengths of twine from inside each roll.

   - Weigh and record the weight of each piece separately and record the values. Compare the weight values to determine the variability of the samples. If the individual weights of the eight twine samples vary by more than one division on the scale, use one of the following steps: If the lot is short, determine the actual length of the lightest-weight roll found in the lightest-weight package of the lot to confirm that the weight shortages reflect the shortages in the length of the rolls; or, determine the average weight-per-unit of measure by taking ten 30.48 m (100 ft) lengths from inside the lightest weight package. Use this value to recalculate its length and determine lot compliance.

3. Weigh all of the sample lengths together and record the total value. Determine the total length of the samples (243.8 m or 800 ft, unless more than eight sample-lengths were taken) and record the value. Compute the average weight-per-unit-of-length by dividing the total weight by the total length of the pieces.

4. Determine the MAV for a package of twine (refer to Appendix A, Table 2-8. "Maximum Allowable Variations for Packages Labeled by Length, Width, or Area").

   - Record the total declared package length.

   - Multiply the MAV from Appendix A, Table 2-8. "Maximum Allowable Variations for Packages Labeled by Length, (Width), or Area," times the total package length to obtain the MAV for length and record this value.

Step:

- Multiply the weight per unit of length (from step 3) times the MAV for the total declared package length to obtain the MAV by weight and record this value.

- Convert the MAV to dimensionless units and record.

5. Calculate the nominal gross weight and record.

   Follow Section 2.3. "Basic Test Procedure – Determine Nominal Gross Weight and Package Errors for Sample Tare" to determine individual package errors. Determine errors using the following formula:

   Package error (weight) = (package gross weight) − (nominal gross weight)

- To convert the Package error in weight back to length, divide the weight by the average weight-per-unit-of-length.

Evaluation of Results

Follow the procedures in Section 2.3. "Basic Test Procedure – Evaluating Results" to determine lot compliance.

4.10 Procedure for Checking the Area Measurement of Chamois

Chamois is natural leather made from skins of sheep and lambs that have been oil-tanned. Chamois are irregularly shaped, which makes area measurement difficult. Because of these characteristics, an accurate area determination can only be made using an internationally recognized method of conditioning (rehydrating) and measurement. Chamois is produced in a wet manufacturing process, so it has high moisture content at time of measurement. Chamois is hydroscopic; therefore, its dimensions and total area change as it loses or absorbs moisture. It is also subject to wrinkling. Because of the variation of the thickness and density, and therefore the weight per unit area of chamois, an estimated gross weight procedure cannot be used to verify the labeled area declaration.

Standard Test Conditions: As with all hydroscopic products, reasonable variations in measure must be allowed if caused by ordinary and customary exposure to atmospheric conditions that normally occur in good distribution practice. Both federal and international standards specify procedures to restore the moisture content of chamois so that tests to verify dimensions and area can be conducted.

Federal Test Method Standard 311, "Leather, Methods of Sampling and Testing," (January 15, 1969) defines the standard atmospheric condition for chamois as 50 ± 4 % relative humidity and 23 ± 2 °C (73.4 ± 3.6 °F). The chamois is considered to be at equilibrium moisture when the difference in two successive weighings, made at 1 hr intervals, is no greater than 0.25 % (e.g., the maximum change in weight on a 100 g sample in two successive weighings is less than 0.25 g (250 mg).

Test Procedures

The area of chamois is verified using a two-stage test procedure. The first stage is a field audit using the template test procedure. This test is used for field audits because it is simpler to perform and does not require the chamois to be conditioned. The field audit is used to identify chamois that are potentially under measure. It is not as accurate as the gravimetric procedure because some error results from reading the area from the template. The gravimetric procedure should be used for compliance testing because it includes conditioning (rehydrating) the chamois.

Template Test Method (for field audits)

Select a random sample of chamois and use the Template Procedure (below) to determine the area of each sample. Chamois is labeled in uniform sizes in terms of square decimeters and square feet, and are sized in increments of ¼ ft^2 (e.g., 1 ft^2, 1¼ ft^2, and 1½ ft^2). Separate the chamois into different sizes and define the inspection lot by specific sizes.

Test Equipment

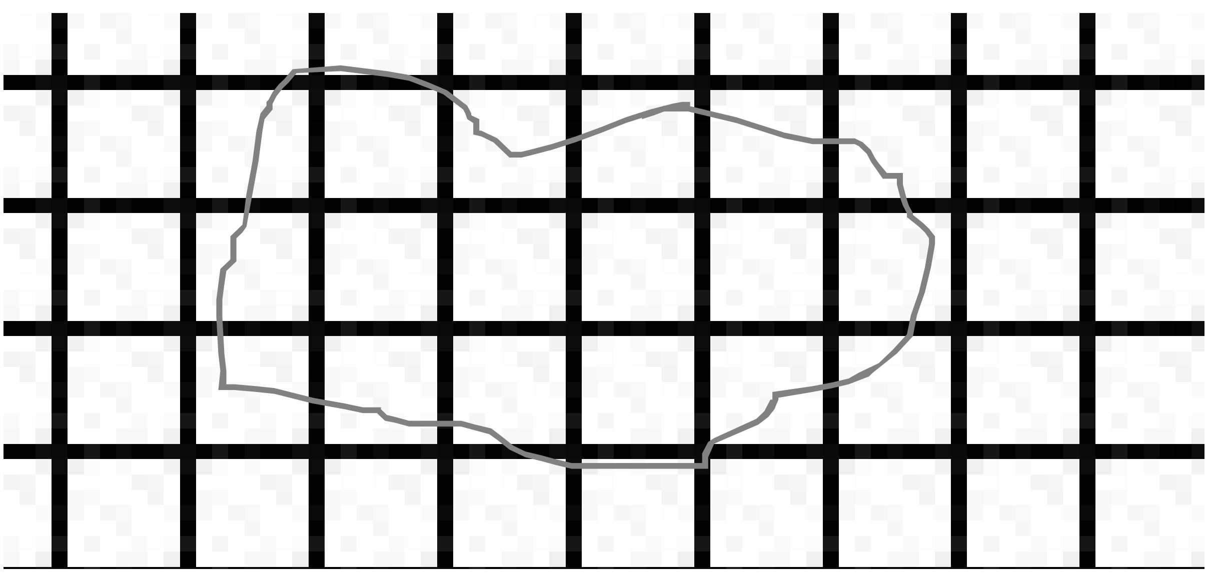
Use a transparent, flexible template that is graduated in square centimeters or square inches and that has been verified for accuracy. The template must be large enough to completely cover the chamois under test.

Template Procedures

Step:

1. Template Procedure
   Place the template over the chamois specimen on a smooth surface. Determine the area by counting the number of squares that cover the surface of the chamois. Estimate parts of the template that do not completely cover the chamois by adding the number of partially covered blocks. (See Figure 1.) Compute the total area and go to Evaluation to determine if further action is necessary.

Figure 1.



Step:
First Stage – Decision Criteria

If the average minus error exceeds 3 % of the labeled area, the chamois may not be labeled accurately. To confirm the finding, the sample must be taken to a laboratory for conditioning and testing using the gravimetric test procedure.

2. Gravimetric Procedure for Area Measurement

   This test cannot be performed in the field because the samples must be conditioned with water before testing. This method is intended for use in checking full or cut skins, or pattern shapes. Open and condition all of the packages in the sample before determining their area on the recommended paper. Conditioning and verifying chamois can be accomplished without destroying the product. When successful tests are completed, the chamois may be repackaged for sale, so do not destroy the packaging material.

Test Equipment

- Scale with a capacity of 1 kg that is accurate to at least ± 0.01 g and a load-receiving element of adequate size to properly hold the chamois
- Atomizer or trigger-type sprayer and sealable, airtight polyethylene bags
- Medium weight drawing paper (e.g., drawing paper, medium weight (100 lb), regular surface or comparable)
- Household iron with low temperature settings 30 °C to 40 °C (86 °F to 104 °F)
- Rule or tape that is graduated in centimeters or inches
- Instrument for cutting paper (razor blade, scissors, or cutting board)

Sample Conditioning

Step:
1. Remove each sample from its package and weigh and record each weight. Using an atomizer-type sprayer, spray water in the amount of 25 % of the weight of each skin uniformly over its area. Place wetted chamois in an airtight polyethylene bag; seal the bag, and leave it in this condition at room temperature for 24 hours.

2. Open the bag, remove the chamois, and reweigh the chamois to confirm that it retained maximum moisture. (This is done by confirming that the difference in the two consecutive weighings conducted an hour apart does not exceed 0.25 %).

3. Place the chamois flat on a continuous piece of drawing paper. To remove wrinkles and make the chamois lie flat, use a normal domestic iron that is heated to a maximum of 30 °C to 40 °C (86 °F to 104 °F). Place the iron on the bottom of the skin, and iron the skin up from the center to the top. Then, iron the skin from the center out to each side. Iron until the skin is fully extended and perfectly flat.

Measurement

Step:

1. Immediately after ironing, carefully draw around the outline of the skin on the paper. Remove the skin; carefully cut along the outline of the skin; weigh the cutout pattern, and record to the nearest 0.1 g as Sample Weight 1 (W1).

2. Lay out the pattern and cut an accurately measured rectangle of a size not less than one-half the area of the pattern. Weigh the cutout rectangle and record the weight to the nearest 0.1 g as Sample Weight 2 (W2). Calculate the area of the rectangle cut from the patterns by multiplying length by width and record as Area (A) in centimeters or square inches.

   - For metric units – calculate the area of the original skin being checked as follows:

     $$W1/W2 \text{ x } A = \text{Skin Area in } cm^2/100 = \text{Area in } dm^2$$

   - For inch-pound units – calculate the area of the original skin being checked as follows:

     $$W1/W2 \text{ x } A = \text{Skin Area in } in^2/144 = \text{Area } ft^2$$

Evaluation of Results

Compute the average error for the sample and follow the procedures in Section 2.3. "Basic Test Procedure – Evaluating Results" to determine lot conformance.

The MAV for area declarations on chamois is 3 % of the labeled area as specified in Appendix A, Table 2-8. "Maximum Allowable Variations for Packages Labeled by Length, (Width), or Area".

Appendix A. Tables

Table 1-1. Agencies Responsible for Package Regulations and Applicable Requirements

Commodity	Responsible Agency	NIST Handbook 133 Sampling Plans	Table of Maximum Allowable Variations
Meat and Poultry	U.S. Department of Agriculture/Food Safety and Inspection Service and state and local weights and measures.	1. Use Table 2-1. Sampling Plans for Category A to test packages at other than point of pack. 2. Use Table 2-2. Sampling Plans for Category B to test packages in federally inspected meat and poultry plants.	Table 2-9. U.S. Department of Agriculture, Meat and Poultry, Groups and Lower Limits for Individual Packages
Foods, drugs, and cosmetics subject to the Food, Drug, and Cosmetic Act including those packaged at the retail store level that have been in interstate commerce (e.g., seafood) or those made with ingredients that have been in interstate commerce	U.S. Food and Drug Administration and state and local weights and measures http://www.fda.gov	Use Table 2-1. Sampling Plans for Category A to test packages at all locations.	Table 2-5. MAVs for Packages Labeled by Weight Table 2-6. MAVs for Packages Labeled by Liquid or Dry Volume Table 2-7. MAVs for Packages Labeled by Count Table 2-8. MAVs for Packages Labeled by Length (Width) or Area Table 2-10. Exceptions to the MAVs for Textiles, Polyethylene Sheeting and Film, Mulch and Soil Labeled by Volume, Packaged Firewood, and Packages Labeled
Food products <u>not</u> subject to the Federal Food, Drug, and Cosmetic Act, including meat and poultry products packaged at the retail store level	State and local weights and measures http://www.nist.gov/owm		
Non-food Consumer Products	Federal Trade Commission http://www.ftc.gov		
Non-food Consumer and Non-consumer Products	State and local weights and measures		

Table 1-1. Agencies Responsible for Package Regulations and Applicable Requirements			
Commodity	**Responsible Agency**	**NIST Handbook 133 Sampling Plans**	**Table of Maximum Allowable Variations**
Alcohol and Tobacco Products	U.S. Bureau of Alcohol, Tobacco, and Firearms and state and local weights and measures ~~**http://www.atf.treas.gov**~~ **http:// www.atf.gov**		by Count with Less than 50 Items
Pesticides	U.S. Environmental Protection Agency and state and local weights and measures http://www.epa.gov		

Table 2-1. Sampling Plans for Category A

1	2	3	4	5	6
Inspection Lot Size	**Sample Size**	**Sample Correction Factor**	**Number of Minus Package Errors Allowed to Exceed the MAV ***	**Initial Tare Sample Size ****	
				Glass and Aerosol Packages	**All Other Packages**
1	1	Apply MAV	0*	2	2
2	2	8.98~~4~~5			
3	3	2.484			
4	4	1.591			
5	5	1.24~~1~~2			
6	6	1.0~~50~~49			
7	7	0.925			
8	8	0.836			
9	9	0.769			
10	10	0.715			
11	11	0.672			
12 to 250	12	0.635			
251 to 3 200	24	0.422		3	
More than 3 200	48	0.29~~1~~0	1*		

* For mulch and soils packaged by volume, see Table 2-10. Exceptions to the Maximum Allowable Variations – 1 package may exceed the MAV for every 12 packages in the sample.

** If sample size is 11 or fewer, the initial tare sample size and the total tare sample size is 2 samples.
(Amended 2001)

Table 2-2. Sampling Plans for Category B
For Use In USDA-Inspected Meat and Poultry Plants Only

1	2	3	4
Inspection Lot Size	**Sample Size**	**Initial Tare Sample Size**	**Number of Packages Allowed to Exceed the MAVs in Table 2-9**
250 or Fewer	10	2	0
251 or More	30	5	

Table 2-3. Category A – Total Number of Packages to be Opened for Tare Determination Numbers Include those Packages Opened for Initial Tare Sample					
Ratio of R_c/R_t	**Total Number of Packages in Tare Sample**				
Sample Size	**12**	**24**		**48**	
Initial Tare Sample Size	**2**	**2**	**3**	**2**	**3**
If range of tare equals "zero," use Initial Tare Sample Size. If the ratio is "zero" based on a "zero" range of net weight, open all of the packages in the sample.	2	2	3	2	3
If the ratio is greater than 0 but less than or equal to 0.2	12	24	24	48	48
0.21 to 0.60	12	24	24	48	48
0.61 to 0.70	12	24	24	47	47
0.71 to 0.80	12	23	23	47	47
0.81 to 1.00	12	23	23	46	46
1.01 to 1.10	11	23	23	46	46
1.11 to 1.20	11	23	23	45	45
1.21 to 1.30	11	22	22	45	45
1.31 to 1.50	11	22	22	44	44
1.51 to 1.60	11	22	22	43	43
1.61 to 1.70	11	21	21	42	42
1.71 to 1.80	10	21	21	42	42
1.81 to 1.90	10	21	21	41	41
1.91 to 2.00	10	20	20	41	41
2.01 to 2.10	10	20	20	40	40
2.11 to 2.20	10	20	20	39	39
2.21 to 2.30	10	19	19	39	39
2.31 to 2.40	9	19	19	38	38
2.41 to 2.50	9	19	19	37	37
2.51 to 2.60	9	18	18	37	37
2.61 to 2.70	9	18	18	36	36
2.71 to 2.80	9	18	18	35	35
2.81 to 2.90	9	17	17	34	34
2.91 to 3.00	8	17	17	34	34
3.01 to 3.10	8	17	17	33	33
3.11 to 3.30	8	16	16	32	32
3.31 to 3.40	8	16	16	31	31
3.41 to 3.50	8	15	15	30	30
3.51 to 3.60	7	15	15	30	30
3.61 to 3.70	7	15	15	29	29
3.71 to 3.90	7	14	14	28	28
3.91 to 4.00	7	14	14	27	27
4.01 to 4.10	7	13	13	27	27
4.11 to 4.20	7	13	13	26	26
4.21 to 4.30	6	13	13	25	25

Table 2-3. Category A – Total Number of Packages to be Opened for Tare Determination Numbers Include those Packages Opened for Initial Tare Sample

Ratio of R_c/R_t	Total Number of Packages in Tare Sample				
Sample Size	**12**	**24**		**48**	
Initial Tare Sample Size	**2**	**2**	**3**	**2**	**3**
4.31 to 4.40	6	12	12	25	25
4.41 to 4.60	6	12	12	24	24
4.61 to 4.70	6	12	12	23	23
4.71 to 4.80	6	11	11	23	23
4.81 to 4.90	6	11	11	22	22
4.91 to 5.00	5	11	11	22	22
5.01 to 5.10	5	11	11	21	21
5.01 to 5.10	5	11	11	21	21
5.11 to 5.20	5	10	10	21	21
5.21 to 5.40	5	10	10	20	20
5.41 to 5.60	5	10	10	19	19
5.61 to 5.70	5	9	9	19	19
5.71 to 5.80	5	9	9	18	18
5.81 to 5.90	4	9	9	18	18
5.91 to 6.10	4	9	9	17	17
6.11 to 6.20	4	8	8	17	17
6.21 to 6.50	4	8	8	16	16
6.51 to 6.70	4	8	8	15	15
6.71 to 6.80	4	7	7	15	15
6.81 to 7.00	4	7	7	14	14
7.01 to 7.20	3	7	7	14	14
7.21 to 7.40	3	7	7	13	13
7.41 to 7.60	3	6	6	13	13
7.61 to 8.00	3	6	6	12	12
8.01 to 8.20	3	6	6	11	11
8.21 to 8.50	3	5	5	11	11
8.51 to 8.80	3	5	5	10	10
8.81 to 9.00	2	5	5	10	10
9.01 to 9.30	2	5	5	9	9
9.31 to 9.70	2	4	4	9	9
9.71 to 10.40	2	4	4	8	8
10.41 to 10.90	2	4	4	7	7
10.91 to 11.30	2	3	3	7	7
11.31 to 12.50	2	3	3	6	6
12.51 to 13.20	2	3	3	5	5
13.21 to 13.90	2	2	3	5	5
13.91 to 16.00	2	2	3	4	4
16.01 to 19.10	2	2	3	3	3
19.11 to 19.20	2	2	3	2	3
Initial Tare Sample Size	**2**	**2**	**3**	**2**	**3**

Table 2-4. Category B – Total Number of Packages to be Opened for Tare Determination Numbers Include those Packages Opened for Initial Tare Sample		
Ratio of R_c/R_t	**Total Number of Packages in Tare Sample**	
Sample Size	**10**	**30**
Initial Tare Sample Size	**2**	**5**
If the ratio is zero, based on a "zero" range of tare, use Initial Tare Sample Size. If the ratio is "zero" based on a "zero" range of net weight, open all the packages in the sample.	2	5
If the ratio is greater than 0 but less than or equal to 0.2	10	30
0.21 to 0.40	10	29
0.41 to 0.60	10	28
0.61 to 0.80	9	26
0.81 to 1.00	8	24
1.01 to 1.20	8	23
1.21 to 1.40	7	21
1.41 to 1.60	7	19
1.61 to 1.80	6	17
1.81 to 2.00	5	15
2.01 to 2.20	5	14
2.21 to 2.40	5	13
2.41 to 2.60	4	12
2.61 to 2.80	4	11
2.81 to 3.00	4	10
3.01 to 3.20	3	9
3.21 to 3.60	3	8
3.61 to 3.80	3	7
3.81 to 4.40	2	6
If the ratio is greater than 4.40, use the Initial Tare Sample Size	2	5

Table 2-5. Maximum Allowable Variations (MAVs) for Packages Labeled by Weight Do Not Use this Table for Meat and Poultry Products subject to USDA Regulations – Use Table 2-9. For Polyethylene Sheeting and Film, see Table 2-10. Exceptions to the MAVs.	
Labeled Quantity	**Maximum Allowable Variations**
Less than 36 g, 0.08 lb, or 1.28 oz	10 % of labeled quantity
36 g or more to 54 g **0.08 lb or more to 0.12 lb** 1.28 oz or more to 1.92 oz	3.6 g **0.008 lb** 1/8 oz
More than 54 g to 81 g **More than 0.12 lb to 0.18 lb** More than 1.92 oz to 2.88 oz	5.4 g **0.012 lb** 3/16 oz
More than 81 g to 117 g **More than 0.18 lb to 0.26 lb** More than 2.88 oz to 4.16 oz	7.2 g **0.016 lb** ¼ oz
More than 117 g to 154 g **More than 0.26 lb to 0.34 lb** More than 4.16 oz to 5.44 oz	9.0 g **0.020 lb** 5/16 oz
More than 154 g to 208 g **More than 0.34 lb to 0.46 lb** More than 5.44 oz to 7.36 oz	10.8 g **0.024 lb** 3/8 oz
More than 208 g to 263 g **More than 0.46 lb to 0.58 lb** More than 7.36 oz to 9.28 oz	12.7 g **0.028 lb** 7/16 oz
More than 263 g to 317 g **More than 0.58 lb to 0.70 lb** More than 9.28 oz to 11.20 oz	14.5 g **0.032 lb** ½ oz
More than 317 g to 381 g **More than 0.70 lb to 0.84 lb** More than 11.20 oz to 13.44 oz	16.3 g **0.036 lb** 9/16 oz
More than 381 g to 426 g **More than 0.84 lb to 0.94 lb** More than 13.44 oz to 15.04 oz	18.1 g **0.040 lb** 5/8 oz
More than 426 g to 489 g **More than 0.94 lb to 1.08 lb** More than 15.04 oz to 17.28 oz	19.9 g **0.044 lb** 11/16 oz
More than 489 g to 571 g More than 1.08 lb to 1.26 lb	21.7 g 0.048 lb
More than 571 g to 635 g More than 1.26 lb to 1.40 lb	23.5 g 0.052 lb
More than 635 g to 698 g More than 1.40 lb to 1.54 lb	25.4 g 0.056 lb
More than 698 g to 771 g More than 1.54 lb to 1.70 lb	27.2 g 0.060 lb
More than 771 g to 852 g More than 1.70 lb to 1.88 lb	29.0 g 0.064 lb
More than 852 g to 970 g More than 1.88 lb to 2.14 lb	31.7 g 0.070 lb

Table 2-5. Maximum Allowable Variations (MAVs) for Packages Labeled by Weight Do Not Use this Table for Meat and Poultry Products subject to USDA Regulations – Use Table 2-9. For Polyethylene Sheeting and Film, see Table 2-10. Exceptions to the MAVs.	
Labeled Quantity	**Maximum Allowable Variations**
More than 970 g to 1.12 kg More than 2.14 lb to 2.48 lb	35.3 g 0.078 lb
More than 1.12 kg to 1.25 kg More than 2.48 lb to 2.76 lb	39.0 g 0.086 lb
More than 1.25 kg to 1.45 kg More than 2.76 lb to 3.20 lb	42.6 g 0.094 lb
More than 1.45 kg to 1.76 kg More than 3.20 lb to 3.90 lb	49 g 0.11 lb
More than 1.76 kg to 2.13 kg More than 3.90 lb to 4.70 lb	54 g 0.12 lb
More than 2.13 kg to 2.63 kg More than 4.70 lb to 5.80 lb	63 g 0.14 lb
More than 2.63 kg to 3.08 kg More than 5.80 lb to 6.80 lb	68 g 0.15 lb
More than 3.08 kg to 3.58 kg More than 6.80 lb to 7.90 lb	77 g 0.17 lb
More than 3.58 kg to 4.26 kg More than 7.90 lb to 9.40 lb	86 g 0.19 lb
More than 4.26 kg to 5.30 kg More than 9.40 lb to 11.70 lb	99 g 0.22 lb
More than 5.30 kg to 6.48 kg More than 11.70 lb to 14.30 lb	113 g 0.25 lb
More than 6.48 kg to 8.02 kg More than 14.30 lb to 17.70 lb	127 g 0.28 lb
More than 8.02 kg to 10.52 kg More than 17.70 lb to 23.20 lb	140 g 0.31 lb
More than 10.52 kg to 14.33 kg More than 23.20 lb to 31.60 lb	167 g 0.37 lb
More than 14.33 kg to 19.23 kg More than 31.60 lb to 42.40 lb	199 g 0.44 lb
More than 19.23 kg to 24.67 kg More than 42.40 lb to 54.40 lb	226 g 0.50 lb
More than 24.67 kg More than 54.40 lb	2 % of labeled quantity

(Amended 2004)

Table 2-6. Maximum Allowable Variations for Packages Labeled by Liquid and Dry Volume Do Not Use this Table for Meat and Poultry Products Subject to USDA Regulations For Mulch, see Table 2-10. Exceptions to the Maximum Allowable Variations Use Table 2-9 for USDA –Regulated Products.	
Labeled Quantity	**Maximum Allowable Variations (MAVs)**
3 mL or less **0.50 fl oz or less** 0.18 in^3 or less	0.5 mL **0.02 fl oz** 0.03 in^3
More than 3 mL to 8 mL More than 0.18 in^3 to 0.49 in^3	1.0 mL 0.06 in^3
More than 8 mL to 14 mL More than 0.49 in^3 to 0.92 in^3	1.5 mL 0.09 in^3
More than 14 mL to 22 mL **More than 0.50 fl oz to 0.75 fl oz** More than 0.92 in^3 to 1.35 in^3	1.7 mL **0.06 fl oz** 0.10 in^3
More than 22 mL to 66 mL **More than 0.75 fl oz to 2.25 fl oz** More than 1.35 in^3 to 4.06 in^3	3.8 mL **0.13 fl oz** 0.23 in^3
More than 66 mL to 125 mL **More than 2.25 fl oz to 4.25 fl oz** More than 4.06 in^3 to 7.66 in^3	5.6 mL **0.19 fl oz** 0.34 in^3
More than 125 mL to 170 mL **More than 4.25 fl oz to 5.75 fl oz** More than 7.66 in^3 to 10.37 in^3	7.3 mL **0.25 fl oz** 0.45 in^3
More than 170 mL to 221 mL **More than 5.75 fl oz to 7.50 fl oz** More than 10.37 in^3 to 13.53 in^3	9.1 mL **0.31 fl oz** 0.55 in^3
More than 221 mL to 347 mL **More than 7.50 fl oz to 11.75 fl oz** More than 13.53 in^3 to 21.20 in^3	11.2 mL **0.38 fl oz** 0.68 in^3
More than 347 mL to 502 mL **More than 11.75 fl oz to 17.00 fl oz** More than 21.20 in^3 to 30.67 in^3	14.7 mL **0.5 fl oz** 0.90 in^3
More than 502 mL to 621 mL More than 17 fl oz to 21 fl oz More than 30.67 in^3 to 37.89 in^3	18.6 mL **0.63 fl oz** 1.13 in^3
More than 621 mL to 798 mL More than 21 fl oz to 27 fl oz More than 37.89 in^3 to 48.72 in^3	22.1 mL **0.75 fl oz** 1.35 in^3
More than 798 mL to 916 mL More than 27 fl oz to 31 fl oz More than 48.72 in^3 to 55.94 in^3	26.0 mL **0.88 fl oz** 1.58 in^3
More than 916 mL to 1.15 L **More than 31 fl oz to 39 fl oz** More than 55.94 in^3 to 70.38 in^3	29 mL **1 fl oz** 1.80 in^3
More than 1.15 L to 1.62 L **More than 39 fl oz to 55 fl oz** More than 70.38 in^3 to 99.25 in^3	36 mL **1.25 fl oz** 2.25 in^3

Table 2-6. Maximum Allowable Variations for Packages Labeled by Liquid and Dry Volume

Do Not Use this Table for Meat and Poultry Products Subject to USDA Regulations
For Mulch, see Table 2-10. Exceptions to the Maximum Allowable Variations
Use Table 2-9 for USDA –Regulated Products.

Labeled Quantity	Maximum Allowable Variations (MAVs)
More than 1.62 L to 2.04 L **More than 55 fl oz to 69 fl oz** More than 99.25 in^3 to 124.5 in^3	44 mL **1.5 fl oz** 2.70 in^3
More than 2.04 L to 2.51 L **More than 69 fl oz to 85 fl oz** More than 124.5 in^3 to 153.3 in^3	51 mL **1.75 fl oz** 3.1 in^3
More than 2.51 L to 3.04 L **More than 85 fl oz to 103 fl oz** More than 153.3 in^3 to 185.8 in^3	59 mL **2 fl oz** 3.6 in^3
More than 3.04 L to 4.73 L **More than 103 fl oz to 160 fl oz** More than 185.8 in^3 to 288.7 in^3	73 mL **2.5 fl oz** 4.5 in^3
More than 4.73 L to 5.48 L **More than 160 fl oz to 185.6 fl oz** More than 288.7 in^3 to 334.9 in^3	88 mL **3 fl oz** 5.4 in^3
More than 5.48 L to 7.09 L **More than 185.6 fl oz to 240 fl oz** More than 334.9 in^3 to 443.1 in^3	103 mL **3.5 fl oz** 6.3 in^3
More than 7.09 L to 8.04 L **More than 240 fl oz to 272 fl oz** More than 443.1 in^3 to 490.8 in^3	118 mL **4 fl oz** 7.2 in^3
More than 8.04 L to 10.17 L **More than 272 fl oz to 344 fl oz** More than 490.8 in^3 to 620.8 in^3	133 mL **4.5 fl oz** 8.1 in^3
More than 10.17 L to 11.59 L **More than 344 fl oz to 392 fl oz** More than 620.8 in^3 to 707.4 in^3	147 mL **5 fl oz** 9.0 in^3
More than 11.59 L to 16.56 L **More than 392 fl oz to 560 fl oz** More than 707.4 in^3 to 1 010 in^3	177 mL **6 fl oz** 10.8 in^3
More than 16.56 L to 18.92 L **More than 560 fl oz to 640 fl oz (5 gal)** More than 1 010 in^3 into 1 155 in^3	207 mL **7 fl oz** 12.6 in^3
More than 18.92 L to 23.65 L **More than 640 fl oz to 800 fl oz** More than 1 155 in^3 to 1 443 in^3	236 mL **8 fl oz** 14.4 in^3
More than 23.65 L to 26.73 L **More than 800 fl oz to 904 fl oz** More than 1 443 in^3 to 1 631 in^3	266 mL **9 fl oz** 16.2 in^3
More than 26.73 L **More than 904 fl oz** More than 1 631 in^3	**1 % of labeled quantity**

(Amended 2004)

Table 2-7. Maximum Allowable Variations (MAVs) for Packages Labeled by Count	
Labeled Quantity	**Maximum Allowable Variations (MAVs)**
17 or less	0
18 to 50	1
51 to 83	2
84 to 116	3
117 to 150	4
151 to 200	5
201 to 240	6
241 to 290	7
291 to 345	8
346 to 400	9
401 to 465	10
466 to 540	11
541 to 625	12
626 to 725	13
726 to 815	14
816 to 900	15
901 to 990	16
991 to 1 075	17
1 076 to 1 165	18
1 166 to 1 250	19
1 251 to 1 333	20
1 334 or more	1.5 % of labeled count rounded off to the nearest whole number

Table 2-8. Maximum Allowable Variations for Packages Labeled by Length, (Width), or Area For Textiles, Polyethylene Sheeting and Film – Use Table 2-10.	
Labeled Quantity	**Maximum Allowable Variations (MAVs)**
1 m or less 1 yd or less	3 % of labeled quantity
More than 1 m to 43 m More than 1 yd to 48 yd	1.5 % of labeled quantity
More than 43 m to 87 m More than 48 yd to 96 yd	2 % of labeled quantity
More than 87 m to 140 m More than 96 yd to 154 yd	2.5 % of labeled quantity
More than 140 m to 301 m More than 154 yd to 330 yd	3 % of labeled quantity
More than 301 m to 1 005 m More than 330 yd to 1 100 yd	4 % of labeled quantity
More than 1 005 m or 1 100 yd	5 % of labeled quantity
Maximum Allowable Variations for Packages Labeled by Area	
The MAV for packages labeled by area is 3 % of labeled quantity.	
For Textiles, Polyethylene Sheeting and Film, see Table 2-10. Exceptions to the MAVs.	

(Amended 2004)

Table 2-9. U.S. Department of Agriculture, Meat and Poultry **Groups and Lower Limits for Individual Packages (Maximum Allowable Variations)**		
Definition of Group and Labeled Quantity		**Lower Limit for Individual Weights (MAVs)**
Homogenous Fluid When Filled (e.g., baby food or containers of lard)	**All Other Products**	
Less than 85 g or 3 oz		10 % of labeled quantity
85 g or more to 453 g 3 oz or more to 16 oz		7.1 g 0.016 lb (0.25 oz)
More than 453 g More than 16 oz	85 g or more to 198 g 3 oz to 7 oz	14.2 g 0.031 lb (0.5 oz)
	More than 198 g to 1.36 kg 7 oz to 48 oz	28.3 g 0.062 lb (1 oz)
	More than 1.36 kg to 4.53 kg More than 48 oz to 160 oz	42.5 g 0.094 lb (1.5 oz)
	More than 4.53 kg More than 160 oz	1 % of labeled quantity

Table 2-10. Exceptions to the Maximum Allowable Variations for Textiles, Polyethylene Sheeting and Film, Mulch and Soil Labeled by Volume, Packaged Firewood, and Packages Labeled by Count with Fewer than 50 Items	
	Maximum Allowable Variations (MAVs)
Polyethylene Sheeting and Film	**Thickness** When the labeled thickness is 25 µm (1 mil or 0.001 in) or less, any individual thickness measurement of polyethylene film may be up to 35 % below the labeled thickness. When the labeled thickness is greater than 25 µm (1 mil or 0.001 in), individual thickness measurements of polyethylene sheeting may be up to 20 % less than the labeled thickness. The average thickness of a single package of polyethylene sheeting may be up to 4 % less than the labeled thickness. **Weight** The MAV for individual packages of polyethylene sheeting and film shall be 4 % of the labeled quantity.
Textiles	The MAVs are: For packages labeled with dimensions of 60 cm (24 in) or more: Three percent of the labeled quantity for negative errors and 6 % of the labeled quantity for plus errors. For packages labeled with dimensions less than 60 cm (24 in): 6 % of the labeled quantity for negative errors and 12 % for plus errors.
Mulch And Soil Labeled By Volume	The MAVs are: For individual packages: 5 % of the labeled volume. For example: One package may exceed the MAV for every 12 packages in the sample (e.g., when the sample size is 12 or fewer, 1 package may exceed the MAV and when the sample size is 48 packages, 4 packages may exceed the MAV).
Packaged Firewood and Packages Labeled by Count with Fewer than 50 Items	MAVs are not applied to these packages.

(Amended 2004)

Table 2-11. Accuracy Requirements for Packages Labeled by Low Count (50 or Fewer) and Packages Given Tolerances (Glass and Stemware)			
	1	**2**	**3**
Inspection Lot Size	**Sample Size**	**For Packages Labeled by Low Count (50 or Fewer)**	**For Packages Given Tolerances (Glasses and Stemware)**
		Number of Packages Allowed to Contain Less than the Labeled Count	**Number of Package Errors that May Exceed the Allowable Difference**
1 - 11	1-11	1	0
12 - 250	12	1	0
251 – 3 200	24	2	1
More than 3 200	48	3	2

(Amended 2004)

Appendix B. Random Number Tables

Reproduced from Million Random Digits, used with permission of the Rand Corporation, Copyright, 1955, The Free Press (**http://www.rand.org/publications/classics/randomdigits.)**

All of the sampling plans presented in this handbook are based on the assumption that the packages constituting the sample are chosen at random from the inspection lot. Randomness in this instance means that every package in the lot has an equal chance of being selected as part of the sample. It does not matter what other packages have already been chosen, what the package net contents are, or where the package is located in the lot.

To obtain a random sample, two steps are necessary. First it is necessary to identify each package in the lot of packages with a specific number whether on the shelf, in the warehouse, or coming off the packaging line. Then it is necessary to obtain a series of random numbers. These random numbers indicate exactly which packages in the lot shall be taken for the sample.

The Random Number Table

The random number tables in Appendix B are composed of the digits from 0 through 9, with approximately equal frequency of occurrence. This appendix consists of 8 pages. On each page digits are printed in blocks of ~~five~~ columns and blocks of ~~five~~ rows. The printing of the table in blocks is intended only to make it easier to locate specific columns and rows.

Random Starting Place

Starting Page. The Random Digit pages are numbered B-2 through B-8. You can use the day of the week to determine the starting page or use the first page for the first lot you test in a location, the second page for the second lot, and so on, moving to the following page for each new lot.

Starting Column and Row. You may choose a starting page in the random number table and with eyes closed, drop a pencil anywhere on the page to indicate a starting place in the table.

For example, assume that testing takes place on the 3rd day of the week. Start with Table 3 of Appendix B. Assume you dropped your pencil on the page and it has indicated a starting place at column 22, row 45. That number is 1.

If one-digit random numbers are needed, record them, going down the column to the bottom of the page and then to the top of the next column, and so on. Ignore duplicates and record zero (0) as ten (10). Following on from the last example, these numbers are 3, 2, 9, 8, etc. If two-digit random numbers are needed, rule off the pages, and further pages if necessary, in columns of two digits each. If there is a single column left on the page, ignore this column, and rule the next page in columns of two. Again, ignore duplicate numbers and record 00 as 100. For example, using the same starting place as in the last example (Table 3, column 22, row 45), the recorded two-digit numbers would be 11, 34, 26, 95, etc. When three-digit numbers are needed, rule the page in columns of three. Record 000 as 1000. Starting on Table 3, column 22, row 45, the recorded numbers would be 119, 346, 269, 959, etc.

TABLE 1 – RANDOM DIGITS

11164	36318	75061	37674	26320	75100	10431	20418	19228	91792
21215	91791	76831	58678	87054	31687	93205	43685	19732	08468
10438	44482	66558	37649	08882	90870	12462	41810	01806	02977
36792	26236	33266	66583	60881	97395	20461	36742	02852	50564
73944	04773	12032	51414	82384	38370	00249	80709	72605	67497
49563	12872	14063	93104	78483	72717	68714	18048	25005	04151
64208	48237	41701	73117	33242	42314	83049	21933	92813	04763
51486	72875	38605	29341	80749	80151	33835	52602	79147	08868
99756	26360	64516	17971	48478	09610	04638	17141	09227	10606
71325	55217	13015	72907	00431	45117	33827	92873	02953	85474
65285	97198	12138	53010	94601	15838	16805	61004	43516	17020
17264	57327	38224	29301	31381	38109	34976	65692	98566	29550
95639	99754	31199	92558	68368	04985	51092	37780	40261	14479
61555	76404	86210	11808	12841	45147	97438	60022	12645	62000
78137	98768	04689	87130	79225	08153	84967	64539	79493	74917
62490	99215	84987	28759	19177	14733	24550	28067	68894	38490
24216	63444	21283	07044	92729	37284	13211	37485	10415	36457
16975	95428	33226	55903	31605	43817	22250	03918	46999	98501
59138	39542	71168	57609	91510	77904	74244	50940	31553	62562
29478	59652	50414	31966	87912	87154	12944	49862	96566	48825
96155	95009	27429	72918	08457	78134	48407	26061	58754	05326
29621	66583	62966	12468	20245	14015	04014	35713	03980	03024
12639	75291	71020	17265	41598	64074	64629	63293	53307	48766
14544	37134	54714	02401	63228	26831	19386	15457	17999	18306
83403	88827	09834	11333	68431	31706	26652	04711	34593	22561
67642	05204	30697	44806	96989	68403	85621	45556	35434	09532
64041	99011	14610	40273	09482	62864	01573	82274	81446	32477
17048	94523	97444	59904	16936	39384	97551	09620	63932	03091
93039	89416	52795	10631	09728	68202	20963	02477	55494	39563
82244	34392	96607	17220	51984	10753	76272	50985	97593	34320
96990	55244	70693	25255	40029	23289	48819	07159	60172	81697
09119	74803	97303	88701	51380	73143	98251	78635	27556	20712
57666	41204	47589	78364	38266	94393	70713	53388	79865	92069
46492	61594	26729	58272	81754	14648	77210	12923	53712	87771
08433	19172	08320	20839	13715	10597	17234	39355	74816	03363
10011	75004	86054	41190	10061	19660	03500	68412	57812	57929
92420	65431	16530	05547	10683	88102	30176	84750	10115	69220
35542	55865	07304	47010	43233	57022	52161	82976	47981	46588
86595	26247	18552	29491	33712	32285	64844	69395	41387	87195
72115	34985	58036	99137	47482	06204	24138	24272	16196	04393
07428	58863	96023	88936	51343	70958	96768	74317	27176	29600
35379	27922	28906	55013	26937	48174	04197	36074	65315	12537
10982	22807	10920	26299	23593	64629	57801	10437	43965	15344
90127	33341	77806	12446	15444	49244	47277	11346	15884	28131
63002	12990	23510	68774	48983	20481	59815	67248	17076	78910
40779	86382	48454	65269	91239	45989	45389	54847	77919	41105
43216	12608	18167	84631	94058	82458	15139	76856	86019	47928
96167	64375	74108	93643	09204	98855	59051	56492	11933	64958
70975	62693	35684	72607	23026	37004	32989	24843	01128	74658
85812	61875	23570	75754	29090	40264	80399	47254	40135	69916

TABLE 2 – RANDOM DIGITS

40603	16152	83235	37361	98783	24838	39793	80954	76865	32713
40941	53585	69958	60916	71018	90561	84505	53980	64735	85140
73505	83472	55953	17957	11446	22618	34771	25777	27064	13526
39412	16013	11442	89320	11307	49396	39805	12249	57656	88686
57994	76748	54627	48511	78646	33287	35524	54522	08795	56273
61834	59199	15469	82285	84164	91333	90954	87186	31598	25942
91402	77227	79516	21007	58602	81418	87838	18443	76162	51146
58299	83880	20125	10794	37780	61705	18276	99041	78135	99661
40684	99948	33880	76413	63839	71371	32392	51812	48248	96419
75978	64298	08074	62055	73864	01926	78374	15741	74452	49954
34556	39861	88267	76068	62445	64361	78685	24246	27027	48239
65990	57048	25067	77571	77974	37634	81564	98608	37224	49848
16381	15069	25416	87875	90374	86203	29677	82543	37554	89179
52458	88880	78352	67913	09245	47773	51272	06976	99571	33365
33007	85607	92008	44897	24964	50559	79549	85658	96865	24186
38712	31512	08588	61490	72294	42862	87334	05866	66269	43158
58722	03678	19186	69602	34625	75958	56869	17907	81867	11535
26188	69497	51351	47799	20477	71786	52560	66827	79419	70886
12893	54048	07255	86149	99090	70958	50775	31768	52903	27645
33186	81346	85095	37282	85536	72661	32180	40229	19209	74939
79893	29448	88392	54211	61708	83452	61227	81690	42265	20310
48449	15102	44126	19438	23382	14985	37538	30120	82443	11152
94205	04259	68983	50561	06902	10269	22216	70210	60736	58772
38648	09278	81313	77400	41126	52614	93613	27263	99381	49500
04292	46028	75666	26954	34979	68381	45154	09314	81009	05114
17026	49737	85875	12139	59391	81830	30185	83095	78752	40899
48070	76848	02531	97737	10151	18169	31709	74842	85522	74092
30159	95450	83778	46115	99178	97718	98440	15076	21199	20492
12148	92231	31361	60650	54695	30035	22765	91386	70399	79270
73838	77067	24863	97576	01139	54219	02959	45696	98103	78867
73547	43759	95632	39555	74391	07579	69491	02647	17050	49869
07277	93217	79421	21769	83572	48019	17327	99638	87035	89300
65128	48334	07493	28098	52087	55519	83718	60904	48721	17522
38716	61380	60212	05099	21210	22052	01780	36813	19528	07727
31921	76458	73720	08657	74922	61335	41690	41967	50691	30508
57238	27464	61487	52329	26150	79991	64398	91273	26824	94827
24219	41090	08531	61578	08236	41140	76335	91189	66312	44000
31309	49387	02330	02476	96074	33256	48554	95401	02642	29119
20750	97024	72619	66628	66509	31206	55293	24249	02266	39010
28537	84395	26654	37851	80590	53446	34385	86893	87713	26842
97929	41220	86431	94485	28778	44997	38802	56594	61363	04206
40568	33222	40486	91122	43294	94541	40988	02929	83190	74247
41483	92935	17061	78252	40498	43164	68646	33023	64333	64083
93040	66476	24990	41099	65135	37641	97613	87282	63693	55299
76869	39300	84978	07504	36835	72748	47644	48542	25076	68626
02982	57991	50765	91930	21375	35604	29963	13738	03155	59914
94479	76500	39170	06629	10031	48724	49822	44021	44335	26474
52291	75822	95966	90947	65031	75913	52654	63377	70664	60082
03684	03600	52831	55381	97013	19993	41295	29118	18710	64851
58939	28366	86765	67465	45421	74228	01095	50987	83833	37216

TABLE 3 – RANDOM DIGITS

37100	62492	63642	47638	13925	80113	88067	42575	44078	62703
53406	13855	38519	29500	62479	01036	87964	44498	07793	21599
55172	81556	18856	59043	64315	38270	25677	01965	21310	28115
40353	84807	47767	46890	16053	32415	60259	99788	55924	22077
18899	09612	77541	57675	70153	41179	97535	82889	27214	03482
68141	25340	92551	11326	60939	79355	41544	88926	09111	86431
51559	91159	81310	63251	91799	41215	87412	35317	74271	11603
92214	33386	73459	79359	65867	39269	57527	69551	17495	91456
15089	50557	33166	87094	52425	21211	41876	42525	36625	63964
96461	00604	11120	22254	16763	19206	67790	88362	01880	37911
28177	44111	15705	73835	69399	33602	13660	84342	97667	80847
66953	44737	81127	07493	07861	12666	85077	95972	96556	80108
19712	27263	84575	49820	19837	69985	34931	67935	71903	82560
68756	64757	19987	92222	11691	42502	00952	47981	97579	93408
75022	65332	98606	29451	57349	39219	08585	31502	96936	96356
11323	70069	90269	89266	46413	61615	66447	49751	15836	97343
55208	63470	18158	25283	19335	53893	87746	72531	16826	52605
11474	08786	05594	67045	13231	51186	71500	50498	59487	48677
81422	86842	60997	79669	43804	78690	58358	87639	24427	66799
21771	75963	23151	90274	08275	50677	99384	94022	84888	80139
42278	12160	32576	14278	34231	20724	27908	02657	19023	07190
17697	60114	63247	32096	32503	04923	17570	73243	76181	99343
05686	30243	34124	02936	71749	03031	72259	26351	77511	00850
52992	46650	89910	57395	39502	49738	87854	71066	84596	33115
94518	93984	81478	67750	89354	01080	25988	84359	31088	13655
00184	72186	78906	75480	71140	15199	69002	08374	22126	23555
87462	63165	79816	61630	50140	95319	79205	79202	67414	60805
88692	58716	12273	48176	86038	78474	76730	82931	51595	20747
20094	42962	41382	16768	13261	13510	04822	96354	72001	68642
60935	81504	50520	82153	27892	18029	79663	44146	72876	67843
51392	85936	43898	50596	81121	98122	69196	54271	12059	62539
54239	41918	79526	46274	24853	67165	12011	04923	20273	89405
57892	73394	07160	90262	48731	46648	70977	58262	78359	50436
02330	74736	53274	44468	53616	35794	54838	39114	68302	26855
76115	29247	55342	51299	79908	36613	68361	18864	13419	34950
63312	81886	29085	20101	38037	34742	78364	39356	40006	49800
27632	21570	34274	56426	00330	07117	86673	46455	66866	76374
06335	62111	44014	52567	79480	45886	92585	87828	17376	35254
64142	87676	21358	88773	10604	62834	63971	03989	21421	76086
28436	25468	75235	75370	63543	76266	27745	31714	04219	00699
09522	83855	85973	15888	29554	17995	37443	11461	42909	32634
93714	15414	93712	02742	34395	21929	38928	31205	01838	60000
15681	53599	58185	73840	88758	10618	98725	23146	13521	47905
77712	23914	08907	43768	10304	61405	53986	61116	76164	54958
78453	54844	61509	01245	91199	07482	02534	08189	62978	55516
24860	68284	19367	29073	93464	06714	45268	60678	58506	23700
37284	06844	78887	57276	42695	03682	83240	09744	63025	60997
35488	52473	37634	32569	39590	27379	23520	29714	03743	08444
51595	59909	35223	44991	29830	56614	59661	83397	38421	17503
90660	35171	30021	91120	78793	16827	89320	08260	09181	53616

TABLE 4 – RANDOM DIGITS

54723	56527	53076	38235	42780	22716	36400	48028	78196	92985
84828	81248	25548	34075	43459	44628	21866	90350	82264	20478
65799	01914	81363	05173	23674	41774	25154	73003	87031	94368
87917	38549	48213	71708	92035	92527	55484	32274	87918	22455
26907	88173	71189	28377	13785	87469	35647	19695	33401	51998
68052	65422	88460	06352	42379	55499	60469	76931	83430	24560
42587	68149	88147	99700	56124	53239	38726	63652	36644	50876
97176	55416	67642	05051	89931	19482	80720	48977	70004	03664
53295	87133	38264	94708	00703	35991	76404	82249	22942	49659
23011	94108	29196	65187	69974	01970	31667	54307	40032	30031
75768	49549	24543	63285	32803	18301	80851	89301	02398	99891
86668	70341	66460	75648	78678	27770	30245	44775	56120	44235
56727	72036	50347	33521	05068	47248	67832	30960	95465	32217
27936	78010	09617	04408	18954	61862	64547	52453	83213	47833
31994	69072	37354	93025	38934	90219	91148	62757	51703	84040
02985	95303	15182	50166	11755	56256	89546	31170	87221	63267
89965	10206	95830	95406	33845	87588	70237	84360	19629	72568
45587	29611	98579	42481	05359	36578	56047	68114	58583	16313
01071	08530	74305	77509	16270	20889	99753	88035	55643	18291
90209	68521	14293	39194	68803	32052	39413	26883	83119	69623
04982	68470	27875	15480	13206	44784	83601	03172	07817	01520
19740	24637	97377	32112	74283	69384	49768	64141	02024	85380
50197	79869	86497	68709	42073	28498	82750	43571	77075	07123
46954	67536	28968	81936	95999	04319	09932	66223	45491	69503
82549	62676	31123	49899	70512	95288	15517	85352	21987	08669
61798	81600	80018	84742	06103	60786	01408	75967	29948	21454
57666	29055	46518	01487	30136	14349	56159	47408	78311	25896
29805	64994	66872	62230	41385	58066	96600	99301	85976	84194
06711	34939	19599	76247	87879	97114	74314	39599	43544	36255
13934	46885	58315	88366	06138	37923	11192	90757	10831	01580
28549	98327	99943	25377	17628	65468	07875	16728	22602	33892
40871	61803	25767	55484	90997	86941	64027	01020	39518	34693
47704	38355	71708	80117	11361	88875	22315	38048	42891	87885
62611	19698	09304	29265	07636	08508	23773	56545	08015	28891
03047	83981	11916	09267	67316	87952	27045	62536	32180	60936
26460	50501	31731	18938	11025	18515	31747	96828	58258	97107
01764	25959	69293	89875	72710	49659	66632	25314	95260	22146
11762	54806	02651	52912	32770	64507	59090	01275	47624	16124
31736	31695	11523	64213	91190	10145	34231	36405	65860	48771
97155	48706	52239	21831	49043	18650	72246	43729	63368	53822
31181	49672	17237	04024	65324	32460	01566	67342	94986	36106
32115	82683	67182	89030	41370	50266	19505	57724	93358	49445
07068	75947	71743	69285	30395	81818	36125	52055	20289	16911
26622	74184	75166	96748	34729	61289	36908	73686	84641	45130
02805	52676	22519	47848	68210	23954	63085	87729	14176	45410
32301	58701	04193	30142	99779	21697	05059	26684	63516	75925
26339	56909	39331	42101	01031	01947	02257	47236	19913	90371
95274	09508	81012	42413	11278	19354	68661	04192	36878	84366
24275	39632	09777	98800	48027	96908	08177	15364	02317	89548
36116	42128	65401	94199	51058	10759	47244	99830	64255	40516

TABLE 5 – RANDOM DIGITS

47505	02008	20300	87188	42505	40294	04404	59286	95914	07191
13350	08414	64049	94377	91059	74531	56228	12307	87871	97064
33006	92690	69248	97443	38841	05051	33756	24736	43508	53566
55216	63886	06804	11861	30968	74515	40112	40432	18682	02845
21991	26228	14801	19192	45110	39937	81966	23258	99348	61219
71025	28212	10474	27522	16356	78456	46814	28975	01014	91458
65522	15242	84554	74560	26206	49520	65702	54193	25583	54745
27975	54923	90650	06170	99006	75651	77622	20491	53329	12452
07300	09704	36099	61577	34632	55176	87366	19968	33986	46445
54357	13689	19569	03814	47873	34086	28474	05131	46619	41499
00977	04481	42044	08649	83107	02423	46919	59586	58337	32280
13920	78761	12311	92808	71581	85251	11417	85252	61312	10266
08395	37043	37880	34172	80411	05181	58091	41269	22626	64799
46166	67206	01619	43769	91727	06149	17924	42628	57647	76936
87767	77607	03742	01613	83528	66251	75822	83058	97584	45401
29880	95288	21644	46587	11576	30568	56687	83239	76388	17857
36248	36666	14894	59273	04518	11307	67655	08566	51759	41795
12386	29656	30474	25964	10006	86382	46680	93060	52337	56034
52068	73801	52188	19491	76221	45685	95189	78577	36250	36082
41727	52171	56719	06054	34898	93990	89263	79180	39917	16122
49319	74580	57470	14600	22224	49028	93024	21414	90150	15686
88786	76963	12127	25014	91593	98208	27991	12539	14357	69512
84866	95202	43983	72655	89684	79005	85932	41627	87381	38832
11849	26482	20461	99450	21636	13337	55407	01897	75422	05205
54966	17594	57393	73267	87106	26849	68667	45791	87226	74412
10959	33349	80719	96751	25752	17133	32786	34368	77600	41809
22784	07783	35903	00091	73954	48706	83423	96286	90373	23372
86037	61791	33815	63968	70437	33124	50025	44367	98637	40870
80037	65089	85919	74391	36170	82988	52311	59180	37846	98028
72751	84359	15769	13615	70866	37007	74565	92781	37770	76451
18532	03874	66220	79050	66814	76341	42452	65365	07167	90134
22936	22058	49171	11027	07066	14606	11759	19942	21909	15031
66397	76510	81150	00704	94990	68204	07242	82922	65745	51503
89730	23272	65420	35091	16227	87024	56662	59110	11158	67508
81821	75323	96068	91724	94679	88062	13729	94152	59343	07352
94377	82554	53586	11432	08788	74053	98312	61732	91248	23673
68485	49991	53165	19865	30288	00467	98105	91483	89389	61991
07330	07184	86788	64577	47692	45031	36325	47029	27914	24905
10993	14930	35072	36429	26176	66205	07758	07982	33721	81319
20801	15178	64453	83357	21589	23153	60375	63305	37995	66275
79241	35347	66851	79247	57462	23893	16542	55775	06813	63512
43593	39555	97345	58494	52892	55080	19056	96192	61508	23165
29522	62713	33701	17186	15721	95018	76571	58615	35836	66260
88836	47290	67274	78362	84457	39181	17295	39626	82373	10883
65905	66253	91482	30689	81313	01343	37188	37756	04182	19376
44798	69371	07865	91756	42318	63601	53872	93610	44142	89830
35510	99139	32031	27925	03560	33806	85092	70436	94777	57963
50125	93223	64209	49714	73379	89975	38567	44316	60262	10777
25173	90038	63871	40418	23818	63250	05118	52700	92327	55449
68459	90094	44995	93718	83654	79311	18107	12557	09179	28416

TABLE 6 – RANDOM DIGITS

96195	07059	13266	31389	87612	88004	31843	83469	22793	14312
22408	94958	19095	58035	43831	32354	83946	57964	70404	32017
53896	23508	16227	56929	74329	12264	26047	66844	47383	42202
22565	02475	00258	79018	70090	37914	27755	00872	71553	56684
49438	20772	60846	69732	07612	70474	46483	21053	95475	53448
65620	34684	00210	04863	01373	19978	61682	69315	46766	83768
20246	26941	41298	04763	19769	25865	95937	03545	93561	73871
09433	09167	35166	32731	73299	41137	37328	28301	61629	05040
95552	73456	16578	88140	80059	50296	07656	01396	83099	09718
76053	05150	69125	69442	16509	03495	26427	58780	27576	31342
34822	35843	78468	82380	52313	71070	71273	10768	86101	51474
07753	04073	58520	80022	28185	16432	86909	82347	10548	83929
04204	94434	62798	81902	29977	57258	87826	35003	46449	76636
96770	19440	29700	42093	64369	69176	29732	37389	34054	28680
65989	62843	10917	34458	81936	84775	39415	10622	36102	16753
06644	94784	66995	61812	54215	01336	75887	57685	66114	76984
88950	46077	34651	12038	87914	20785	39705	73898	12318	78334
21482	95422	02002	33671	46764	50527	46276	77570	68457	62199
55137	61039	02006	69913	11291	87215	89991	26003	55271	08153
98441	81529	59607	65225	49051	28328	85535	37003	87211	10204
57168	30458	23892	07825	53447	53511	09315	42552	43135	57892
71886	65334	38013	09379	83976	42441	14086	33197	82671	05037
40418	59504	52383	07232	14179	59693	37668	26689	93865	78925
28833	76661	47277	92935	63193	94862	60560	72484	29755	40894
37883	62124	62199	49542	55083	20575	44636	92282	52105	77664
44882	33592	66234	13821	86342	00135	87938	57995	34157	99858
19082	13873	07184	21566	95320	28968	31911	06288	77271	76171
45316	29283	89318	55806	89338	79231	91545	55477	19552	03471
22788	55433	31188	74882	44858	69655	08096	70982	61300	23792
08293	86193	05026	21255	63082	92946	28748	25423	45282	57821
29223	70541	67115	84584	10100	33854	26466	77796	70698	99393
22681	80110	31595	09246	39147	11158	43298	36220	88841	11271
74580	90354	43744	22178	38084	60027	24201	71686	59767	33274
69093	71364	08107	96952	50005	30297	97417	89575	04676	35616
40456	91234	58090	65342	95002	28447	21'700	43137	13746	85959
72927	67349	83962	58912	59734	76323	02913	46306	53956	38936
61869	33093	81129	06481	89281	83629	81960	63704	56329	10357
40048	16520	07638	10797	22270	57350	72214	36410	95526	87614
68773	97669	28656	89938	12917	25630	08068	19445	76250	24727
09774	30751	49740	11385	91468	28900	76804	52460	52320	70493
46139	36689	82587	13586	35061	76128	38568	62300	43439	53434
26566	95323	32993	89988	12152	01862	93113	33875	31730	62941
06765	57141	48617	18282	13086	76064	83334	70192	15972	80429
35384	90380	12317	89702	33091	68835	62960	38010	52710	87604
49333	78482	36199	11355	86044	88760	03724	22927	91716	92332
45595	14044	56806	99126	85584	87750	78149	22723	48245	78126
79819	15054	76174	12206	06886	06814	43285	20008	75345	19779
11971	62234	74857	46401	20817	57591	41189	49604	29604	30660
11452	89318	53084	21993	62471	74101	61217	76536	58393	63718
38746	81271	96260	98137	60275	22647	33103	50090	29395	10016

TABLE 7 – RANDOM DIGITS

93369	13044	69686	78162	29132	51544	17925	56738	32683	83153
19360	55049	94951	76341	38159	31008	41476	05278	03909	02299
47798	89890	06893	65483	97658	74884	38611	27264	26956	83504
69223	32007	03513	61149	66270	73087	16795	76845	44645	44552
34511	50721	84850	34159	38985	75384	22965	55366	81632	78872
54031	59329	58963	52220	76806	98715	67452	78741	58128	00077
66722	85515	04723	92411	03834	12109	85185	37350	93614	15351
71059	07496	38404	18126	37894	44991	45777	02070	38159	23930
45478	86066	31135	33243	01190	47277	55146	56130	70117	83203
97246	91121	89437	20393	76598	99458	76665	83793	37448	32664
22982	25936	96417	34845	28942	65569	38253	77182	12996	19505
48243	62993	47132	85248	79160	90981	71696	79609	33809	60839
93514	14915	67960	82203	22598	94802	75332	95585	69542	79924
69707	98303	93069	16216	01542	51771	16833	20922	94415	27617
87467	91794	70814	12743	17543	04057	71231	11309	32780	83270
81006	81498	59375	30502	44868	81279	23585	49678	70014	10523
15458	83481	50187	43375	56644	72076	59403	65469	74760	69509
33469	12510	23095	48016	22064	39774	07373	10555	33345	21787
67198	07176	65996	18317	83083	11921	06254	68437	59481	54778
58037	92261	85504	55690	63488	26451	43223	38009	50567	09191
84983	68312	25519	56158	22390	12823	92390	28947	36708	25393
35554	02935	72889	68772	79774	14336	50716	63003	86391	94074
04368	17632	50962	71908	13105	76285	31819	16884	11665	16594
81311	60479	69985	30952	93067	70056	55229	83226	22555	66447
03823	89887	55828	74452	21692	55847	15960	47521	27784	25728
80422	65437	38797	56261	88300	35980	56656	45662	29219	49257
61307	49468	43344	43700	14074	19739	03275	99444	62545	23720
83873	82557	10002	80093	74645	33109	15281	38759	09342	69408
38110	16855	28922	93758	22885	36706	92542	60270	99599	17983
43892	91189	87226	56935	99836	85489	89693	49475	31941	78065
93683	09664	53927	49885	94979	88848	42642	93218	80305	49428
32748	02121	11972	96914	83264	89016	45140	20362	63242	86255
49211	92963	38625	65312	52156	36400	67050	64058	45489	24165
63365	64224	69475	57512	85097	05054	88673	96593	00902	53320
63576	26373	44610	43748	90399	06770	71609	90916	69002	57180
41078	47036	65524	68466	77613	20076	71969	47706	22506	81053
70846	89558	64173	15381	67322	70097	82363	90767	17879	32697
68800	64492	20162	32707	69510	82465	26821	79917	34615	35820
44977	89525	51269	63747	30997	97213	53016	65909	05723	50168
79354	63847	24395	53679	07667	67993	24634	78867	78516	00448
14954	22299	40156	52685	19093	06090	23800	06739	76836	19050
01711	98439	09446	33937	98956	85676	89493	05132	45886	49379
62328	55328	45738	93940	15772	81975	91017	21387	57949	13992
73004	62109	81907	71077	50322	66093	79921	61412	18347	21115
34218	89445	03609	52336	19005	15179	94958	99448	11612	76981
99159	01968	45886	86875	05196	64297	59339	39878	61548	56442
92858	29949	15817	93372	34732	61584	72007	58597	43802	51066
27396	97477	65554	71601	01540	26509	19487	39684	18676	41219
37103	45309	30129	43380	66638	10841	77292	40288	25826	61431
57347	97012	48428	20606	54138	75716	23741	50462	13221	47216

Appendix C. Glossary

A

allowable difference. The amount, by which the actual quantity in the package may differ from the declared quantity. Pressed and blown tumblers and stemware labeled by count and capacity are assigned an allowable difference in capacity. This is also called a tolerance.

audit testing. Preliminary tests designed to quickly identify potential noncompliance units.

average. The sum of a number of individual measurement values divided by the number of values. For example, the sum of the individual weights of 12 packages divided by 12 would be the average weight of those packages.

average error. The sum of the individual "package errors" (defined) (considering their arithmetic sign) divided by the number of packages comprising the sample.

average requirement. A requirement that the average net quantity of contents of packages in a "lot" equals the net quantity of contents printed on the label.

average tare. The sum of the weights of individual package containers (or wrappers, etc.) divided by the number of containers or wrappers weighed.

B

berry baskets and boxes. Disposable containers in capacities of 1 dry quart or less for berries and small fruits. See Section 4.46. in NIST Handbook 44.

C

Category A (Category B). A set of sampling plans provided in this handbook to use in checking packages that must (except when exempted) meet the "average requirement" (defined).

chamois. A natural leather made from skins of sheep and lambs that have been oil-tanned.

combination quantity declarations. A package label that contains the count of items in the package as well as one or more of the following: weight, measure, or size.

compliance testing. Determining package conformance using specified legal requirements.

D

decision criteria. The rules for deciding whether or not a lot conforms to package requirements based on the results of checking the packages in the sample.

delivery. A quantity of identically labeled product received at one time by a buyer.

dimensionless units. The integers in terms of which the official records package errors. The dimensionless units must be multiplied by the "unit of measure" to obtain package errors in terms of weight, length, etc.

division, value of (d). The value of the scale division, expressed in units of mass, is the smallest subdivision of the scale for analog indication or the difference between two consecutively indicated or printed values for digital indication or printing. See NIST Handbook 44.

drained weight. The weight of solid or semisolid product representing the contents of a package obtained after a prescribed method for removal of the liquid has been employed.

dry measure. Rigid containers designed for general and repeated use in the volume measurement of particulate solids. See Section 4.45. Dry Measures in NIST Handbook 44.

dry pet food. All extruded dog and cat foods and baked treats packaged in Kraft paper bags and cardboard boxes that have a moisture content of 13 % or less at the time of packaging.

dry tare. See UNUSED DRY TARE.

E

error. See PACKAGE ERROR.

G

gravimetric test procedure. An analytical procedure that involves measurement by mass or weight.

gross weight. The weight of the package including contents, packing material, labels.

H

headspace. The container volume not occupied by product.

I

inch-pound units. Units based upon the yard, gallon, and the pound commonly used in the United States of America. Some of these units have the same name as similar units in the United Kingdom (British, English, or Imperial units), but they are not necessarily equal to them.

initial tare sample. The first packages (either two or five) selected from the sample to be opened for tare determination in the tare procedure. Depending upon the variability of these individual tare weights as compared with the variability of the net contents, this initial tare sample may be sufficient or more packages may be needed to determine the tare.

inspection lot. The collection of identically labeled (random packages, in some cases, are exempt from identity and labeled quantity when determining the inspection lot) packages available for inspection at one time. This collection will pass or fail as a whole based on the results of tests on a sample drawn from this collection.

L

label. Any written, printed, or graphic matter affixed to, applied to, attached to, blown into, formed, molded into, embossed on, or appearing upon or adjacent to a consumer commodity or a package containing any consumer commodity, for purposes of branding, identifying, or giving any information with respect to the commodity or to the contents of the package, except that an inspector's tag or other non-promotional matter affixed to or appearing upon a consumer commodity is not a label. See Section 2.5 in the Uniform Packaging and Labeling Regulation in NIST Handbook 130.

linear measures. Rulers and tape measures.

location of test. The place where the package will be examined. This is broadly defined as one of three general locations: (1) where the commodity was packaged, (2) a warehouse or storage location, or (3) a retail outlet.

lot. See INSPECTION LOT.

lot code. A series of identifying numbers and/or letters on the outside of a package designed to provide information such as the date and location of packaging or the expiration date.

lot size. The number of packages in the "inspection lot".

M

MAV. See MAXIMUM ALLOWABLE VARIATION

maximum allowable variation (MAV). A deficiency in the weight, measure, or count of an individual package beyond which the deficiency is considered to be an "unreasonable error". The number of packages with deficiencies that are greater than the MAV is controlled by the sampling procedure.

measure containers. Containers whose capacities are used to determine quantity. They are of two basic types: (a) retail and (b) prepackaged. Retail containers are packaged at the time of retail sale, and prepackaged containers are packaged in advance of sale. An example of a prepackaged measure container is an ice cream package.

metric or SI units. Units of the International System of Units as established in 1960 by the General Conference on Weights and Measures and interpreted or modified for the United States by the Secretary of Commerce. (See NIST Special Publication 814 – Metric System of Measurement; Interpretation of the SI for the United States and Federal Government Metric Conversion Policy)

minus or plus errors. Negative or positive deviations from the labeled quantity of the actual package quantities as measured. See PACKAGE ERROR.

moisture allowance. That variation in weight of a packaged product permitted in order to account for loss of weight due to loss of moisture during good package distribution practices. For packaged goods subject to moisture loss, when the average net weight of a sample is found between the labeled weight and the boundary of the moisture allowance, the lot is said to be in a no-decision area. Further information is required to determine lot compliance or noncompliance.

mulch. Any product or material other than peat or peat moss for sale, or sold for primary use as a horticultural, above-ground dressing for decoration, moisture control, weed control, erosion control, temperature control, or other similar purposes.

N

net quantity or net contents. That quantity of packaged product remaining after all necessary deductions for tare (defined) have been made.

nominal. A designated or theoretical size that may vary from the actual.

nominal gross weight. The sum of the nominal tare weight (defined) plus the declared or labeled weight (or other labeled quantity converted to a weight basis).

P

package error. The difference between the actual net contents of an individual package as measured and the declared net contents on the package label; minus (−) for less than the label and plus (+) for more than the label.

packaged goods. Product or commodity put up in any manner in advance of sale suitable for either wholesale or retail sale.

petroleum products. Gasoline, diesel fuel, kerosene, or any product (whether or not such a product is actually derived from naturally occurring hydro-carbon mixtures known as "petroleum") commonly used in powering, lubricating, or idling engines or other devices, or labeled as fuel to power camping stoves or lights. Sewing machine lubricant, camping fuels, and synthetic motor oil are "petroleum products" for the purposes of this regulation. The following products are not "petroleum products": brake fluid, copier machine dispersant, antifreeze, cleaning solvents, and alcohol.

plus errors. See MINUS OR PLUS ERRORS

principal display panel or panels. Part(s) of a label that are designed to be displayed, presented, shown, or examined under normal and customary conditions of display and purchase. Wherever a principal display panel appears more than once on a package, all requirements pertaining to the "principal display panel" shall pertain to all such "principal display panels." See Section 2.7 in the Uniform Packaging and Labeling Regulation in NIST Handbook 130.

production lot. The total collection of packages defined by the packager, usually consisting of those packages produced within a given unit of time and coded identically.

pycnometer. A container of known volume used to contain material for weighing so that the weight of a known volume may be determined for the material. If it is constructed, it is called a density cup.

R

random pack. The term "random package" shall be construed to mean a package that is one of a lot, shipment, or delivery of packages of the same consumer commodity with varying weights which means, packages of the same consumer commodity with no fixed pattern of weight.

random sampling. The process of selecting sample packages such that all packages under consideration have the same probability of being selected. An acceptable method of random selection is to use a table of random numbers.

range. The difference between the largest and the smallest of a set of measured values.

reasonable variation. An amount by which individual package net contents are allowed to vary from the labeled net contents. This term is found in most federal and state laws and regulations governing packaged goods. Reasonable variations from the labeled declaration are recognized for (1) unavoidable deviations in good manufacturing practice, and (2) loss or gain of moisture in good distribution practice.

rounding. The process of omitting some of the end digits of a numerical value and adjusting the last retained digit so that the resulting number is as near as possible to the original number.

S

sample. A group of packages taken from a larger collection of packages and providing information that can be used to make a decision concerning the larger collection of packages or of the package production process. A sample provides a valid basis for decision only when it is a random sample (defined).

sample correction factor. ~~Students' "t" value for a one sided test at the 3 % confidence level and n is the sample size~~. **The factor as computed is the ratio of the 97.5 th quantile of the student's t-distribution with (n-1) degrees of freedom and the square root of n where n is the sample size.**

sample error limit (SEL). A statistical value computed by multiplying the sample standard deviation times the sample correction factor from Column 3 of Table 2-1. Category A – Sampling Plans for the appropriate sample size. The SEL value allows for the uncertainty between the average error of the sample and the average error of the inspection lot with an approximately 97**.5** % level of confidence.

sample size (n). The number of packages in a sample.

sampling plan. A specific plan that states the number of packages to be checked and the associated decision criteria.

scale tolerance. The official value fixing the limit of allowable error for weighing equipment as defined in NIST Handbook 44.

seat. (as in "seat diameter" or "seated capacity"). The projection or shoulder near the upper rim of a cup or container that is designed to serve as the support for a lid or cover.

seated capacity. The capacity of a cup, container, or bottle, as defined by the volume contained by them when the lid or a flat disc is inserted into the lid groove that is located inside and near the upper rim of the cup, container, or bottle.

SEL. See SAMPLE ERROR LIMIT.

shipment. A quantity of identically labeled product (except for lot code) sent at one time to a single location.

slicker plate. A flat plate, usually of glass or clear plastic composition, used to determine the "level full" condition of a capacity (volumetric) measure.

standard deviation. A measure to describe the scatter of the individual package contents around the mean contents.

standard pack. That type of package in which a commodity is put up with identical labels and only in certain specific quantity sizes. Examples of goods so packed are canned, boxed, bottled and bagged foods, and over-the-counter drugs.

supplementary quantity declarations. The required quantity declaration may be supplemented by one or more declarations of weight, measure, or count, such declaration appearing other than on a principal display panel. Such supplemental statement of quantity of contents shall not include any terms qualifying a unit of weight, measure, or count that tends to exaggerate the amount of commodity contained in the package (e.g., "giant" quart, "full" gallon, "when packed," "minimum," or words of similar import). See Section 6.12 in the Uniform Packaging and Labeling Regulation in NIST Handbook 130.

T

tare sample. The packages or packaging material used to determine the average tare weight.

tare sample size. The number of packages or packaging material units used to determine the average tare weight.

tare weight. The weight of a container, wrapper, or other material that is deducted from the gross weight to obtain the net weight.

tolerance. A value fixing the limit of allowed departure from the labeled contents; usually presented as a plus (+) and minus (-) value.

U

unit of measure. An increment of weight, length, or volume so that an inspector may record package errors in terms of small integers. (The package errors are actually the integers multiplied by the unit of measure.)

unreasonable errors. Minus package errors that exceed the MAV (defined). The number of unreasonable errors permitted in a sample is specified by the sampling plan.

unused dry tare. All unused packaging materials (including glue, labels, ties, etc.) that contain or enclose a product. It includes prizes, gifts, coupons, or decorations that are not part of the product.

used dry tare. Used tare material that has been air dried, or dried in some manner to simulate the unused tare weight. It includes all packaging materials that can be separated from the packaged product, either readily (e.g., by shaking) or by washing, scraping, ambient air drying, or other techniques involving more than "normal" household recovery procedures, but not including laboratory procedures like oven drying. Labels, wire closures, staples, prizes, decorations, and such are considered tare. It is not the same as "wet tare." See also "wet tare."

V

volumetric measures. Standard measuring flasks, graduates, cylinders, for use in measuring volumes of liquids.

W

wet tare. Used packaging materials when no effort is made to reconstruct unused tare weight by drying out the absorbent portion (if any) of the tare.

Appendix D. Acknowledgments and References

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Appendix E. Model Inspection Report Forms

Date	**Random Package Report**	Sampling Plan ☐ A ☐ B	Report Number
Location (name, address)	Product/Brand Identity Lot Codes	Manufacturer	Container Description

1. Labeled Quantity – enter weight for each package in column 1 below.	2. Unit of Measure	3. MAV – look up the MAV for each package with a minus error, convert it to dimensionless units and enter this value in Column 4 below.		5. Inspection Lot Size	6. Sample Size (n)
7. Initial Tare Sample Size	8. No. of MAVs Allowed	9. Range of Package Errors (Rc)	10. Range of Tare Weights (Rt)	11. Rc/Rt (9)10 =)	12. Total No. of Tare Samples
13. Avg. Tare Wt ☐ Used Dry Tare ☐ Wet Tare ☐ Unused Dry Tare			13a. ☐ Tare Correction ☐ Moisture Allowance		14. Nominal Gross Wt (Labeled Wt + 13 – 13a)

	Pkg 1	Pkg 2	Pkg 3	Pkg 4	Pkg 5	Pkg 6	Pkg 7	Pkg 8	Pkg 9	Pkg 10
a. Gross Wt										
b. Tare Wt										
c. Net Wt										
d. Package Error										

Product Description, Lot Code, Unit Price	Money Errors		1. Labeled Net Weight	Package Errors		4. MAV
	-	+		-	+	
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						
			Totals			

15. Total Error	16. No. of unreasonable minus errors (compare each package error with the MAV in Col 4)	17. Is 16 greater than 8? ☐ Yes, Lot Fails ☐ No, go to 18	18. Avg. error in dimensionless units (15) 6 =)	19. Avg. error in labeled units (18 x 2 =)
20. Is 18 Zero or Plus? ☐ Yes, lot passes, go to 25 ☐ No, go to 21	21. Compute Sample Standard Deviation	22. Sample Correction Factor	23. Compute Sample Error Limit (21 x 22 =)	

24. Disregarding the signs, is 18 larger than 23? ☐ Yes, Lot Fails, go to 25 ☐ No, Lot Passes, go to 25	25. Disposition of Inspection Lot ☐ Approved ☐ Rejected
Comments	Official's Signature Acknowledgement of Report

Date *September 16, 1999*	**Random Package Report - Example Form**	Sampling Plan ■ A ☐ B	Report Number *17*
Location (name, address) *L&O Market* *MacCorkle Ave* *Charleston, WV 25177*	Product/Brand Identity *Ground Chuck* Lot Codes *1, 19, 99*	Manufacturer *Meat Department – L&O Market*	Container Description *2S Tray with soaker and plastic wrap*

1. Labeled Quantity- enter weight for each package in the column 1 below.	2. Unit of Measure *0.001 lb*	3. MAV – look up the MAV for each package with a minus error, convert it to dimensionless units and enter this value in Column 4 below.	5. Inspection Lot Size *23*	6. Sample Size (n) *12*

7. Initial Tare Sample Size *2*	8. No. of MAVs Allowed *0*	9. Range of Package Errors (Rc) *10*	10. Range of Tare Weights (Rt) *1*	11. Rc/Rt (9)10 =) *10*	12. Total No. of Tare Samples *2*

13. Avg. Tare Wt ☐ Used Dry Tare ☐ Wet Tare ■ Unused Dry Tare *0.0205 lb*	13a. ☐ Tare Correction ☐ Moisture Allowance *N/A*	14. Nominal Gross Wt (Labeled Wt + 13 – 13a) *Label Wt + 0.020 lb*

	Pkg 1	Pkg 2	Pkg 3	Pkg 4	Pkg 5	Pkg 6	Pkg 7	Pkg 8	Pkg 9	Pkg 10
a. Gross Wt	*1.852 lb*	*1.223 lb*								
b. Tare Wt	*0 .020 lb*	*0 .021 lb*								
c. Net Wt	*1.832 lb*	*1.202 lb*								
d. Package Error (a – 14 =)	*-18*	*-8*								

Product Description, Lot Code, Unit Price	Money Errors -	Money Errors +	1. Labeled Net Weight	Package Errors -	Package Errors +	4. MAV
1. *Ground Chuck - 1, 19, 99 - $1.79 per lb*			*1.85 lb*	*18*		
2.			*1.21 lb*	*7*		
3.			*1.56 lb*	*8*		
4.			*1.98 lb*	*14*		
5.	*$ 0.04*		*1.07 lb*	*23*		*44*
6.			*1.55 lb*	*16*		
7.			*1.02 lb*	*2*		
8.	*$ 0.04*		*1.44 lb*	*25*		*56*
9.			*1.33 lb*	*16*		
10.			*2.03 lb*	*20*		*70*
11.			*1.73 lb*	*14*		
12.			*1.16 lb*	*11*		
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						
			Totals	*174*		

15. Total Error *- 174*	16. No. of unreasonable minus errors (compare each package error with 4) *0*	17. Is 16 greater than 8? ☐ Yes, Lot Fails ■ No, go to 18	18. Avg. error in dimensionless units (15) 6 =) *- 14.5*	19. Avg. error in labeled units (18 x 2 =) *- 0.014 lb*

20. Is 18 = Zero or Plus? ☐ Yes, lot passes, go to 25 ■ No, go to 21	21. Compute Sample Standard Deviation *6.721*	22. Sample Correction Factor *0.635*	23. Compute Sample Error Limit (21 x 22 =) *4.267*

24. Disregarding the signs, is 18 larger than 23? ■ Yes, Lot Fails, go to 25 ☐ No, Lot Passes, go to 25	25. Disposition of Inspection Lot ☐ Approved ■ Rejected
Comments: *Product found to contain less than the stated net contents*	Official's Signature Acknowledgement of Report

Date	**Standard Package Report**	Sampling Plan ☐ A ☐ B	Report Number
Location (name, address)	Product/Brand Identity Lot Codes	Manufacturer	Container Description

1. Labeled Quantity	2. Unit of Measure	3. MAV	4. MAV (dimensionless units) (3) 2 =)	5. Inspection Lot Size	6. Sample Size (n)
7. Initial Tare Sample Size	8. No. of MAVs Allowed	9. Range of Package Errors (Rc)	10. Range of Tare Weights (Rt)	11. Rc/Rt (9)10 =)	12. Total No. of Tare Samples

13. Avg. Tare Wt ☐ Used Dry Tare ☐Wet Tare ☐ Unused Dry Tare	13a. ☐ Tare Correction ☐ Moisture Allowance ☐ Vacuum Pack	14. Nominal Gross Wt (1 + 13 – 13 a =)

	Pkg 1	Pkg 2	Pkg 3	Pkg 4	Pkg 5	Pkg 6	Pkg 7	Pkg 8	Pkg 9	Pkg 10
a. Gross Wt										
b. Tare Wt										
c. Net Wt										

-	+	-	+	-	+	-	+
1.		13.		25.		37.	
2.		14.		26.		38.	
3.		15.		27.		39.	
4.		16.		28.		40.	
5.		17.		29.		41.	
6.		18.		30.		42.	
7.		19.		31.		43.	
8.		20.		32.		44.	
9.		21.		33.		45.	
10.		22.		34.		46.	
11.		23.		35.		47.	
12.		24.		36.		48.	
Total	Total	Total	Total	Total	Total	Total	Total

15. Total Error	16. No. of unreasonable minus errors (compare each package error with 4)	17. Is 16 greater than 8? ☐ Yes, lot fails ☐ No, go to 18	18. Avg. error in dimensionless units (15) 6 =)	19. Avg. error in labeled units (18 x 2 =)

20. Is 18 = Zero or Plus? ☐ Yes, lot passes, go to 25 ☐ No, go to 21	21. Compute Sample Standard Deviation	22. Sample Correction Factor	23. Compute Sample Error Limit (21 x 22 =)

24. Disregarding the signs, is 18 larger than 23? ☐ Yes, lot fails, go to 25 ☐ No, lot passes, go to 25	25. Disposition of Inspection Lot ☐ Approved ☐ Rejected
Comments:	Official's Signature Acknowledgement of Report

Date	**Standard Package Report - Sample Form**	Sampling Plan: ■ A □ B	Report Number
January 20, 1999			*16*

Location (name, address)	Product/Brand Identity	Manufacturer	Container Description
Volunteer Market *18765 Alcoa Highway* *Knoxville, Tennessee 37920*	*Community Group Cookies (Thin Mints)* Lot Codes *April 1998 A&B*	*ABC Cookies Inc* *1069 Capitol Avenue* *Nashville, Tennessee 37204*	*Cardboard Box / Plastic Liner*

1. Labeled Quantity	2. Unit of Measure	3. MAV	4. MAV (dimensionless units) (3) 2 =)	5. Inspection Lot Size	6. Sample Size (n)
453 g (1 lb)	*0.001 lb*	*0 .044 lb*	*44*	*172*	*12*

7. Initial Tare Sample Size	8. No. of MAVs Allowed	9. Range of Package Errors (Rc)	10. Range of Tare Weights (Rt)	11. Rc/Rt (9)10 =)	12. Total No. of Tare Samples
2	*0*	*24*	*2*	*12*	*2*

13. Avg. Tare Wt ■ Used Dry Tare □ Wet Tare □ Unused Dry Tare	13a. □ Tare Correction □ Moisture Allowance □ Vacuum Pack	14. Nominal Gross Wt (1 + 13 – 13 a =)
0 .014 lb	*N/A*	*1.014 lb*

	Pkg 1	Pkg 2	Pkg 3	Pkg 4	Pkg 5	Pkg 6	Pkg 7	Pkg 8	Pkg 9	Pkg 10
a. Gross Wt	*1.052 lb*	*1.026 lb*								
b. Tare Wt	*0.015 lb*	*.013 lb*								
c. Net Wt	*1.037 lb*	*1.013 lb*								

-	+	-	+	-	+	-	+
1.	*38*	13.		25.		37.	
2.	*12*	14.		26.		38.	
3.	*8*	15.		27.		39.	
4.	*4*	16.		28.		40.	
5. 3		17.		29.		41.	
6. 2		18.		30.		42.	
7.	*12*	19.		31.		43.	
8. 3		20.		32.		44.	
9.	*4*	21.		33.		45.	
10. 1		22.		34.		46.	
11. 0		23.		35.		47.	
12.	*6*	24.		36.		48.	
Total *9*	Total *84*	Total	Total	Total	Total	Total	Total

15. Total Error	16. No. of unreasonable minus errors (compare each package error with 4)	17. Is 16 greater than 8?	18. Avg. error in dimensionless units. (15) 6 =)	19. Avg. error in labeled units (18 x 2 =)
+ 75	*0*	□ Yes, lot fails ■ No, go to 18	*+ 6.25*	*+ 0.006 lb*

20. Is 18 = Zero or Plus?	21. Compute Sample Standard Deviation	22. Sample Correction Factor	23. Compute Sample Error Limit (21 x 22 =)
■ Yes, lot passes, go to 25 □ No, go to 21			

24. Disregarding the signs, is 18 larger than 23?	25. Disposition of Inspection Lot
□ Yes, lot fails, go to 25 □ No, lot passes	■ Approved □ Rejected

Comments:	Official's Signature
Lot Passes	
	Acknowledgement of Report

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Index

NIST Handbook 133 Fourth Edition (2011)

Appendix C

International Ice Cream Association Letter (IICA) to the Food and Drug Administration (FDA)

(Letter dated July 10, 2008)

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International Dairy Foods Association
Milk Industry Foundation
National Cheese Institute
International Ice Cream Association

July 10, 2008

Ms. Geraldine A. June
Team Leader, Food Labeling and Standards
Office of Nutritional Products, Labeling and Dietary Supplements
FDA/Center for Food Safety & Applied Nutrition
CPK1/4D014
5100 Paint Branch Parkway
College Park, MD 20740
Sent Via E-mail to: geraldine.june@cfsan.fda.gov

RE: Request for Interpretation of FDA Food Labeling Regulations for Net Quantity of Contents and Serving Size of Pelletized Ice Cream and Frozen Desserts

Dear Ms. June:

The International Ice Cream Association (IICA) appreciated the opportunity to meet on June 27, 2008 with officials from FDA's Office of Food Labeling, along with staff from the National Institute of Standards and Technology (NIST) Weights and Measure's Division, and regional Weights & Measures officials to discuss the net contents declaration and method of measurement for pelletized ice cream.

We are writing this letter seeking FDA assistance on determining the net quantity of content statement and serving size declaration that should be used for pelletized ice cream and frozen desserts. For the reasons noted below, IICA believes the net quantity of content statement should be a volumetric declaration that excludes the external air. We also are asking for FDA guidance in identifying the serving size that should appear in the nutrition facts panel for these products.

Pelletized ice cream is a unique and novel ice cream product that entered the market in 1988 under the brand name Dippin' Dots,™ which was predominantly sold in food service venues to consumers for immediate consumption. Due to commercialization and development of processing technology, pelletized ice cream has been introduced into retail stores over the past several years by five companies. Today the product is sold in food service and retail stores both in multi-serving and individual serving packages.

Pelletized ice cream products meet the federal standard of identity (SOI) for ice cream as specified in 21 CFR §135.110. The product is made using pasteurized mix consisting of one or more of the prescribed dairy ingredients, sweeteners, stabilizers and flavorings. The ice cream mix is stirred via pumping and spraying action as the droplets are frozen at very low temperatures using liquid nitrogen. The freezing process results in small round shaped beads or pellets of ice cream that meet the required 4.5 lbs per gallon weight requirements set forth in the SOI for ice cream. Different flavored ice cream pellets such as strawberry, banana, chocolate and vanilla may be mixed together to create novel flavors such as "banana split," or flavoring can be added to the pellets such as cookie pieces, cookie dough, brownies, and other inclusions. In addition to pelletized ice cream, this same freezing process is also used to produce similar products such as pelletized water ice and pelletized frozen desserts. IICA believes that determination of the method of sale and serving size in the nutrition fact panel should apply to all pelletized ice cream, and all pelletized frozen dessert products.

As we discussed during the June 27th meeting, ice cream and frozen desserts are sold by units of fluid measure. Therefore, the declared net quantity of contents for pelletized ice cream and frozen desserts will be expressed in fluid ounces. The ice cream industry's position is that the method of sale and net quantity of contents for pelletized ice cream and pelletized frozen desserts should be declared in fluid ounces without including any external air surrounding the pellets of ice cream or flavoring. We are seeking concurrence from FDA that it agrees with the industry position of using in the net quantity statement fluid ounces that exclude the external air.

We also are seeking FDA guidance on the serving size that should be stated in the nutrition facts panel (NFP) for pelletized ice creams and frozen desserts. During the June 27th meeting we discussed the issue and are asking FDA to identify the serving size that should be used on these products.

We would greatly appreciate your prompt reply in this matter, as it is critical to future work on determining the proper method for measuring the volume of the pelletized ice cream and frozen desserts. The IICA would like to propose a new method of measurement for this product to the 2009 National Conference of Weights and Measures. In order to meet that deadline we would need to develop and verify a test method to submit the proposal to the Southern Weights and Measures Association meeting on October 5, 2008.

If you have any questions or require additional information regarding this matter, please feel free to contact me at (202) 220-3543 or via e-mail at cfrye@idfa.org.

Sincerely,

Cary Frye

Cary Frye
Vice President,
Regulatory Affairs

cc: K. Butcher, NIST
L. Warfield, NIST

Appendix D

Food and Drug Administration (FDA)

Decision on Pelletized Ice Cream

(Letter dated April 17, 2009)

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DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Food and Drug Administration
College Park, MD 20740

APR 1 7 2009

Cary Frye
Vice President
Regulatory Affairs
International Dairy Foods Association
Milk Industry Foundation
National Cheese Institute
International Ice Cream Association
1250 H Street NW, Suite 900
Washington, DC 20005

Dear Ms. Frye:

This is in response to your July 10, 2008 letter to the Food and Drug Administration (FDA) and a follow up to the June 27th meeting at the National Institute of Standards and Technology (NIST) seeking assistance on how to determine the appropriate net quantity of content statement for pelletized ice cream and the appropriate measurement, i.e. volume excluding the external air versus net weight. You also asked FDA for clarification on the appropriate serving size for these products.

You stated in your letter that the International Ice Cream Association believes the net quantity of content statement for pelletized ice cream and frozen desserts should be a volumetric declaration that excludes the external air. You stated that, as we discussed at the June 27th meeting at NIST, ice cream and frozen desserts are sold by units of fluid measure and, therefore, the declared net quantity of contents for pelletized ice cream and frozen desserts should be expressed in fluid ounces. Further, you stated that the ice cream industry's position is that the method of sale and the net quantity of contents for pelletized ice cream be declared in fluid ounces without any external air surrounding the pellets of ice cream or flavoring.

By way of background, the FDA enforces the Federal Food, Drug, and Cosmetic Act (FFDCA) and certain provisions of the Fair Packaging and Labeling Act (FPLA). The FFDCA requires that all labeling and packaging of food products, including the net quantity of contents statement, be truthful, informative, and not deceptive. The FPLA is concerned with the labeling of packaged consumer goods for retail sale to enable consumers to obtain accurate information about the quantity of contents and to facilitate value comparisons. Compliance with these laws and the regulations promulgated under the authority of these laws is secured through periodic inspections of facilities and products, analyses of samples, educational activities, investigations of consumer trade complaints, and legal proceedings.

Provisions of 21 CFR 101.105(a) specify that the declaration of quantity of contents shall be in terms of weight if the product is solid, semisolid, or viscous, or a mixture of solid and liquid. Thus, it would appear that traditional ice cream products, being semisolid foods, would be declared by weight. However, provisions of §101.105(a) also provide that if there is a firmly established general consumer usage and trade custom of declaring the contents of a liquid by weight, or a solid, semisolid, or viscous product by fluid measure, it may be used. Because there appears to be a firmly established general consumer usage and trade custom of expressing quantity of contents declarations on traditional ice cream products in terms of volume, the agency has not required industry to revise their declarations to be expressed in terms of weight.

Pelletized ice cream is a unique and totally new ice cream product that is emerging in the marketplace. Because it is a semisolid food, in accordance with 21 CFR 101.105(a), the appropriate net quantity of content declaration for these products would be net weight. In addition, there is not a firmly established general consumer usage and trade custom of expressing the quantity of contents declaration in terms of volume on pelletized ice cream.

As you know, pelletized ice cream is manufactured at very low temperatures using a nitrogen process and consists of thousands of small beads of ice cream of varying sizes. Moreover, because there is variation in the diameter of the pieces, settling in the package, and the absence of a test procedure, FDA believes that a net quantity of content declaration using a volume measurement would be difficult for manufacturers to determine and confirm and for regulatory officials to test. In addition, density variations occur when inclusions are added to packages of pelletized ice cream. Because these inclusions such as cookie bits, themselves, vary in size and weight, using gravimetric testing to verify the declared volume of a sample may not be practical.

FDA believes that a net weight approach would eliminate the need to develop a new test procedure that could be time consuming and require expensive test equipment. It appears that because of the uniqueness of these products, a net weight declaration would be an easier measurement to test than a volume declaration. Furthermore, it is FDA's understanding that these products have been sold by net weight from at least one manufacturer in the United States for more than a year and there is no record of any consumer complaints regarding the method of sale. Therefore, FDA believes that the net quantity of content statement on pelletized ice cream should be declared in terms of net weight. We would expect manufacturers of pelletized ice cream to revise their labels to reflect a net weight declaration during the next printing cycle and encourage all marketers of pelletized cream to modify their labels with a net weight declaration within one year from the issue date of this letter.

Page 3 - Cary Frye

With regards to your request for guidance in identifying the serving size that should appear in the nutrition facts panel for pelletized ice cream, we point out that FDA regulations in 21 CFR 101.12 establish reference amounts customarily consumed and how to use these reference amounts to declare serving sizes. In 21 CFR 101.12(b), Table 2, the reference amount for ice cream, ice milk, frozen yogurt, sherbet, bulk and novelty frozen desserts (e.g., bars, sandwiches, cones) is a half cup with the equivalent metric quantity in parentheses. While we acknowledge that pelletized ice cream is a unique and totally new ice cream product, we believe that the half cup serving size is appropriate for this product. Therefore, the serving size for pelletized ice cream is a half cup with the equivalent weight in grams.

If you have additional questions, do not hesitate to contact us.

Sincerely yours,

Felicia Billingslea for

Geraldine A. June
Supervisor
Product Evaluation and Labeling Team
Office of Nutrition, Labeling,
and Dietary Supplements
Center for Food Safety
and Applied Nutrition

Page 4 - Cary Frye

cc:
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Appendix E

Food and Drug Administration (FDA) Letter to the International Ice Cream Association (IICA)

on Uniform Compliance Date for Pelletized Ice Cream

(Letter dated October 22, 2009)

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DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Food and Drug Administration
College Park, MD 20740

OCT 22 2009

Cary Frye
Vice President
Regulatory Affairs
International Dairy Foods Association
Milk Industry Foundation
National Cheese Institute
International Ice Cream Association
1250 H Street NW, Suite 900
Washington, DC 20005

Dear Ms. Frye:

This is in response to your May 29, 2009, letter to the Food and Drug Administration (FDA) in which you thanked FDA for explaining the agency's position regarding the appropriate measurement and declaration of the net quantity of contents for pelletized ice cream. You requested that pelletized ice cream and frozen dessert manufacturers have until the next uniform compliance date of January 2, 2012 to revise their labels to a net weight declaration.

You stated in your letter that it has long been the practice of the ice cream and frozen dessert industry to declare the net quantity of contents of its products in terms of volume, not weight. You also stated that as affected member companies begin to comply with the new policy requiring declarations in terms of net weight, they will need to conduct new testing to ensure accurate declarations, and they will need to print and run labels. You further stated that many of these members have substantial existing stocks of labels, and given the seasonal nature of the affected products, it will take significant time to use this stock.

As you know, in the response letter dated April 17, 2009 to the International Ice Cream Association, FDA's decision to require a net weight declaration applied to pelletized ice cream products only and not to any other frozen dessert. Pelletized ice cream is a unique and new ice cream product that has emerged in the marketplace and our evaluation was limited to this type of product. We were not asked to evaluate other frozen dessert products, nor provided any information on any additional products that are in the marketplace. Further, we were not aware that there were similar questions regarding other frozen dessert products. It is FDA's understanding that there is a limited number of manufacturers of pelletized ice cream products and at least one manufacturer in the United States has been selling the product by net weight for more than a year. Thus, FDA believes that the one year compliance date from April 17, 2009 is an appropriate

Page 2 – Ms. Cary Frye

amount of time for manufacturers to change their labels from a volume declaration to a net weight declaration on pelletized ice cream products. Therefore, FDA is denying your request for manufacturers of pelletized ice cream and frozen desserts to have until the next uniform compliance date of January 2, 2012 to revise their labels.

However, the agency recognizes that individual manufacturers may need additional time to change their labels and may request additional time. Therefore, the agency believes that it would be appropriate to consider, on a case-by-case basis, whether to exercise enforcement discretion with respect to the April 17, 2010 date. Factors that the agency intends to consider in any request from a manufacturer for the agency to exercise enforcement discretion include; the explanation of why the request is being made, the number of existing labels that the manufacturer is requesting to use, the dollar amount associated with the number of labels to be used, and the estimate of the amount of time needed to exhaust existing labels the manufacturer is requesting to use. Manufacturers may submit their requests in writing to Felicia Billingslea, HFS-820, Food and Drug Administration, Center for Food Safety and Applied Nutrition, Office of Nutrition, Labeling, and Dietary Supplements, 5100 Paint Branch Parkway, College Park, Maryland 20740.

If you have additional questions, do not hesitate to contact us.

Sincerely yours,

Geraldine A. June

Geraldine A. June
Supervisor
Product Evaluation and Labeling Team
Office of Nutrition, Labeling,
and Dietary Supplements
Center for Food Safety
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cc:
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Appendix F

U.S. National Work Group for the Development of Commercial Hydrogen Measurement Standards

Fuel Specifications Subcommittee (FSS) Proposed Method of Sale and Quality Specification for Hydrogen Vehicle Fuel

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U.S. National Work Group for the Development of Commercial Hydrogen Measurement Standards

Fuel Specifications Subcommittee (FSS) A Proposed Method of Sale and Quality Specification for Hydrogen Vehicle Fuel

Summary of Current Information

The Chairman of the FSS is: Mr. Robert W. Boyd, Linde North American, Inc.

a. Initially, the proposed method of sale and quality specification for hydrogen vehicle fuel was presented at the Western (WWMA) and Southern (SWMA) Weights and Measures Association Annual Meetings in the fall of 2008. The proposal was adopted with a recommendation that it be submitted as an Informational item on the National Conference of Weights and Measures (NCWM) Laws and Regulations (L&R) agenda at the 2009 Interim Meeting, which was held January 11 - 14, 2009, in Daytona Beach, Florida. This item was also presented at the two remaining regions, the Central (CWMA) and Northeastern (NEWMA), Annual Conferences in the spring of 2009. The proposal was again presented at the 2009 NCWM Annual Conference, held July 12 - 16, 2009 in San Antonio, Texas.

b. The recommendations of the FSS, based on the subcommittee's April 2009 review of the proposed method of sale for hydrogen engine fuel are:

   i. The FSS agreed to use the current proposal as a foundation for the fuel quality standard for hydrogen. The FSS will continue to consider further refinement of the definitions for hydrogen vehicle fuel based on input from SAE International should they be deemed necessary to finalize the standard.

   ii. The FSS noted that Federal Trade Commission's (FTC) Fuel Rating Rule (16 CFR Part 309), see the requirements in "Labeling of Alternative Fuels" (http://www.ftc.gov/bcp/edu/pubs/business/autos/bus29.shtm), requires dispensers to bear a declaration of minimum hydrogen content determined according to the test methods described in "Standard Test Method for Analysis of Natural Gas by Gas Chromatography (ASTM D1946-90)."

   iii. The FSS further modified the proposed HB 130 language to recognize the language in 16 CFR Part 309.15 Posting of non-liquid alternative vehicle fuel rating.

Section I. Prologue

The discussion paper that follows is "The Starting Point: A Discussion Paper Describing a Proposed Method of Sale and Quality Specification for Hydrogen Vehicle Fuel" originally published in June 2008. The corresponding proposals are for the method of sale and fuel quality.

This paper describes proposals for a uniform method of sale and fuel quality specifications on hydrogen vehicle fuels that are under development by the USNWG Fuel Specifications Subcommittee (FSS). The purpose of this document is to organize, focus, and record the work of the FSS. Participation in the work of the subcommittee is open to anyone intending to make a positive contribution to the process

The States have always had a leadership role in establishing and enforcing the laws and regulations for legal metrology and fuel quality in the United States. The goal of this effort is to develop proposals for inclusion in NIST Handbook 130, "Uniform Laws and Regulations in the areas of Legal Metrology and Engine Fuel Quality,"[1] which is a source for model laws that the States use in developing their legal requirements. Some states adopt the regulations in that handbook by reference or citation in law. This approach has provided national uniformity in regulation of a number of significant issues, including packaging and labeling, net quantity of contents, and fuel quality.

The FSS includes hydrogen producers, dispenser and component manufacturers, weights and measures, air resource, fuel quality officials, and other interested parties. This document is presented to invite comments from automotive and fuel cell manufacturers, marketers, weights and measures, and other state officials and other experts who certainly will have questions, concerns, and suggestions as these proposals are developed in the NCWM – L&R Committee.

The members of the FSS recognize that when small groups develop standards for emerging technologies it is impossible to be knowledgeable about all aspects of a subject which is, by its nature, changing even as a meeting takes place or a report of its progress is being composed. With this in mind, please review this document and contribute your knowledge, understanding, and ideas to this effort.

Section II. Method of Sale and Fuel Quality Standard

Participants at the first FSS meeting in March 2008, considered a proposal for a Method of Sale for Hydrogen Fuel that was prepared by NIST. Recent FSS work to update the proposed Method of Sale requirements are presented below. Also discussed was the need for a quality standard. The basis for that discussion was the proposed Hydrogen Fuel Standard developed by the California Department of Food and Agriculture; Division of Measurement Standards (CDFA/DMS) contained in a March 3, 2008, regulatory notice.[2] The FSS recognizes and commends the State of California for sharing its knowledge and experience in providing a starting point for a national standard for hydrogen fuel. This document should be interpreted as neither an endorsement, nor criticism, of the CDFA/DMS proposal by either the FSS or NIST unless otherwise stated. For the most recent FSS updates on the fuel quality proposal, refer to Section III.

Uniform Method of Sale for Hydrogen Vehicle Fuel

Defining a legal requirement for a uniform method of sale for commodities is the most practical and efficient way that weights and measures uses to ensure that consumers can make value comparisons between competing sellers of the same commodity. The purpose is to ensure that purchasing decisions enable consumers to obtain the greatest value for their money. A uniform method of sale also ensures that sellers advertise and deliver a commodity using a single unit of measurement so comparisons can be quick and simple. Typically commodities (e.g., gasoline, diesel fuel, food, milk, wine, sand and gravel, and others) are sold by weight, measure (volume or dimensions, including area), or count.

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[1] See the 2009 Edition of NIST HB 130 at http://www.nist.gov/owm

[2] Available at http://www.cdfa.ca.gov/dms/hydrogenfuel/hydrogenfuel.html

Establishing a method of sale for any product is a critical first step in the development of a fair and competitive marketplace for any commodity, especially one that is just emerging and for which there is not a traditional method of sale for the commodity on which to build. History has shown that when products are introduced into the marketplace without a legally defined standard, confusion and unfair competitive practices can quickly evolve and potentially harm the consumer's perception of the product and business reputation of the seller.

The need for a method of sale was stated in the 2005 "Hydrogen Delivery Technology Roadmap,"[3] which called on retailers and appropriate government agencies to establish a legal unit of measurement for hydrogen (see endnote[i] for further discussion).

The FSS recommends that all retail sales of hydrogen vehicle fuel be by mass using the kilogram as the unit of measurement.

The industry's pre-market practice has been to dispense hydrogen using the kilogram as the unit of measurement. The use of mass was strongly favored by the FSS participants who agreed that it should be the basis for retail commercial transactions. By requiring use of the kilogram as the unit of measurement for all retail dispensers, consumers can make value comparisons between competing retailers. Dispensing hydrogen by mass using the kilogram is specified in Section 2.4.2. Indications of OIML R 139 "Compressed Gaseous Fuel Measuring Systems for Vehicles" (Edition 2007) and is the method of sale used in other countries so the U.S. method of sale will be consistent with that used in the global marketplace. As this fuel becomes fully commercialized, consumers considering the lease or purchase of a hydrogen vehicle will need to learn the fueling process for their hydrogen vehicle and be educated that their fuel purchases will be made on the basis of mass using the kilogram. The FSS considered, but does not support, a gasoline gallon equivalent (GGE) units for use in retail commercial sales (see endnote [ii]).

This proposal presents the kilogram as the unit of measurement to be used in commercial sales. (See Figure 1 [pg 7] for an example of how the unit measurement may appear on the dispenser, and see Figure 2 [pg 7] on how the street signs will display the unit price). The unit can be shown using the term "kilogram" or by use of its accepted abbreviation "kg," which is its prescribed symbol in NIST Special Publication 330 – "The International System of Units (SI)."[4]

Nothing in the proposal should be interpreted as prohibiting the use of a hydrogen GGE for information purposes to facilitate general comparisons with other fuels in advertisements and other literature. Consumers who are considering the lease or purchase of a hydrogen vehicle should be informed that they will be purchasing fuel by the kilogram and that they can make reliable value comparisons using that method of sale.

The FSS recommends that in retail sales "HXX" be used to represent Hydrogen vehicle fuel and the capital "H" precede the "XX," which represents the service pressure of the hydrogen fuel offered for sale (expressed in the International System of Units (SI) unit megapascal [MPa]).

Product Identity

The FSS agreed to support the use of the capital letter "H" as the symbol for hydrogen instead of H_2 to simplify product identification of hydrogen vehicle fuel sold at the retail level.

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[3] Available at http://www1.eere.energy.gov/vehiclesandfuels on the Internet
[4] See NIST Special Publication 330 – 2008 "The International System of Units (SI)." Ambler Thompson, Editor.

Service Pressures shall be shown in the SI Unit Pascal (MPa)

Knowing the service pressure of the dispenser is a critical factor for consumers as the storage tanks on their vehicle is designed to be filled at one of those pressures. In addition to needing this information for safety and vehicle filling purposes, participants at the March 2008 FSS meeting indicated that retailers may charge different prices depending on the delivery pressure at which the fuel is dispensed. Currently, some dispensers are marked with service pressures in units of bar[5] (e.g., 350 bar and 700 bar) or megapascals (MPa), which are the pressures available to service hydrogen vehicles. A few dispenser manufacturers use megapascal (MPa) in trade publications and in declaring dispenser delivery pressures. The FSS agreed that the service pressure at which the product is dispensed must be posted on the user's interface of all dispensers.

While the bar is accepted for use with SI, the metric system, the primary SI unit for pressure is the pascal (international symbol – Pa). Typical values encountered for dispenser of service pressures in pascals, bar and pounds are 35 MPa (350 bar) (approximately equivalent to 5 000 psi) and 70 MPa (700 bar) (approximately equivalent to 10 000 psi). The FSS agreed that in using the SI unit for pressure, the pascal would standardize industry practice and enable it to easily present this information in a consistent manner. It will also simplify the manner used to declare service pressures on dispensers, street signs, and in advertisements.

Unit Pricing in Whole Cents

The FSS also agreed that the conditions for sale, when unit pricing is based on features, such as operation pressure, should be stated with the unit price in whole cents per kilogram on street signage to inform drivers of hydrogen vehicles of the service pressures available at the retailer's fueling facility. The proposal does not mandate street signs, but will require that when street signs are available they must display the unit price and service pressure of the dispensers. The requirement is only applicable when retailers voluntarily post or present the price of fuel in advertisements and on street signs.

The FSS agreed the traditional practice of using decimal fractions of a cent in unit pricing in advertisements, the unit price, or in the calculation of total price should not be extended to sales of hydrogen fuel. Under the proposed method of sale, that practice is prohibited (e.g., $3.499 per kg would not be permitted but $3.49 per kg would be permitted).

[5] A bar is an atmospheric pressure defined as 100 kilopascals. See NIST Special Publication 330 – 2008 "The International System of Units (SI)." Ambler Thompson, Editor.

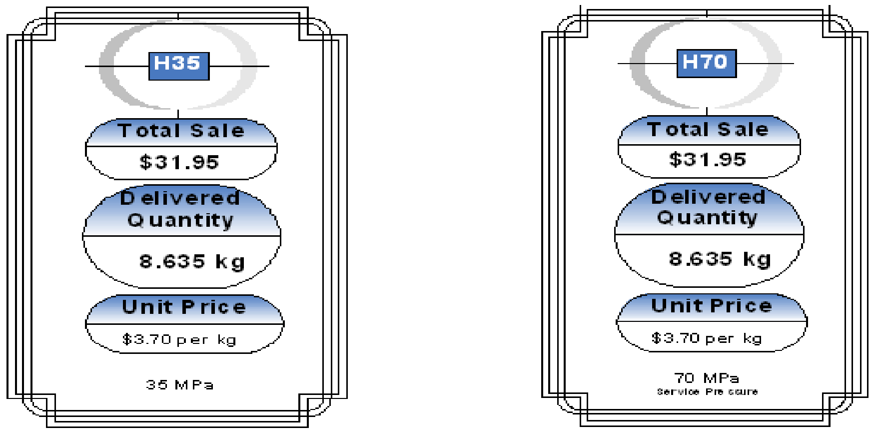

Figure 1. Examples of the product identity, measurement unit, unit price, and service pressure on the user's interface of a hydrogen Fuel Dispenser

A Competitive Marketplace

Figure 2 depicts how a fueling station in the marketplace might display required information. The purpose of the graphic is to illustrate that a uniform method of sale in a single unit of measurement and other requirements for posting of service delivery information will facilitate value comparison in a competitive marketplace and provide users with critical information. The graphics of the signage shows how posting the unit of measurement and service pressure provides drivers with information to permit them to make product and service pressure value comparisons between retailers.

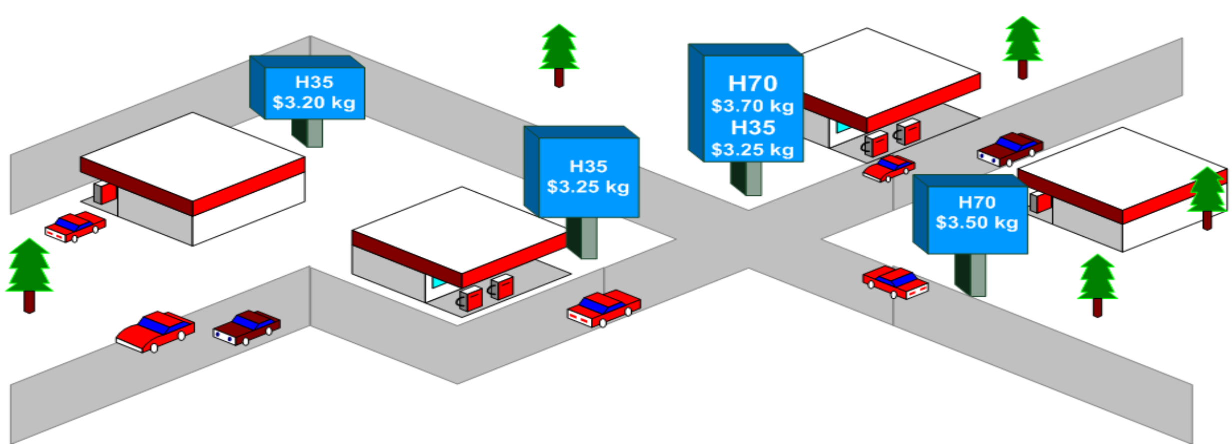

Figure 2. The use of the uniform unit of measurement and posting of product identity, and service pressure to enable value comparison.

One alternative to the posting of service pressures (perhaps even unit prices) may be found in the growing prevalence of vehicle navigation systems and satellite information services. If drivers of hydrogen vehicles have access to real-time price and service pressure information through those systems, and use them to make their purchasing decisions, the current approach of using street sign pricing may not continue in this marketplace.

The FSS supports the following method of sale for petroleum:

Recommendation: The FSS supports the proposal to be included in NIST Handbook 130: Section IV: Uniform Regulation for Method of Sale of Commodities. The FSS presented the following recommendation for consideration by the 2009 NCWM L&R Committee. This modified version includes a change to paragraph 2.XX.4.2 to include the units of megapascals.

Section 2. Non-food Products [*Note 1*, page 103]

2.XX. Retail Sales. – Hydrogen Fuel (H).

2.XX.1. Definitions – Hydrogen Fuel (H).

2.XX.1.1. Hydrogen Fuel. – A fuel composed of the chemical hydrogen intended for consumption in an internal combustion engine or fuel cell.

The symbol for hydrogen vehicle fuel shall be the capital letter "H" (the word Hydrogen may also be used.)

2.XX.2. Method of Retail Sale and Dispenser Labeling. – All hydrogen fuel kept, offered, or exposed for sale and sold at retail shall be in terms of the kilogram.

2.XX.3. Retail Dispenser Labeling.

2.XX.3.1. A computing dispenser must display the unit price in whole cents on the basis of price per kilogram.

2.XX.3.2. The service pressure(s) of the dispenser must be conspicuously shown on the user interface in bar or the SI Unit of Pascal (Pa) (e.g., MPa).

2.XX.3.3. The product identity must be shown in a conspicuous location on the dispenser.

2.XX.3.4. National Fire Protection Association (NFPA) labeling requirements also apply.

2.XX.3.5. Hydrogen shall be labeled in accordance with 16 CFR 309 – FTC Labeling Alternative Fuels.

2.XX.4. Street Sign Prices and Advertisements.

2.XX.4.1. The unit price must be in terms of price per kilogram in whole cents (e.g., "$3.49 per kg" not $3.499 per kg).

2.XX.4.2. The sign or advertisement must include the service pressure~~(s)~~ (expressed in megapascals) at which the dispenser(s) delivers hydrogen fuel (e.g., H35 or H70).

Section III. Hydrogen Vehicle Fuel Quality Specification

The FSS will continue to develop a model regulation to specify the quality requirements for hydrogen vehicle fuel for addition to the Uniform Fuels and Lubricants Regulation (UFLR) in NIST Handbook 130. The UFLR cites ASTM International and SAE International standards for gasoline, diesel, and other fuels. At least 11 states use that model regulation as a basis for their rules on fuel quality. As with other fuels, the regulations in Handbook 130 will reference standards from appropriate standards organization and utilize the test methods authorized and referenced by those standards. The proposed regulation will likely include standards developed by ASTM International, SAE International, and the International Organization for Standardization (ISO), or other American National Standards Institute (ANSI) accredited organization.

The State of California is at the forefront in establishing a fuel quality standard for Hydrogen to meet a legislative mandate.[6] At its first meeting in March 2008, the FSS participants reviewed the March 3, 2008 draft developed by the CDFA/DMS so that it could be used as a starting point in the development process for a national standard. This approach takes advantage of California's expertise, and the fact that it has been published for comment as part of that state's rulemaking process, meaning that it has received public review. The CDFA/DMS proposal provides an interim standard for hydrogen fuel.

Once ANSI has adopted fuel standard, the CDFA/DMS is required by law to adopt that standard by reference. Since test procedures have not yet been finalized to measure the properties specified in the CDFA/DMS interim standard, that agency will adopt sampling and test procedures in regulation as they are developed. The agency will begin enforcement of its regulations and require compliance once sample and test procedures have been adopted by an accredited organization and its regulation are finalized. Several FSS participants reminded the group that the higher the quality of the fuel the higher its cost may be, so the approach taken in the United States must be practical and cost effective if the commercialization of hydrogen vehicle fuel is to be successful.

Proposed Specification for Hydrogen Fuel

The FSS identified several quality criteria where there was tentative agreement with their associated values and the ability to test to those values with current technology available today (see properties 6, 7, 8, 9, 12, 14, and 16 which are highlighted in green) in the proposed Table 1. Hydrogen Fuel Quality Specification.

The FSS did not agree on all of the properties contained in the DMS proposal because there was either not enough research data or test methods available to support a decision (see properties 1, 2, 3, 4, 5, 10, 11, 13, and 15 which are highlighted in yellow) in Table 1 below. These and perhaps other properties will receive further consideration by the FSS and may be added to the quality standard in the future when such action is supported by research.

FSS supports the proposed new definitions to be included in NIST Handbook 130 Section IV. Uniform Regulations Part G. Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Regulations Section 2. Standard Fuel Specifications to address gaseous hydrogen refueling applications.

[6] See http://www.cdfa.ca.gov/dms/hydrogenfuel/hydrogenfuel.html for more information on the California Division of Measurement Standards Hydrogen Fuel Program. (Viewed 4/11/08)

1. Specification for Hydrogen Fuel for Internal Combustion Engines and Fuel Cells

2. Definitions

1.XX. Fuel Cell. – an electrochemical energy conversion device in which fuel and an oxidant react to generate energy without consumption of its electrodes or electrolyte.

1.XX. Hydrogen Fuel. – a fuel composed of the chemical hydrogen intended for consumption in a surface vehicle with an internal combustion engine or fuel cell.

1.XX. Internal Combustion Engine. – a device used to generate power by converting chemical energy bound in the fuel into mechanical work to power a vehicle.

Cite the appropriate reference for the hydrogen fuel quality standard below that was developed by the California Division of Measurement Standards in NIST Handbook 130 Section IV. Uniform Regulations Part G. Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Regulations Section 2. Standard Fuel Specifications as follows:

Table 1. Hydrogen Fuel Quality Specification*

	Property	Value	Unit	Limit	Test Method(s)
1	Ammonia	0.1	ppm v/v	Maximum	to be specified
2	Carbon Dioxide	2.0	ppm v/v	Maximum	to be specified
3	Carbon Monoxide	0.2	ppm v/v	Maximum	to be specified
4	Formaldehyde	0.01	ppm v/v	Maximum	to be specified
5	Formic Acid	0.2	ppm v/v	Maximum	to be specified
6	Helium	300.0	ppm v/v	Maximum	to be specified
7	Hydrogen Fuel Index	99.97	% (a)	Minimum	to be specified
8	Nitrogen and Argon	100.0	ppm v/v	Maximum	to be specified
9	Oxygen	5.0	ppm v/v	Maximum	to be specified
10	Particulate Concentration	1.0	mg/kg	Maximum	to be specified
11	Total Allowable Non-Hydrogen, Non-Helium, Non-particulate constituents	100.0	ppm v/v	Maximum	to be specified
12	Total Non-Hydrogen Gases	300.0	ppm v/v (c)	Maximum	to be specified
13	Total Halogenated Compounds	0.05	ppm v/v	Maximum	to be specified
14	Total Hydrocarbons	2.0	ppm v/v (d)	Maximum	to be specified
15	Total Sulfur Compounds	0.004	ppm v/v	Maximum	to be specified
16	Water	5.0	ppm v/v	Maximum	to be specified

Footnotes to Table 1 –

a. Hydrogen fuel index is the value obtained with the value of total gases (%) subtracted from 100 %.
b. Total Gases = Sum of all impurities listed on the table except particulates.
c. Total Hydrocarbons may exceed 2 ppm v/v only due to the presence of methane, provided that the total gases do not exceed 300 ppm v/v.

* The FTC's Fuel Rating Rule (16 CFR Part 309) see the requirements in "Labeling of Alternative Fuels" at http://www.ftc.gov/bcp/edu/pubs/business/autos/bus29.shtm requires dispensers to bear an declaration of minimum percent of hydrogen determined according to test methods described in "Standard Test Method for Analysis of Natural Gas by Gas Chromatography (ASTM D1946)

The FSS will monitor national and international standard activities, research, and other programs to avoid duplication of effort and to ensure that its work provides a fuel specification for hydrogen vehicle fuel that serves the needs of the this emerging marketplace. Quality standards are currently under development in SAE International (e.g., SAE J2719 "Hydrogen Specification Guideline for Fuel Cell Vehicles") and in ASTM International (e.g., see www.astm.org for a list of the work underway in its Committee D03.14 on Hydrogen and Fuel Cells and that organizations other committees).

Quality standards are under consideration around the world, including the European Union, Japan, and other countries. Also of interest are the efforts of Working Group 12 of ISO's Technical Committee 197 on Hydrogen, which is very active in this area.[7] ISO's website indicates that its fuel quality standard will be finalized within a few years.

When a quality property and numerical value (defining a maximum or minimum limit) is added to the specification, appropriate test methods must then be identified. As test methods are identified and adopted by the FSS, they will be added to Column 6 in Table 1.

Future work of the FSS may include the development of recommendations for field sampling equipment and handling procedures, along with suggestions about what type of test equipment is appropriate for establishing a hydrogen vehicle fuel quality laboratory.

For Further Information or to Comment Contact:

Please send comments and suggestions concerning the proposals presented in this document to Ms. Lisa Warfield or Mr. Ken Butcher, Technical Advisors to the USNWG Fuel Specifications Subcommittee, at lisa.warfield@nist.gov or (301) 975-3308 or kbutcher@nist.gov or at (301) 975-4859. Faxes may be sent to (301) 975-8091.

Fuel Specifications Subcommittee
U.S. National Work Group for the
Development of Commercial Hydrogen Measurement Standards
NIST Weights and Measures Division
Laws and Metric Group
100 Bureau Drive, MS 2600
Gaithersburg, Maryland 20899

7 http://www.iso.org/iso/standards_development/technical_committees/list_of_iso_technical_committees/iso_technical_committee.htm?commid=54560. (Viewed 9/2/09)

[i] **Additional Information on the Importance of a Method of Sale** – Establishing a uniform method of sale ensures marketplace integrity and increases consumer confidence while ensuring fair trade practice in a competitive marketplace. In past experience, the lack of a legal standard of sale has resulted in sellers establishing different methods of sale for the same product. This resulted in investments in weighing and measuring equipment and spending on packaging and marketing programs, only to find that the units of measurement used were not appropriate for the commodity. Once a new standard was established, existing measuring equipment, labeling, and sales literature had to be retrofitted or discarded. Establishing a method of sale early in the process informs the designers of weighing and measuring devices about how they are to design the device and the user interface. It also enables marketers to create sales and promotional programs for the product using a consistent unit of measurement throughout the system. Past experience with conflicting methods of sale has taught weights and measures and sellers many valuable lessons over the years. One of the most important lessons is that consumers are intelligent and willing to learn new methods of sale and readily accept products and services, if the information they receive from different sellers is informative, uniform, and accurate. Establishing a uniform method of sale will also inform automobile and fuel cell manufacturers about how they will need to educate consumers in sales literature and owners' manuals about the fuel and how it will be measured for dispensing into the vehicles and other refueling applications. Decisions are needed so that as marketing and promotional ideas are being considered and developed, the uniqueness of the fuel and dispensers can be addressed using a single unit of measurement.

[ii] **Additional Information on the Gasoline Gallon Equivalent** – A question at the FSS March 2008 meeting was whether the marketing of hydrogen vehicles against those that use fuels sold on the basis of a gallon would benefit from the establishment of a gasoline gallon equivalent (GGE). GGEs are based on energy content of fuels. GGE for hydrogen is mentioned in the media and government literature as 1 kg = 119,823 kilojoules (kJ) (113,571 BTU (lower heating value). GGE is used to compare the fuel in terms of price per gallon and to introduce hydrogen as a commercial vehicle fuel. This approach facilitates those comparisons as long as it is also understood that the energy content in a gallon of fuel varies widely with the fuel. When the GGE for Compressed Natural Gas (CNG) was developed as a legally defined value in the 1990s, one reason for its adoption was to allow consumers to compare the cost of competing fuels on street signs and on dispensers in a unit of measurement that was comparable among fuels such as gasoline. Thus, consumers could determine the potential savings when choosing a vehicle capable of using one type of fuel over another. In 1994, the GGE was set at 2.567 kg for CNG by NCWM using the lower heating value of gasoline, which was then given at 120,401.7 kJ (114,118.8 BTU). It should be noted that the adoption of the GGE for CNG was somewhat contentious. A proposal to add a diesel gallon equivalent (DGE) for CNG is expected to be on the NCWM's agenda in 2009.

It is difficult to make accurate comparisons between fuels because energy content varies by fuel, by region, and season for gasoline. Currently, the *Transportation Energy Data Book* lists the net energy of a gallon of gasoline at 121,753.4 kJ (115,400 BTU) and diesel as 135,785.7 kJ (128,700 BTU). Variations in energy content increase when gasoline is blended with Ethanol (E10 or E20) and E85 (15 % gasoline + 85 % ethanol) which contains only 89,679.76 kJ (85,000 BTUs) according to the National Ethanol Vehicle Coalition. Hydrogen fuel, which is expected to come into the marketplace as a commercial fuel within the next ten years, will be competing for customers who have far more fuel choices than are currently available. If a GGE is considered for hydrogen, the question that should be asked is "Would a GGE based on today's net energy content for hydrogen be a valid tool 10 years from now to compare it against gasoline, CNG, E85, diesel, and other fuels and the new electric cars expected from automobile manufacturers?"

Because of constant changes in energy policies and environmental concerns, new fuels and blends will continue to emerge in the marketplace. This constant state of change impacts the validity of GGEs. One question that must be raised if a GGE for hydrogen is proposed is, will these artificial comparison tools be periodically reviewed to ensure they provide an equitable means of ensuring reasonable and reliable comparisons between fuels.

Appendix G

American Seed Trade Association (ASTA)

Seed Count Rule for Agriculture Seeds

(Letter dated September 11, 2009)

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AMERICAN SEED TRADE ASSOCIATION

first–the seed®

September 11, 2009

Don Onwiler
Executive Director
c/o Laws & Regulations Committee
National Conference on Weights and Measures
1135 M Street, Suite 110
Lincoln, NE 68508

Jonelle Brent
Chair, Central Weights & Measures Association
Illinois Department of Agriculture
801 Sangamon Ave
PO Box 19281
Springfield, IL 62794-9281

Re: Seed Count Rule for Agricultural Seeds

Dear Mr. Onwiler and Ms. Brent:

The American Seed Trade Association ("ASTA") submits this proposal to request that the National Conference on Weights and Measures ("NCWM") amend Handbook 133 by adopting the mechanical seed count procedures for agricultural seed promulgated by the Association of Official Seed Analysts ("AOSA") in its *Rules for Testing Seeds*. ASTA is the national trade association representing about 750 companies involved in seed production and distribution, plant breeding, and related industries in North America on matters involving the purchase and sale of seed. ASTA advocates science and policy issues of industry importance and is informed by the seed industry's experience and expertise. Our mission is to enhance the development and free movement of quality seed worldwide. ASTA's members are directly affected by the method used for determining the accuracy of seed count declarations on seed labels and appreciate the opportunity to work with NCWM on this important issue.

As widely adopted planting technologies have modernized agriculture in recent years, farmers increasingly prefer to purchase bulk seed by count (versus weight). Because of changes in industry practice, field inspectors commonly are conducting compliance checks by verifying count rather than net weight. The current Handbook 133 standard for packages labeled by count is not practicable to apply to verify statements of count for corn seed, soybean seed, field bean seed, and wheat seed. While the Handbook 133 standard for packages labeled by count functions well for products that are manufactured to precise size and weight specifications, seed that is sold for planting is still produced in seed production fields resulting in inevitable size and

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weight variations between seeds or kernels. Against this backdrop, the seed industry and AOSA, along with state and federal seed regulators and academics at leading agricultural universities, have developed a uniform and practical method for determining seed count that is widely accepted and used. 1/ NCWM's adoption of the AOSA consensus standard for seed count would ensure that a fair, uniform system for seed count is applied in a manner that ensures an accurate statement of count to the benefit of purchasers and sellers alike.

I. Background on Issue

The American seed industry has had a long and rich history of producing quality products that meet rigorous seed standards, including purity. Members of the seed industry aim to deliver high quality seed products that meet or exceed federal and state standards, as well as customer expectations, and to label seed accordingly. To that end, the AOSA *Rules for Testing Seeds* provide a practical approach for sampling and verifying seed count. In recent months, it has come to our attention through conversations with the Iowa Department of Agriculture that the two different standards regarding seed count labeling, one in Handbook 133 and the other in AOSA's *Rules for Testing Seeds*, are causing confusion. The broad consensus that had developed in the seed industry and among state seed control officials and academics on seed count labeling is threatened unless regulatory clarity is provided through adoption of a uniform method for verifying seed count in Handbook 133.

The manner in which seed is purchased and sold has significantly changed in recent years. Planting equipment has become more sophisticated and precise and producers have become more focused on plant populations on a per acre/per hectare basis. Instead of being sold by weight measurements, seed is increasingly sold and labeled by count. Further, in most instances, even when sold by weight, the seed count per pound is provided on the package. Such information is critically important to modern farming techniques and highly desired by industry's farmer customers. The underlying impetus for the proposal is demand-driven. That is, the seed industry has moved to sale by count in response to the purchasing preferences of its farmer customers.

Selling and labeling by count (rather than by weight or volume) reflects the nature of the product and customary channels of trade that have emerged for seed in recent years. However, because seed is the product of a natural process and is not uniform in size and weight, traditional methods for determining count have proven impractical when applied to seed. Seed is a living biological product. Differing weather conditions, storage conditions, and genetics result in a disparity in

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1/ AOSA is an organization of official state, federal, and university seed laboratories and regulators from the U.S. and Canada whose mission is to promote uniform laws, regulations, and laboratory test methods. The organization publishes *Rules for Testing Seeds* to promote uniformity among testing labs in seed qualities and characteristics.

The *Rules for Testing Seeds* were developed to aid the agriculture industry in avoiding some of the hazards of crop production by furnishing needed information about seeds that are to be used for planting purposes. The *Rules for Testing Seeds* set definitions and fundamental procedures that are based on a thorough knowledge of the principles involved with seeds and attempt to summarize and make useful the accumulated experience of seed analysts.

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the size and weight of seeds grown not only in the same production field, but also on the same plant or even on the same pod (in the case of soybeans). Environmental factors that cause seed size variability include the growing season length, heat unit accumulation, rainfall, soil type, fertility, and individual variety response to stress conditions. The impacts of these factors are particularly pronounced for corn and soybeans. For example, corn kernels can range from round to flat and can have different sizes and shapes depending on their location on an ear of corn. Additional handling to increase uniformity, such as sizing or sieving, cannot be undertaken because it may significantly damage the seed and render it unsuitable for sale.

The challenges for weights and measures officials conducting accurate, uniform regulatory compliance checks have been managed historically by Handbook 133's methods relating to packages sold by weight. The now widespread use of count promoted the development and acceptance of the AOSA method. At the request of farmers, the seed industry is increasingly providing seed count information on the package and is selling seed by count rather than by weight or volume to provide farmers with the information they desire and to maximize the value they obtain in each bag of seed. Because planting equipment has become more precise, farmers are able to better control the plant populations in their fields. Additionally, as there is increased seed value (due to traits, genetics, and treatment), farmers prefer not to retain any surplus seed. Selling by seed count also allows farmers to make purchasing decisions solely on the basis of agronomic considerations, rather than discriminating against some varieties of seed because of large seed size, which was the case when seed was sold by weight. Therefore, the seed industry has sought to deliver and market products that reflect this purchase preference of the growers. Knowing the number of seeds needed for the specific planting rates of their fields, farmers are better able to determine the cost of planting associated with seeding their fields. Because seed count is an important service provided to customers to assist with planting accuracy, seed companies have a strong interest in accuracy of their seed count and have worked together with regulators to develop reliable methods for determining seed count. The proposal directly advances the important role that Handbook 133 plays in ensuring accuracy and fair-dealing in the sale of agricultural seed.

II. Regulatory History

Interest in selling and labeling seed by seed count arose in the mid-1990s. In response, a number of AOSA and Society of Commercial Seed Technologists ("SCST") laboratories began offering seed count services. The addition of seed counts to the seed bag and label required the development of a standardized sampling and testing procedure that allowed for an appropriate level of variation that is scientifically validated and verifiable.

In 1995, AOSA established a committee to research and establish procedures for conducting seed counts. This committee was chaired by Dr. Richard Payne, Chief of the USDA-AMS Seed Regulatory and Testing Branch. The committee recognized that Handbook 133 stipulates a maximum allowable variation ("MAV") in packages labeled by count of 1.5% for packages containing over 1,334 items, which applies to almost all types of products and is not a seed

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specific standard. 2/ The industry's experience indicated that the standard in Handbook 133 was unattainable, and very difficult to apply, when applied to seed labeled by count. Because seed is a living biological product sold in very high quantities, it differs from the uniformly produced commodities to which the "packages labeled by count" provisions of Handbook 133 are typically applied.

The AOSA committee conducted "referee tests" in 1996 and 1997. 3/ In 1998, the AOSA Board of Directors approved a tentative rule for seed counts to be included in the AOSA *Rules for Testing Seeds*. Additional referee projects were conducted in 1998 and 1999, after analysts had an opportunity to become familiar with the procedure and to suggest modifications. The final proposal was approved in 2000. This standard is widely used and accepted now by many state regulatory seed officials, as well as by industry.

During this time period, NCWM's Laws and Regulations Committee worked with members of the seed industry, trade associations, and other interested parties to develop a proposal for NCWM consideration regarding agricultural seed count. 4/ Around 1998, two differing standards were proposed for determining seed count. One standard was based on studies undertaken by ASTA and Iowa State University and the other was based on AOSA's studies. 5/ Due to the disparity in the recommended allowable variations from labeled count determined by the two studies, and despite efforts to develop a joint proposal, the NCWM committee voted in 2000 to withdraw consideration of amending Handbook 133 seed count procedures. 6/ The Committee stated that "variations on seed count make it impossible to determine and establish an appropriate MAV. The Committee believes that it will be some time before such standards can be determined and considered." 7/ Since this time, AOSA's rule has been adopted as the uniform standard for the seed industry and seed control community. Indeed, collective experts in this field have come together to establish and validate the AOSA rule for seed count. A validated, consensus method provides NCWM with the opportunity to revisit this issue and to adopt the proposal that would align Handbook 133 with the AOSA method.

III. Current Seed Count Standards

Currently, both Handbook 133 and AOSA's *Rules for Testing Seeds* have rules governing labeled weight and/or count on agricultural seed packages. Handbook 133 sets a general

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2/ *See* Handbook 133, Table 2-7, Maximum Allowable Variations for Packages Labeled by Count; § 4.4, Packages Labeled by Count of More than 50 Items.

3/ A referee test is a specially designed test which is sent out to a number of seed laboratories in order to obtain information intended to improve seed testing and to provide valuable feedback to the participating laboratories. Referee tests promote precision, standardization, and uniformity among seed laboratories with regard to seed testing methods. They also allow for testing of new methods, which may prove to produce more uniform results than existing methods.

4/ NIST, Special Publication No. 932, 83rd NCWM, L&R 18 (1998).

5/ *Id.*

6/ NIST, Special Publication No. 957, 85th NCWM, L&R 13 (2000).

7/ *Id.*

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standard of maximum allowable variation at 1.5% of labeled count for products containing over 1,334 units, rounded to the nearest whole number. 8/ The AOSA's *Rules for Testing Seeds* set the "tolerance" specifically for labeled seed count at 2.0% for corn seed, 4.0% for soybean seed, 5.0% for field bean seed, and 3.0% for wheat seed based on a properly calibrated mechanical seed counter and a properly obtained representative sample. 9/ The "allowances" specifically account for biological variables that are not only unique to agricultural seed, but that also vary by seed type, as noted above.

The standards in Handbook 133 were not developed specifically for agricultural seeds labeled by count. Handbook 133 applies the same standard for products labeled by count to seed as to items where size and weight are precisely controlled in the manufacturing process. Because seed is a living biological product with variable sizes and weights for individual seeds in a single package, it differs from manufactured commodities that only have slight variation in size and weight between individual products. Environmental and storage factors can result in variations in the appearance, size, and weight of a single variety of seeds. As explained above, the need for adoption of the proposal arose only as a result of the growing prevalence of sale by count of agricultural seed.

Applying Handbook 133's standards that were developed based on uniform manufacturing production to this biological product can prove to be quite onerous in the context of modern agriculture. For example, under current test procedures, a package containing 80,000 seeds would require a manual count of 8,000 seeds by the inspector. 10/ As bags of agricultural seeds are often labeled with count declarations of over to 200,000 seeds, these requirements are impractical, if not impossible to apply in a regulatory context. Of course, neither industry nor purchasers are well-served if weights and measures officials lack a practical, effective means for conducting field package checks.

The AOSA *Rules for Testing Seeds* were thoughtfully developed to apply specifically to labeled seed count. They are used across the United States by private laboratories, official state seed testing laboratories, and state seed control officials in sampling, inspecting, analyzing, testing, and examining agricultural seeds. The AOSA *Rules for Testing Seeds* are therefore the standard most often used by state and federal regulators when enforcing the accuracy of seed count on seed labels. Many states have expressly adopted these rules into their state code. Accordingly, seed companies rely on the AOSA *Rules for Testing Seeds* as the source of the rules on the appropriate labeling of seed.

Although the AOSA *Rules for Testing Seeds* have been adopted by many states, some states are have indicated that they may be legally bound to apply the NIST Handbook 133 procedures to

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8/ Handbook 133, Table 2-7, Maximum Allowable Variations for Packages Labeled by Count. *See also* Handbook 133, § 4.4.

9/ AOSA, *Rules for Testing Seeds*, § 12. AOSA terminology differs from that used in the Weights & Measures community. That is, "tolerance" is understood to essentially specify the maximum allowable variation between labeled count and actual count contained within a package.

10/ *See* Handbook 133, § 4.4.

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agricultural seed due to a lack of clarity in their individual state regulations. 11/ While each state could certainly amend its laws to establish the AOSA *Rules for Testing Seeds* as the appropriate standard for agricultural seed labeling, it is more efficient and appropriate to amend Handbook 133 to include workable standards for agricultural seeds. This proposal is ripe for consideration and adoption because there is now uniformity in the industry and consensus among federal and state seed regulators about the appropriate approach that should be adopted. Furthermore, amending of Handbook 133 will also function to ensure the Handbook maintains its proper role as the authoritative source used by state weights and measures officials conducting net weight compliance inspections. The scope of the proposal is limited by the scientifically valid basis for the MAV values for the particular seed varieties. In the future, further amendment may be appropriate based on development of data validating values for other seed varieties.

IV. Considerations of an Accurate Seed Count

It is appropriate for NCWM to adopt the proposal, paralleling the AOSA's seed count rules, because the rules are based on comprehensive studies and will ensure accuracy. Research has indicated that there are a number of factors that must be considered when conducting a seed count. First, a representative sample of at least 500 grams must be drawn according to the sampling protocol and procedures specified in the AOSA *Rules for Testing Seeds*. The automatic seed counter also must be calibrated daily prior to use. For these reasons, detailed directions for maintaining a calibration sample and the calibration technique are included in AOSA's *Rules for Testing Seeds* and should be incorporated into Handbook 133.

Additionally, a purity analysis must be conducted on the sample so that only pure seeds will be counted. There are specific pure seed unit definitions for corn and soybeans described in the AOSA *Rules for Testing Seeds*, which would be adopted into Handbook 133 under this proposal. The rule provides a calculation for determining the number of seeds per pound based on the sample analyzed.

The final component of the AOSA's current seed count rule provides "tolerances" for comparing results between laboratories or comparing the label against a regulatory laboratory test. Because the wording of this section does not conform to the function of Handbook 133 as it was written for a different purpose (although is entirely applicable), this proposal suggests making a slight modification to this language. 12/ The variation levels were established from the research gathered during the referee projects. AOSA's rule establishes "tolerances" based on the typical variation in size and weight of different types of agricultural seed.

V. Proposed Amendment to Handbook 133

ASTA requests that Handbook 133 be amended by adding the language in Section 12 (Mechanical Seed Count) of the AOSA *Rules for Testing Seeds* as Section 4.11 of Handbook 133,

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11/ For example, Iowa's Attorney General recently determined that the state is bound to use Handbook 133's MAV standard for seed because the state Department of Agriculture lacks legal authority to use the AOSA standard.

12/ *See* Section V., below.

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to be titled "Procedure for Checking the Content of Certain Agricultural Seed Packages Labeled by Count." The language will be altered to conform the headings and section numbers.

In addition, AOSA *Rules for Testing Seeds* Section 12.6 will be changed as follows to adopt the provisions to Handbook 133's purposes (*i.e.*, packaging and labeling for sale): 13/

12.6 ~~Tolerances~~ *Maximum Allowable Variations* ~~for results from different laboratories.~~

Multiply the labeled seed count ~~or first seed count test result~~ by four percent for soybean samples, two percent for corn (round, flat or plateless) samples, five percent for field bean samples and three percent for wheat samples. Express the ~~tolerance~~ *maximum allowable variation* (the number of seeds) to the nearest whole number. Consider the results of two tests in ~~tolerance~~ *accord with the maximum allowable variation* if the difference, expressed as the number of seeds, is equal to or less than the ~~tolerance~~ *maximum allowable variation*.

Example:

Kind of seed: Corn
Label claim ~~(1st test)~~: 2275 seed/lb.

Lab Test ~~(2nd test)~~: Purity working weight = 500.3 g
Seed count of pure seed = 2479 seeds

$$\text{Number of seeds per pound} = \frac{453.6 \text{ g/lb} \times 2479 \text{ seeds}}{500.3 \text{ g}} = 2247.6 \text{ seeds/lb}$$

Rounded to the nearest whole number = 2248 seeds/lb

Calculate ~~tolerance~~ *maximum allowable variation* value for corn:

multiply label claim by 2%
2275 seeds/lb × 0.02 = 45.5 seeds/lb;
rounded to the nearest whole number = 46 seeds/lb

Determine the difference between label claim and lab test:

2275 seeds/lb – 2248 seeds/lb = 27 seeds/lb

The difference between the lab test ~~(2nd test)~~ and the label claim ~~(1st test)~~ is less than the ~~tolerance~~ *maximum allowable variation* (27 < 46); therefore, the two results are in ~~tolerance~~ *accord with the maximum allowable variation.*

13/ Language in italic would be added. Language crossed out would be deleted.

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In addition, Table 2-10 should be modified to add an exception to MAV for seed count. This table would be renamed to add "agricultural seed labeled by count" to the list of covered topics and a box would be added to the table explaining the specific MAVs for agricultural seeds (*i.e.*, 2.0% for corn seed, 4.0% for soybean seed, 5.0% for field bean seed, and 3.0% for wheat seed, all based on a properly calibrated mechanical seed counter). Table 1-1 would have a minor corresponding change, adopting the new name of Table 2-10.

This proposal is structured so that the new MAV only applies to those seeds that fall within the scope of the new standard (*i.e.*, soybeans, corn, field beans, and wheat in packages labeled by count). Within Handbook 133, the accuracy of labeling for other seeds types and seeds labeled by weight would continue to fall under the Handbook's current provisions.

* * *

Historically, the sale of seed by weight has allowed regulatory officials to conduct accurate, uniform package checks to assess net weight compliance. Although Handbook 133 is an essential tool for checking and ensuring the accuracy of the net contents of packaged goods, Handbook 133 does not account for the unique factors that pertain to agricultural seed labeling when sold by count. In order to promote uniformity in labeling standards, ASTA requests that NWCM adopt the AOSA *Rules for Testing Seeds* provisions pertaining to mechanical seed count as part of Handbook 133.

Thank you for your consideration of this proposal. We would be pleased to make experts and technical resources available to the Conference on this matter. We look forward to working with you to ensure the accuracy of seed counts for agricultural products.

Sincerely,

A. W. LaVigne

Andrew W. LaVigne
President & CEO
American Seed Trade Association

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Appendix H

Association of Official Seed Analysts (AOSA)

Section 12: Mechanical Seed Count

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ASSOCIATION OF OFFICIAL SEED ANALYSTS

SECTION 12: MECHANICAL SEED COUNT

The following method shall be employed when using a mechanical seed counter to determine the number of seeds contained in a sample of soybean (*Glycine max*), corn (*Zea mays*), wheat (*Triticum aestivum*) and field bean (*Phaseolus vulgaris*).

12.1 Samples.

Samples for testing shall be of at least 500 grams for soybean, corn and field beans and 100 grams for wheat and received in moisture proof containers. Samples shall be retained in moisture proof containers until the weight of the sample prepared for purity analysis is recorded.

12.2 Seed counter calibration.

The seed counter shall be calibrated daily prior to use.

(a) Prepare a calibration sample by counting 10 sets of 100 seeds. Visually examine each set to insure that it contains whole seeds. Combine the 10 sets of seeds to make a 1,000 seed calibration sample. The seeds of the calibration sample should be approximately the same size and shape as the seeds in a sample being tested. If the seeds in a sample being tested are noticeably different in size or shape from those in the calibration sample, prepare another calibration sample with seeds of the appropriate size and shape. Periodically re-examine the calibration samples to insure that no seeds have been lost or added.

(b) Carefully pour the 1,000 seed calibration sample into the seed counter. Start the counter and run it until all the seeds have been counted. The seeds should not touch as they run through the counter. Record the number of seeds as displayed on the counter read out. The seed count should not vary more than ±2 seeds from 1,000. If the count is not within this tolerance, clean the mirrors, adjust the feed rate and/or reading sensitivity. Rerun the calibration sample until it is within the ±2 seed tolerance. If the seed counter continues to fail the calibration procedure and the calibration sample has been checked to ensure that it contains 1,000 seeds, do not use the counter until it has been repaired.

12.3 Sample preparation.

Immediately after opening the moisture proof container, mix and divide the submitted sample, in accordance with section 2.2, to obtain a sample for purity analysis and record the weight of this sample in grams to the appropriate number of decimal places (refer to section 2.3 a). Conduct the purity analysis to obtain pure seed for the seed count test.

RULES FOR TESTING SEEDS

12.4 Conducting the test.

After the seed counter has been calibrated, test the pure seed portion from the purity test and record the number of seeds in the sample.

12.5 Calculation of results.

Calculate the number of seeds per pound to the nearest whole number using the following formula:

$$\text{Number of seeds per pound} = \frac{453.6\text{ g/lb} \times \text{no. of seeds counted in d.}}{\text{weight (g) of sample analyzed for purity}}$$

12.6 Tolerances for results from different laboratories.

Multiply the labeled seed count or first seed count test result by four percent for soybean samples, two percent for corn (round, flat or plateless) samples, five percent for field bean samples and three percent for wheat samples. Express the tolerance (the number of seeds) to the nearest whole number. Consider the results of two tests in tolerance if the difference, expressed as the number of seeds, is equal to or less than the tolerance.

Example:

Kind of seed: Corn
Label claim (1st test): 2275 seed/lb.

Lab Test (2nd test): Purity working weight = 500.3 g
Seed count of pure seed = 2479 seeds

$$\text{Number of seeds per pound} = \frac{453.6\text{ g/lb} \times 2479\text{ seeds}}{500.3\text{ g}} = 2247.6\text{ seeds/lb}$$

Rounded to the nearest whole number = 2248 seeds/lb

Calculate tolerance value for corn:

multiply label claim by 2%
2275 seeds/lb × 0.02 = 45.5 seeds/lb;
rounded to the nearest whole number = 46 seeds/lb

Determine the difference between label claim and lab test:

2275 seeds/lb – 2248 seeds/lb = 27 seeds/lb

The difference between the lab test (2nd test) and the label claim (1st test) is less than the tolerance (27 < 46); therefore, the two results are in tolerance.

Appendix I

Association of American Seed Control Officials (AASCO)

Letter on Seed Count Rule for Agricultural Seeds

(Letter dated September 11, 2009)

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AASCO

Association of American Seed Control Officials

KNOW WHAT YOU SOW

September 11, 2009

Vicky L. Dempsey, Secretary-Treasurer
Central Weights and Measures Association
451 West Third Street, PO Box 972
Dayton, OH 45422

Jonelle Brent, Chair of Executive Committee
Central Weights and Measures Association
c/o IL Department of Agriculture
PO Box 19281
Springfield, Illinois 62794-9281

RE: Seed Count Rule for Agricultural Seeds

Dear Vicky and Jonelle:

The Association of American Seed Control Officials (AASCO) supports the methods and acceptable variances to determine seed counts as established in the Association of Official Seed Analyst (AOSA) "Rules for Testing Seed". The Recommended Uniform State Seed Law (RUSSL) establishes that the methods used to sample, analyze and test seed shall be those as established by the Association of Official Seed Analysts Rules for Testing Seed.

Seed is a biological unit and as such, it is subject to environmental influences that introduce variation in size and density. Seed cannot be produced utilizing a standardized manufacturing process that controls size and density. Utilizing a process of referee testing and scientific review, The Association of Official Seed Analyst, has established in the Rules for Testing Seed, acceptable testing methods and variances for Corn, Soybeans, Field Beans, and Wheat that are recognized and utilized by state seed control officials in the administration of their respective state seed laws. These standards are also acceptable to the regulated seed industry as a fair and valid means for determining that their products are in compliance with the respective state seed laws.

AASCO

Association of American Seed Control Officials

The Association of American Seed Control Officials is a professional organization of state seed control officials organized in 1945 for purposes of maintenance and amendment of the Recommended Uniform State Seed Law, promotion of uniformity in state seed laws and regulations, and promotion of cooperation between the administrators of the seed laws of the US States, the Dominion of Canada and the Federal Seed Act.

The Association of American Seed Control Officials respectfully requests that NIST adopt the methods and variances used to establish seed counts for Soybeans, Corn, Field Beans and Wheat as established in the Association of Official Seed Analyst Rules for Testing Seed.

Best Regards,

Ronald R. Pence
President – AASCO

Assistant Administrator, Commodity Inspection Division
Oregon Dept of Agriculture
635 Capitol Street NE
Salem, Oregon 97301-2532

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Treasurer
Wisconsin Department of Agr., Trade, & Consumer Protection
P. O. Box 8911
Madison, WI 53708-8911
Tel. 608-224-4596

Appendix J

Lexmark Letter on Inkjet/Printer Cartridges

(Letter dated March 17, 2009)

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LEXMARK

Lexmark International, Inc.
740 West New Circle Road
Lexington, Kentucky 40550
USA

March 17, 2009

Mr. Max Gray
Department of Agriculture and Consumer Services
Bureau of Weights & Measures
3125 Connner Blvd. Lab 2
Tallahassee, FL 32399-1650

Dear Mr. Gray:

Thank you for providing the inquiry from cartridge refiller Dr. Ink, Inc., as well as the link to Tom Coleman's newsletter article dated March 2005. As we discussed briefly, Lexmark does not believe that the packaging for inkjet print cartridges is required to display the volume of ink contained within those devices. Lexmark also believes that despite some superficial appeal, such labeling is more apt to be misleading than illuminating to consumers.

Background

An inkjet print cartridge is not remotely similar to a bottle of milk or a tube of toothpaste; rather, it is one of the most technologically advanced micro-machines in commerce today. In fact, most of the sophisticated technology that comprised a printer in prior technologies is now contained within the print cartridge itself. Not surprisingly, then, the cost of the ink associated with a cartridge is a very small fraction of the total cost of the print cartridge mechanism and much of the price the customer pays for the cartridge is attributable to the micro-machinery, not the ink. Moreover, the capabilities of various cartridge models vary drastically in terms of print speed, print quality, drop size and resolution, and yield so a comparison of those machines based upon the quantity of ink they contain is an apples to oranges comparison. And as explained below, such a comparison could well mislead consumers into buying cartridges that will cost them more, not less, per print. Treating these sophisticated machines as though they were mere containers for ink is inappropriate.

Ink Exemption

Ink is expressly exempt from labeling as provided by the U.S. Fair Packaging and Labeling Act. See 16 C.F.R. 50.3.2(a), attached hereto. The exemption for ink has been consistently observed and applied for decades by the State of Florida, as well as every other state in the union. This is clearly demonstrated by the fact that during this period literally billions of ink pens, markers and highlighters have been sold without any labeling whatsoever as to the quantity of ink these devices contain. It cannot plausibly be denied that during the nearly 40 years the exemption has been in effect, enforcement officials of the Bureau have personally purchased a multitude of such products and cannot possibly have failed to notice that none of them disclosed the quantity of ink.[1]

Yet it does not appear that the Florida or any other state is currently considering requiring labeling of pens, markers and highlighters even though there is no principled way to treat them more leniently than print cartridges. Were the Bureau to abruptly change its longstanding policy regarding the ink, it would constitute a watershed change in Florida law that would encompass the entirety of two large industries that for decades have reasonably believed they were exempt. Any such unannounced deviation from established policy would create significant due process issues for the writing implement and printer companies affected.

Labeling Would Cause Confusion

As mentioned during our brief conversation, contrary to the objective of permitting meaningful comparisons of products, labeling ink volume of printing devices is more likely to cause confusion and in many cases, could cause consumers to make perfectly incorrect decisions. The ratio of the amount of ink contained in a cartridge versus the amount of printed pages a cartridge can produce is markedly different among various cartridge models. For example, a cartridge model that ejects relatively large drops of ink will consume far more ink to produce a given print than one with very fine drops and, ironically, the quality of the fine drop print will be better. Thus a consumer who chooses large-drop technology cartridge because it contains more ink than an equally priced fine-drop technology cartridge, will actually end up be paying more for each print, and obtain poorer print quality to boot.

In contrast, page yield estimates can provide a meaningful comparison of value to a consumer, at least if all manufacturers employ the same estimating assumptions and techniques. In this regard, the International Standards Organization (ISO), an independent, worldwide standard-setting body which is also interested in promoting accurate comparisons by consumers, has rejected reliance on ink volume or quantity. Instead, ISO, after studying for years the specific issue of inkjet cartridge performance and the consumer's need for meaningful comparative information, has developed a yield estimating and claiming methodology that permits cartridges to be compared using a consistent yardstick. Unlike ink volume measurements, these page yield measurements provide consumers a reliable way to compare the relative amount of printing that can be expected from competitive models of printers and their associated cartridges.

Coleman's Newsletter Article

Last, I would like to address Mr. Coleman's March 2005 newsletter article. To be honest, I am not entirely certain what this document is intended to be, but a non-regulatory agency employee's opinion set forth in a newsletter cannot possibly have the effect of countermanding the official Federal Trade Commission regulations that establish the exemption for ink. That regulation has the full force and effect of law and is recognized by all other states. Mr. Coleman's newsletter article simply is not an authoritative document that could formulate the basis for the sweeping regulatory change that Dr. Ink seeks.

---

[1] Inkjet print cartridges have similarly been sold for in every state at least 25 years.

Moreover, Mr. Coleman's article does not address the ink exemption discussed above. Nor does it consider or discuss the lengthy and uniform custom and practice by the Federal government and every state government relating to ink products. It does not address the matter of whether billions of pens, markers and highlighters must, as a direct consequence of his position, must also be labeled. In this regard, there is not a single reason Mr. Coleman cites in support of his opinion that does not apply with equal force to the billions of pen, marker and highlighter packages that also do not display liquid volumes.

Although during our brief conversation you mentioned that the high cost of inkjet cartridges distinguishes them from pens, there is absolutely no provision in any packaging laws or regulations that exempts inexpensive items or provides a higher level of regulation for more highly priced items. If anything, pens, markers and highlighters are dramatically closer to being mere bottles of ink (like milk cartons) than the sophisticated micro-machines that comprise inkjet cartridges. There simply is no conscionable way for the Bureau to require the marking of high-tech ink delivery devices while permitting low-tech ink delivery devices such as pens and markers (which are purchased by more consumers and far more often) continue to be unmarked.

Conclusion

Lexmark very much hopes that based on the foregoing, the Bureau will deny Dr. Ink's request. However, if the Bureau is inclined to change its policy of nearly four decades upon which at least two huge industries have relied in good faith, Lexmark hereby requests that it do so only after giving Lexmark and all other members of the both affected industries notice and a formal opportunity to be heard regarding the complex set of regulatory and compliance issues presented by the change desired by Dr. Ink.

Very truly yours,

Charles S. Kratzer
Associate General Counsel

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TOC: Code of Federal Regulations > TITLE 16-- COMMERCIAL PRACTICES > CHAPTER I-- FEDERAL TRADE COMMISSION > SUBCHAPTER E-- RULES, REGULATIONS, STATEMENT OF GENERAL POLICY OR INTERPRETATION AND EXEMPTIONS UNDER THE FAIR PACKAGING AND LABELING ACT > PART 503-- STATEMENTS OF GENERAL POLICY OR INTERPRETATION > **§ 503.2 Status of specific items under the Fair Packaging and Labeling Act.**
Citation: **16 cfr 503.2**

16 CFR 503.2

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*** THIS SECTION IS CURRENT THROUGH THE FEBRUARY 26, 2009 ISSUE OF ***
*** THE FEDERAL REGISTER ***

TITLE 16 -- COMMERCIAL PRACTICES
CHAPTER I -- FEDERAL TRADE COMMISSION
SUBCHAPTER E -- RULES, REGULATIONS, STATEMENT OF GENERAL POLICY OR INTERPRETATION AND EXEMPTIONS UNDER THE FAIR PACKAGING AND LABELING ACT
PART 503 -- STATEMENTS OF GENERAL POLICY OR INTERPRETATION

Go to the CFR Archive Directory

16 CFR 503.2

§ 503.2 Status of specific items under the Fair Packaging and Labeling Act.

Recent questions submitted to the Commission concerning whether certain articles, products or commodities are included under the definition of the term "consumer commodity", as contained in section 10(a) of the Fair Packaging and Labeling Act, have been considered in the light of the Commission's interpretation of that term as set forth in § 503.5 of this part as follows:

(a) The Commission is of the opinion that the following commodities or classes of commodities are not "consumer commodities" within the meaning of the Act.

Antifreeze.

Artificial flowers and parts.

Automotive accessories.

Automotive chemical products.

Automotive replacement parts.

Bicycle tires and tubes.

Books.

Brushes (bristle, nylon, etc.).

Brooms and mops.

Cameras.

Chinaware.

Christmas light sets.

Cigarette lighters.

Clothespins (wooden, plastic).

Compacts and mirrors.

Diaries and calendars.

Flower seeds.

Footwear.

Garden tools.

Gift ties and tapes.

Glasses and glassware.

Gloves (work type).

Greeting cards.

Hand tools.

Handicraft and sewing thread.

Hardware.

Household cooking utensils.

Inks.

Jewelry.

Luggage.

Magnetic recording tape.

Metal pails.

Motor oil (automobile).

Mouse and rat traps.

Musical instruments.

Paintings and wall plaques.

Photo albums.

Pictures.

Plastic table cloths, plastic placement and plastic shelf paper.

Rubber gloves (household).

Safety flares.

Safety pins.

School supplies.

Sewing accessories.

Silverware, stainless steelware and pewterware.

Small arms ammunition.

Smoking pipes.

Souvenirs.

Sporting goods.

Toys.

Typewriter ribbons.

Woodenware.

(b) The Commission is of the opinion that the following commodities or classes of commodities are "consumer commodities" within the meaning of the Act:

Adhesives and sealants.

Aluminum foil cooking utensils.

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Appendix K

NIST Weights and Measures Division

Position Paper on Inkjet and Printer Cartridge Considerations

(February 2005)

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(Position Provided by NIST WMD February 2005)

Due to the discussion of inkjet cartridges, over the NIST W&M list server, WMD has investigated this situation. WMD concludes that inkjet cartridges need a net quantity statement in liquid measure to comply with Handbook 130 requirements. Our analysis is below and further discussion is welcomed.

Inkjet and Printer Cartridge Considerations

The model weights and measures law contains several relevant sections that apply to ink cartridges.

Weights and Measures Law, Section 19. "Information Required on Packages:"
Except as otherwise provided in this Act or by regulations promulgated pursuant thereto, any package, whether a random package or a standard package, kept for the purpose of sale, or offered or exposed for sale, shall bear on the outside of the package a definite, plain, and conspicuous declaration of:

- the identity of the commodity in the package;
- the quantity of contents in terms of weight, measure, or count;
- the name and place of business of the manufacturer, packer, or distributor, in the case of any package kept, offered, or exposed for sale, or sold in any other place other than on the premises where packed.

Weights and Measures Law, Section 17. "Method of Sale:"
The method of sale shall provide accurate and adequate quantity information that permits the buyer to make price and quantity comparisons, except as provided by established trade custom and practice. While trade custom and practice is a consideration in some instances… the burden to provide "accurate quantity information" by means of a designated "method of sale" is the responsibility of the manufacturer.

Count alone does not fulfill this requirement.

A declaration of quantity in terms of count shall be combined with appropriate declarations of the weight, measure, and size of the individual units unless a declaration of count is fully informative.

Packaging and Labeling Regulation, Section 6.4. – "Terms:" If there exists a firmly established general consumer usage and trade custom with respect to the terms used in expressing a declaration of quantity of a particular commodity, such declaration of quantity may be expressed in its traditional terms, provided such traditional declaration gives accurate and adequate information as to the quantity of the commodity. Any net content statement that does not permit price and quantity comparisons is forbidden.

Weights and Measures Law, Section 15. – "Misrepresentation of Quantity:" No person shall represent the quantity in any manner calculated or tending to mislead or in any way deceive another person. If "accurate quantity information" is not provided, consumers are certainly being mislead or deceived and cannot possibly make price and quantity comparisons.

The Federal Trade Commission (FTC) has informed us that the following commodities (partial list only - similar products) are excluded from FTC jurisdiction.

Ink
Fountain Pens
Kindred Products (ball point pens, lead pencils, lead refills, etc.)
School Supplies
Stationery and Writing Supplies
Typewriter Ribbon
Printer Cartridges*

*While printer cartridges are not listed specifically in Handbook 130, FTC has indicated to NIST that commodities of this nature do not fall under their jurisdiction.

Metric "Only" Labeling:
Since the labeling of printer ink cartridges fall under state labeling regulations, dual unit labeling is not required. Hence, these packages may be labeled in only metric units.

Packaging and Labeling Regulation, Section 11.33. "Inch-Pound Units, Exceptions – Consumer Commodities:"
The requirements for statements of quantity in inch-pound units shall not apply to packages that bear appropriate International System of Units (SI). This exception does not apply to foods, drugs, or cosmetics or to packages subject to regulation by the FTC, meat and poultry products subject to the Federal Meat or Poultry Products Inspection Acts, and tobacco or tobacco products.

NIST Handbook 133, "Checking the Net Content of Packaged Goods," Fourth Edition, January 2005 – Product Testing:
NIST Handbook 133 has been prepared as a procedural guide for compliance testing of net content statements on packaged goods. The gravimetric test method (outlined in Chapter 2) uses weight measurement to determine the net quantity of contents of packaged goods. The handbook provides general test methods to determine the net quantity of contents of packages labeled in terms of weight and special test methods for packages labeled in terms of fluid measure or count. Gravimetric testing is the preferred method of test for products, such as inkjet and other types of printer cartridges. Therefore, the test method to verify the net contents of ink in printer cartridges exists. However, NIST recognizes the difficulties associated with determining the net content of these cartridges, such as, density determination, product cost, tare verification (cartridge), the cleaning of tare and standards, and finally, inspection lot size. Unless the products are checked at the plant or warehouse, it may be difficult to find a sufficient "retail" lot, adequate in size to obtain an appropriate sample.

Appendix L

Amerigrow Mulch Proposal and Documentation

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National Conference on Weights and Measures / National Type Evaluation Program

Form 15: Proposal to Amend Handbooks

Date: September 11, 2009	**Regional Association (s) you wish to consider this proposal:** ☐Central ☐Northeast ☒Southern ☐Western
Submitter Name: C. Tomlinson/Amerigrow Recycling **Address:** 10320 W. Atlantic Ave, Delray Beach, FL 33446 **Phone:** 561-499-8148 **Fax:** 561-499-5896 **Email:** chuck@amerigrow.com	**Regional Actions:** (for use by regional standing committee-votes for and against)

Please attach any background Information, test data, research or additional Documentation that will help the Committee consider the proposal.

Purpose: (Provide a concise statement as to the intent or purpose of this proposal.)
To request that the NIST update their Handbook 133 regarding the methods of measurement of the volume of bagged mulch to take into consideration, the major changes in the mulch industry which have occurred since the last update in 1999.

Proposal: (Provide solutions to problems in specific language in amendment form to handbooks; if a proposal involves a new area of weights and measures activity, provide recommendations for both, regulations and test methods for proper enforcement.) Identify the specific handbook, section and paragraph that would be changed (e.g., Amend Handbook 44, Sec 1.10. General Code, paragraph G-A.1. Commercial and Law-Enforcement Equipment as follows:).
See attached # 1 - Proposals

Justification: (Provide justification for national consideration of this proposal.)
See attached # 2 - Justification

Other Contacts: (Provide position statements, comments, etc. with names and addresses of individuals, firms, manufacturers, and/or trade associations included in developing the proposal.)
None

Other Reasons For: (If none, please indicate none have emerged.)
None

Other Reasons Against:
None

Provide evidence of consistency with other NCWM publications, such as other specific device code section and applicable federal laws and regulations (e.g., USDA):
Unknown

Additional Considerations: (Provide cost estimates and the anticipated benefits for all stakeholders or indicate how the proposal may affect other requirements, programs, etc.)
Unknown

List of Attachments: (documents, data, studies, etc.) -Penn State Cooperative Extension, Home Gardeners Headline Newsletter, Summer 2004. Page 3 of 17. -University of Florida Publication ENH103, Mulches for the Landscape. Page 5 of 5 -Amerigrow Recycling February 13, 2008 - March 28, 2008 test of red and Gold colored mulch.	**Suggested Action:** (Be specific as to the action you request of the committee on this proposal.) Recommend NCWM ☒ Adoption ☐ Withdraw ☐ Developing Item ☐ Informational Item ☐ Other (Please describe)
Send submissions for Regional Associations to: National Conference on Weights & Measures 1135 M Street Suite 110 Lincoln, NE 68508 Attention: Executive Director, info@ncwm.net	**Regional Standing Committees and Sectors submit form to:** National Institute of Standards & Technology Weights & Measures Division 100 Bureau Drive, Stop 2600 Gaithersburg, Maryland 20899-2600 Attention: Committee cc: Attention: Executive Secretary, owm@nist.gov

Revised: September, 2009

ATTACHMENT # 1 - PROPOSALS

Problem #1: Over time bagged mulch suffers from decomposition and desiccation. Unlike most other products, it turns into "dirt" as it ages.

In an article published by the Penn State Cooperative Extension, in Home Gardeners Newsletter, Summer 2004, it is stated that "like other organic matter, wood and bark decompose over time. The primary organisms involved with their decomposition are bacteria and fungi, which derive their energy for growth from carbon-based compounds found in wood and bark. Some fungi, such as artillery fungus are "recyclers" and break down woody tissue directly".

In an article published by the University of Florida Extension Service, Mulches for the Landscape, Publication #ENH103, it is stated "do not store organic mulches, because they will rapidly decompose in the bag".

In addition, wood, which is ground into mulch, contains moisture (one of the desired qualities of mulch is its ability to hold water) and colored mulch contains even more, since approximately 8.26 gallons of water per yard or .60 gallons per bag is added to the mulch during the coloring process. Also, if processing is done in the rain, the moisture content will be even higher. Obviously, over a period of time, especially in the hot Florida sun, there is a major moisture loss and volume from evaporation.

On February 13, 2008 Amerigrow bagged 2 pallets of red mulch and 2 pallets of gold mulch. These 4 pallets were produced in bagging runs during which we more frequently sampled bags off the line to ensure an accurate 2 cu. ft. fill rate. These pallets of mulch were allowed to sit outside until March 28, 2008, at which time 4 bags from the top of each of these 4 pallets were re-measured. The gold bags measured 13.75% less volume and the red bags measured 12.50% less volume. This loss in volume can be attributed to a combination of the decomposition of the mulch and a loss in the volume of water content of the mulch.

There is also the temporary affect of compaction when mulch is stored under weight (which typically may be other bags of mulch). An unscreened bag of colored mulch (which these bags were) typically weighs approximately 37 lbs and a pallet consists of 75 bags weighing a total of approximately 2800 lbs. The bags on the bottom of the pallet with approximately 1 ton of weight above will be compressed, resulting in a temporary loss in volume. Additionally, if the bags tested had been pulled from the bottom of the pallets, the decrease in the volume of the mulch would have been even greater from the compaction.

Solutions to Problem #1: NIST Handbook 133, 4th Edition needs to add in Chapter 3.11 Mulch and Soils Labeled by Volume, a paragraph to cover the decomposition of wood mulch over a period of time. The purchase date of the product needs to be proven so that a reasonable estimate can be made as to whether an upward adjustment needs to be made to properly reflect decomposition since the purchase date.

Under 1.1 Scope, retail "shortages may also be caused by moisture loss (desiccation) if the product is packaged in permeable media", such as is the case with ventilated mulch bags, however, this apparently is not applied to the testing of mulch volumes. Moisture allowances over time need to be determined as they have been for flour and then used in the adjustment of MAV as in section 2.3, How is The Maximum Allowable Variation MAV corrected for the Moisture Allowance?

NIST Handbook #133 4th Edition needs to add in Chapter 2 section 2.3 Moisture Allowances a category including mulch and soil in addition to the current category for flour and dry pet food. It should be required that the purchase date of the product is proven so that a reasonable estimate can be made as to whether an upward adjustment needs to be made to properly reflect desiccation since the purchase date. The Handbook now covers on page 3, "deviations from the net quantity of contents caused by the loss or gain of moisture from the package are permitted when they are caused by ordinary or customary exposure, that normally occur in good distribution practices and that unavoidably result in change of weight or measure", however, this apparently is not applied to the testing of mulch volumes.

In addition, under 3.11 Mulch and Soils Labeled by Volume, evaluation of results, the 5% MAV allowed on one bag in twelve, may compensate for deviations in filling, but doesn't compensate for all twelve bags in a test of mulch being short because of decomposition and desiccation. Theoretically the shortage of all the bags produced and sold at the same point in time should be consistently short and an adjustment needed for decomposition and desiccation.

Problem # 2: It is easy to tamper with mulch bags (open and reseal the bags), which depending upon possible hidden agendas, as there was in our case, can create a major problem. Not only can the fill rate be altered, but also contaminants can be put into the bag. We had a situation several years ago, in which a competitor of ours visited a customer with several of our mulch bags, proceeded to open one in front of our customer, poured it on the ground and a soda can came out. Obviously, it is hard to conceive that he was lucky enough to pick a bag that had a soda can in it, and because of the size of the soda can, it would have been next to impossible for it to pass through our equipment.

Solution to Problem # 2: Testing of mulch bag volumes should require the establishment of a chain of custody, beginning with the purchase date, in order to determine the age of the mulch and the conditions of storage (which is also necessary for the solution to Problem 1). It is too easy to tamper with mulch bags to not determine the chain of custody from the manufacturer to the point of sale. This may not be a problem when the mulch is delivered to the point of sale (e.g. big box store) by the manufacturer, but when there is another party involved, who doesn't account for the purchase details (such as someone with a hidden agenda), this is a problem.

Problem # 3: Bags of mulch with different sizes of grind can produce different fill rates when measured in the measuring box specified in table 3-4 in the NIST Handbook 133. For a 2 cubic foot bag, the specifications call for a box with interior wall dimensions of 16" in length, 9" in width and 48" in height.

We ran a volume test of a competitor's mulch following the required procedures and found that, even though their bags weight 9-10 pounds less than ours, theirs still almost filled the 2 cubic foot measuring box. Upon examination, the reason became obvious – their grind was much larger with some very long pieces, which created substantial air pockets when the standard procedures were used (fluffing the mulch into the measuring container). The bags technically, but not really, meet the legal requirements. This results in the Division of Weights and Measures being satisfied with the fill rate and the public buying pockets of air.

The mulch produced by Amerigrow is a much finer grind and does not benefit from rolling the bags and fluffing the mulch. Under the current regulations, there is no maximum acceptable size of the wood mulch pieces, and to take it to the extreme, what if the bag of mulch contained 10% pieces over 9" (the width of the required measuring box), and 50% +/- of these pieces end up angled form front to back, creating many large air pockets; would that be fair to the public?

Solution to Problem # 3: Make the specifications for the measuring box for a 2 cubic foot bag of mulch, 12" x 12" x 24", which would reduce the effect of any larger pieces causing the large pockets of air.

In fact, it is questionable why the NIST made the width specification for measuring a 1 c.f. bag different than that for measuring 2 c.f. and 3 c.f. bags. The NIST made the measuring box for 2 c.f. and 3 c.f. bags so that one box can be used for measuring both size bags, but why did it make the width for the 1 c.f. measuring box different, while at the same time creating a situation where the public is buying air in the 2 c.f. and 3 c.f. bags? Obviously, the measuring box for all 3 size bags should be the same length and width, and only different in height. This box should be 12" x 12" x 36".

ATTACHMENT # 2 - JUSTIFICATION

In Amerigrow's opinion, the procedures used for the measurement of volume of bagged mulch in accordance with the NIST Handbook 133 implemented 10 years ago, are outdated, inconsistent, and questionable and resulted in Amerigrow's bags failing a Florida Department of Agriculture, Division of Weights & Measures, measurement test.

In November 2007 a lawsuit was filed against Amerigrow Recycling and 5 other defendants for "deceptive and unfair trade practices" in the production and sale of bagged mulch. Subsequently, the plaintiff and their attorneys filed with the Court to convert this to a class action lawsuit against the defendants. This lawsuit, which was dismissed by the Court in July 2009, cost our company well in excess of $75,000 to defend, and in all likelihood, the cost to all defendants was in excess of $500,000 which does not include the cost of company personnel providing information and support to the attorneys.

Tests in December 2007 by the Florida Department of Agriculture, of bags of mulch produced by the 6 defendants and located at the plaintiff's place of business, found many of the bags short packed, and these tests became the cornerstone for furthering the lawsuit and opening the door for certifying the class action.

Amerigrow cannot speak for the other defendants in this lawsuit, but obviously can in regard to our own bags failing the measurement tests. If the procedures for the measurement of bag mulch are not updated ASAP, failed tests will increase and the cost associated with these failed tests, including legal fees such as those having to be absorbed by Amerigrow and its co-defendants in this lawsuit, will occur more often and nationwide and reputations will be unjustifiably ruined.

Home Gardeners Headline Newsletter
Summer 2004

In this newsletter:
(Click on a topic to go directly to it.)

Dear Home Gardener,

This has been an interesting spring in Berks County. We've had infestations of cicadas and of cankerworms in certain areas, but these pests-despite all the media hype-have been invisible over much of the county.

We've had multiple storms-but again, the effects have been spotty. Until recently, some areas were quite dry, while others were soggy. Steady rainfall in early June has now replenished our aquifers and we're going into the heat of summer in good shape nearly everywhere in the county.

With the spring lawn and garden work behind us, it's time to savor the results. Vegetables are coming on strong, flowers are lush, and lawns are green. Now is the time to enjoy gardening events that celebrate our abundance: strawberry festivals, garden tours, the Master Gardener Demo Garden Open House, and of course our county fair.

Happy Gardening!

Beth Finlay, Master Gardener Coordinator
Nancy Bosold, Extension Educator

Correction

In the spring issue, we printed an article on "Lawn Management Through the Seasons." It stated under the mowing section that you should cut your lawn to 1½ to 2 inches. This should have read 2-3" for most home lawns. At 2-3", you'll have better weed management and turf survival through the seasons.

Nancy Bosold, Extension Educator Turfgrass Management

Nuss says orchids, tulip bulbs, chrysanthemums, and dahlias can be allergenic to some individuals.

Skin irritant plants. The chemicals that plants have in leaves, bark, roots, bulbs, or flowers can cause direct skin irritations. "In many cases, the sap within the plant is the cause of the problem," Nuss explains. "Often the irritating substance is released only when the plant tissue has been damaged or mishandled."

Nuss says some common houseplants can cause skin irritation, including poinsettias, penciltrees, daffodils, hyacinths, and ornamental buttercups.

Stinging plants. Most nettles can cause a toxic reaction when touched, but the reaction does not have lasting effects and requires no medical treatment.

Thorny plants. The most common plant-related injuries are caused by thorns. "Most people don't seek medical help after getting stuck by a thorn," Nuss says. "But implanted thorns, needles or spines can cause infections or other medical problems."

Nuss says thorns embedded near joints can cause chronic arthritis. Thorns embedded near bones can mimic a bone tumor. Thorny plants that can cause painful injuries include roses, black locust and honeylocust trees, and blackberry bushes.

"Clothing, tools, and even smoke from burning plants can carry toxins," Nuss says. "Be sure to wash all clothing and tools after working with problem plants. The residues can be hazardous for a long time."
Source: Penn State University PenPages

Return to the top.

What Is Growing In My Landscape Mulch?

Landscape mulches are used to protect soil, conserve moisture, moderate soil temperature, and limit weed growth, as well as beautify and unify landscape plantings. Most mulches are mixtures of shredded wood and bark residues from lumber and paper mills, arboricultural and land-clearing operations, and wooden pallet disposal or recycling facilities.

Like other organic matter, wood and bark decompose over time. The primary organisms involved with their decomposition are bacteria and fungi, which derive their energy for growth from the carbon-based compounds found in wood and bark. These compounds include cellulose, lignin, and simple sugars. Bacteria are microscopic organisms that are not visible in the mulch. Fungi also may be microscopic, but many develop visible reproductive structures.

The fungi involved in the decomposition of landscape mulches are natural components of the mulch environment. Some fungi, such as the artillery fungus, are "recyclers" and break down woody tissue directly. Other fungi, such as slime molds, consume bacteria and other organisms living in the mulch. These fungi are not harmful to landscape plants, and no known health hazards are associated with them unless they are eaten. They can be found from April through October, usually following rainy weather.

ENH103

UF UNIVERSITY of FLORIDA
IFAS Extension

Mulches for the Landscape[1]

Robert J. Black, Edward F. Gilman, Gary W. Knox and Kathleen C. Ruppert[2]

A mulch is any material applied to the soil surface for protection or improvement of the area covered. Mulches are frequently applied around plants to modify the soil environment and enhance plant growth. The mulch material may be organic such as bark, wood chips, leaves, pine needles, grass clippings or similar material; or inorganic such as gravel, pebbles, polyethylene film or woven ground cloth.

BENEFITS OF MULCHING

Mulching has the following beneficial effects upon the soil and plants.

- Mulches can prevent loss of water from the soil by evaporation. Moisture moves by capillary action to the surface and evaporates if the soil is not covered by a mulch.

- Mulches suppress weeds when the mulch material itself is weed-free and applied deeply enough to prevent weed germination or to smother existing small weeds.

- A more uniform soil temperature can be maintained by mulching. The mulch acts as an insulator that keeps the soil cool under intense sunlight and warm during cold weather.

- Mulching will prevent crusting of the soil surface, thus improving absorption and percolation of water into the soil and, at the same time, reducing erosion.

- Organic materials used as a mulch can improve soil structure and tilth. As mulch decays, the material becomes topsoil. Decaying mulch may also add nutrients to the soil.

- Mulches also add to the beauty of the landscape by providing a cover of uniform color and interesting texture to the surface.

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1. This document is ENH103, one of a series of the Environmental Horticulture Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date March 1992. Revised March 1994. Reviewed October 2003. Visit the EDIS Web Site at http://edis.ifas.ufl.edu.
2. Associate Professor & Associate Professor, Environmental Horticulture Department; Associate Professor in Environmental Horticulture, North Florida Research and Education Center; and Assistant Professor, Environmental Horticulture Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville FL 32611.

Bagged mulch is also available in amounts such as 1.25 cubic feet or 2.0 cubic feet. If you purchase the mulch needed for the shrubbery example given above in amounts of 1.25 cubic feet, you will need 20 bags (25 cubic feet r 1.25 cubic feet = 20 bags). If you purchase bags of 2.0 cubic feet, you will need 12.5 bags (25 cubic feet r 2 cubic feet = 12.5 bags). Therefore, you will purchase 13 bags.

However, as discussed above, always remember to pull mulch 1 to 2 inches away from the stems and trunks of plants to lessen the chances of stem or trunk rot. So, whether the shrubs are single or multi-stemmed, you will not need all of the mulch determined above; the calculations did not include either the area used by the stems and/or low branches, or the extra 1 to 2 inches around the stem(s). Therefore, you can purchase less mulch than the calculations indicate. If you are using an organic mulch and buy more bags than you need, return the extras for a refund, if possible (check store policy). Do not store organic mulches, because they will rapidly decompose in the bag. Inorganic mulches, however, may be stored.

REFERENCES

Khatamian, H. 1985. "Mulching-how, when, why and with what". *Grounds Maintenance* June: p. 102-104.

Stinson, J. M., G. H. Brinen, D. B. McConnell and R. J. Black. 1990. "Evaluation of landscape mulches". *Proc. Fla. Hort. Soc.* 103:372-377.

Amerigrow

STUDY OF DECOMPOSITION OF BAGGED RED & GOLD COLORED MULCH

On February 13, 2008 Amerigrow bagged two (2) pallets of red mulch and two (2) pallets of gold mulch. These 4 pallets were bagged in runs during which we more frequently sampled bags taken off the line to ensure a fill rate of 2 cubic feet per bag.

On March 28, 2008 we tested four (4) bags form the top of each of the four (4) pallets and measured their contents. The content for the gold bags measured an average of 1.725 cubic feet per bag and the red bags averaged 1.75 cubic feet per bag.

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Appendix M

National Pasta Association (NPA)

Proposal to Establish a Moisture Allowance for Pasta Products

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September 16, 2009

Don Onwiler
Executive Director
c/o Laws & Regulations Committee
National Conference on Weights and Measures
1135 M Street, Suite 110
Lincoln, NE 68508

Joe Benavides
Chairman, Laws & Regulations Committee
Southern Weights and Measures Association
Texas Department of Agriculture
1700 North Congress Avenue, 11th Floor
Austin, TX 78701

Re: Proposal to Establish a Moisture Allowance for Pasta Products

Dear Messrs. Onwiler and Benavides:

The National Pasta Association ("NPA") submits this proposal to request that the National Conference on Weights and Measures ("NCWM") amend Handbook 133 by adopting a 3 percent moisture allowance for macaroni, noodle, and like products ("pasta products"). NPA is the national trade association representing companies that manufacture, market, and distribute pasta throughout the United States. NPA's allied members include wheat producers and millers, companies that manufacture pasta making equipment, and others who support the production of high quality pasta.

The allowance for pasta products has been previously proposed and accepted as reasonable and valid. 1/ Amendment of Handbook 133 will simplify the ability of inspectors to evaluate moisture loss for this discrete class of products. The change will assist jurisdictions in promoting fair trade and equity in the marketplace in a manner that is consistent with applicable law and regulations.

1/ Although referred to herein as an "allowance," NPA's request is for the establishment of a "gray area." Handbook 133 explains this concept as follows: "When the average net weight of a sample is found to be less than the labeled weight, but not more than the boundary of the 'gray area,' the lot is said to be in the 'gray' or 'no decision area.' The gray area is not a tolerance. More information must be collected before lot compliance or noncompliance can be decided. Appropriate enforcement should be taken on packages found short weight and outside of the 'moisture allowance' or 'gray area.'"

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Discussion

A. Background and Legal Basis for Modification of Handbook 133

The Federal Food, Drug, and Cosmetic Act ("FDCA") requires that food packages bear an "accurate" statement of net weight. 2/ States generally have established and enforce an identical requirement. As contemplated by the FDCA, federal regulations also mandate that "reasonable variations caused by loss or gain of moisture during the course of good distribution practice or by unavoidable deviations in good manufacturing practice will be recognized." 3/ States impose parallel requirements. The required allowance for moisture loss was recognized by the U.S. Supreme Court in the case of *Jones v. Rath Packing Company*. 4/ Accordingly, inspectors must adjust for moisture loss when determining compliance with the federal and state net weight requirement.

Handbook 133 serves as an important tool that informs jurisdictions' good inspection practices. Currently, Handbook 133 includes specific moisture allowances for meat and poultry, flour, and dry pet food. 5/ No moisture allowances are expressly established for pasta products. For commodities other than those specifically listed, Handbook 133 provides limited guidance on the determination and application of moisture allowances. In recent years, NCWM's Laws and Regulations Committee has considered a series of proposals to address aspects of this issue, leading to formation of a "Working Group." 6/ The lack of guidance specific to pasta products causes challenges for state weights and measures officials across the country when conducting package inspections. Some inspectors mistakenly conclude that the absence of a specific moisture allowance for pasta products in Handbook 133 means that no consideration of moisture loss is necessary or required. That is, of course, not the case.

Over the past two decades, there has been interest in, and a sound factual basis for, establishing an allowance for moisture loss in pasta. A proposed rule issued by the Food and Drug Administration ("FDA") provided the first impetus for NPA's efforts. In 1980, FDA proposed to quantitatively define permissible "reasonable variations" from stated net weights for several food categories, including foods subject to moisture loss. 7/ FDA's proposal only specified a moisture allowance for a limited number of foods. The agency acknowledged the narrow scope of its proposed rule and explained that only a few express allowances were being proposed because FDA had a limited amount of moisture loss data available that were developed under

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2/ 21 U.S.C. § 343(e) (Foods in package form must bear "an accurate statement of the quantity of the contents in terms of weight . . . except that . . . reasonable variations shall be permitted").

3/ 21 C.F.R. § 101.105(q).

4/ *Jones v. Rath Packing Co.*, 430 U.S. 519 (1977).

5/ NIST Handbook 133: Checking the Net Contents of Packaged Goods, at 17.

6/ The Working Group has examined primarily mechanical issues (*e.g.*, when and how to account for moisture loss in the course of an inspection). This proposal advances the current efforts of the Working Group and the Conference's goal in maximizing the utility of Handbook 133 in promoting uniform, well-conceived, good inspection practices.

7/ 45 Fed. Reg. 53023 (Aug. 8, 1980). This proposed rule was later withdrawn. 56 Fed. Reg. 67440 (Dec. 30, 1991).

well-defined conditions. 8/ FDA encouraged interested persons having pertinent data on moisture loss to provide the information to the agency so that additional moisture loss categories could be proposed.

Following FDA's request for data, NPA commissioned a comprehensive study regarding moisture loss in pasta products. The protocol for this study was reviewed and accepted by FDA. NPA submitted the findings of this study to NCWM in 1988. 9/ The conclusions of the study were published and are summarized herein. 10/ The packaging used for pasta products has not changed since this study was conducted, nor have the packing methods or the basic formulations relative to moisture content. The findings of the 1989 study are consistent with more recent, discrete data which validate that the hygroscopic nature of pasta products results in unavoidable moisture loss.

Based on the strength of the pasta industry data submissions, FDA included in a 1997 proposal an express allowance of 3 percent for pasta. 11/ FDA specifically proposed a 3 percent allowance for a number of commodities, including pasta, if more than 7 days had passed following the day of pack. 12/ The proposed rule was ultimately withdrawn after many years of inaction, but not for reasons relating to the merit of the proposed moisture loss allowance for pasta products. 13/

During the 1990s, NIST continued to work toward establishing additional moisture allowances for pasta and certain other products (*e.g.*, rice). 14/ As an interim measure, NIST issued guidance to State Directors to facilitate appropriate recognition of "reasonable" moisture loss. Between 1995 and 2006, NIST issued instructions to weights and measures officials advising them to recognize a 3 percent moisture loss for pasta, rice, and other products not specifically included in Handbook 133. 15/

8/ 45 Fed. Reg. at 53029.

9/ Letter from G. Kushner to R. Thompson, February 2, 1988.

10/ Dick, Joel; Shelke, Kantha; "Net Weight Variation in Packaged Pasta," *Cereal Foods World*, Vol. 34, No. 2, pg. 201 (February 1989).

11/ 62 Fed. Reg. 9826 (Mar. 4, 1997). FDA's proposed establishment of an allowance in this rule did not adopt the "gray area" concept. Although the agency found "considerable merit" in this approach, it determined that it was not viable because there were too few limits established for foods subject to moisture loss at that time. 62 Fed. Reg. at 9850-51.

12/ 62 Fed. Reg. at 9851-52, 9869.

13/ 69 Fed. Reg. 68831, 68837 (Nov. 26, 2004).

14/ 62 Fed. Reg. at 9851 ("[L]imits are being developed for rice and pasta."); Weights and Measures Division Memorandum from Carroll S. Brickenkamp, July 12, 1994 ("Work is underway in the NCWM to develop gray areas for rice and pasta and a wide variety of meat and poultry products."); Weights and Measures Division Memorandum from Gilbert M. Ugiansky, Ph.D., April 3, 1995 (same).

NPA also was actively engaged in moisture loss allowance efforts during the early 1990s. Meetings were held between NPA's Moisture Loss Task Force and NCWM regarding establishment of a gray area for pasta products.

15/ Weights and Measures Division Memorandum from Gilbert M. Ugiansky, Ph.D., April 3, 1995 (concerning the impact of the Nutrition Labeling and Education Act of 1990 ("NLEA") on net content testing by State and local weights and measures officials); Weights and Measures Division Memorandum from Ken Butcher, January 1, 2006 (withdrawn for reasons unrelated to moisture loss guidance).

There is a broad consensus within the Conference, at NIST, and among State Directors and local programs, that it is necessary and appropriate to consider a 3 percent moisture allowance when conducting a Handbook 133 inspection. As a matter of law, such an allowance must be considered and accounted for or the inspection results are invalid and a finding that such pasta products are impermissibly underweight would be invalid (*i.e.*, pasta products should not be ordered off-sale absent consideration of moisture loss). The inevitable changes in institutional knowledge, the influx over time of inspectors, and the challenges of training state and local inspectors all point to the inherent value and need for an express 3 percent moisture allowance for pasta in Handbook 133. Failure to codify this allowance will inevitably lead inspectors to unwittingly "fail" an inspection lot, and order pasta products off retail shelves, for products that bear an accurate statement of net weight. 16/

NCWM has appropriately recognized that the issue of moisture loss is "complex" and, because Handbook 133 currently provides specific guidance on the determination and application of moisture allowances for a limited number of commodities, "[w]eights and measures jurisdictions across the country have been struggling with how to properly handle moisture loss during packaging inspections." 17/ The Work Group was created because "more definite guidance on this issue" is needed for commodities other than those specifically listed. 18/ The Work Group has also recommended that industry petition for specific moisture allowances. NPA heeds this call and has developed this proposal to begin the process of NCWM consideration and ultimate adoption of the addition to Handbook 133 for a 3 percent moisture loss allowance for pasta products.

This proposal surveys the substantial body of data that has been developed regarding moisture loss in pasta products. These data support a moisture allowance up to 5 percent, however NPA is only requesting an allowance of 3 percent. It will remain the responsibility of individual packers to minimize and account for moisture loss, consistent with good manufacturing practices, and to over-pack if anticipated moisture loss exceeds the 3 percent allowance.

B. Pasta Industry Practices

NPA member companies engage in a variety of practices regarding processing, distribution, and net quantity control. The following discussion is a typical example of such processes. Because every company is unique, however, companies may engage in different practices than those discussed herein depending on their specific circumstances. Notwithstanding these differences, the properties of pasta products, the method of packing, the nature of packaging, methods of distribution, and other industry practices that could have an impact on moisture loss are largely consistent.

16/ The practical impact of an erroneous inspection where moisture loss in pasta is not accounted for goes far beyond the retail inspection lot of 12 or more packages. Retailers often will remove the entire lot code from not just one store, but from its entire system.

17/ NCWM Laws and Regulation Committee, 2008 Interim Meeting Agenda, Work Group on Moisture Loss, available at http://www.ncwm.net/pdf/LR-08-Pub15-Final.pdf.

18/ *Id.*

Pasta is produced by an extrusion method of semolina dough made from durum wheat flour and water. The shapes are obtained from a series of dies and inserts and high speed cutters to maintain size and dimension. After various stages of mixing, moisture is removed by a drying process utilizing different levels of heat, humidity, ventilation, and cooling. The dryers are set according to specific profiles that control the rate at which moisture is removed. Final moisture results achieved range from 10.5% to 13%, depending on the pasta shape and production line. Product is typically evaluated for moisture, among other traits, during drying cooling, and after final packaging. As discussed further below, monitoring of all package net weights are performed on individual cartons after the package fill process sealing. Manufacturing takes approximately 3 to 12 hours at the processing stage. The length of time for the drying process depends on the shape but generally ranges from 3 hours to 12 hours. This time varies in conjunction with the processing line and type of product.

After the drying and cooling stage, product is stored short term for packaging. Storage times are typically brief, totaling less than 8 hours. For packaging, the product passes through a set of calibrated scales that feed the bagging or cartoning machine. Sealed, non-airtight product packages are then machine cased into paperboard cases. Typically, a fully automated system sends cartons to case packers and then to fully automated palletizers. Warehouse operators receive possession of the product from the palletizer, scan bar coding, and place the pallets in a racking system where it is held for distribution. Packaging takes between 1 and 3 hours.

Product is stored at ambient temperatures and distributed according to sales orders. Inventory of most products is usually no more than a month, but is also subject to sales orders. Inventory turnover is monitored so that no inventory becomes aged. The lag time between shipment and purchase of the product by a consumer varies greatly, usually taking at least 22 weeks.

Net weight quantity control is monitored using calibrated in-line weight system equipment. Scale systems on all packaging lines are computer monitored and calibrated. The monitoring of these checks, and all aspects of the process that can effect package weights are typically monitored and reviewed to ensure that best packing practices are followed in a given processing plant. Some production lines also make use of "check-weighers" to guard against unanticipated unreasonable variation in package weights. Individual packages that are "kicked-off" the check-weigher due to low weights are segregated and designated for "rework procedures" adopted by the particular packager. In other instances where automation is not as complete, Mettler Balances are used on each packaging line for regular sampling (*e.g.*, every 30 minutes) to verify weights.

Compliance with Handbook 133 is also obtained through planned quality systems and utilization of standard operating procedures. All weighing systems are programmed to meet declared packaged weights in compliance with NIST Handbook 133. Specifically, the average net weight of the run must equal or exceed the package label weight and there must be no single package that exceeds Handbook 133's maximum allowable variance at the time of packaging. Although the weight control program is designed to meet declared weights at point-of-pack, a moisture loss deviation will occur over time, which can be caused by ordinary exposure to conditions that normally occur in good distribution practices. The length of time in distribution, environmental conditions, and other storage conditions may also contribute to an unavoidable loss in moisture.

C. Published Data Support a 3 Percent Moisture Allowance for Pasta Products

Pasta is made in many geographic locations across the United States and is shipped throughout the country. Although pasta exhibits weight loss in all geographic locations, extremes in climate, altitude, and temperature have a significant impact over time. As well, additional losses result when packages are uncased and placed in an air conditioned or heated retail environment.

Both carton and flexible (plastic) packaging experience moisture loss for pasta, though greater loss occurs in cartons. Industry studies indicate that moisture loss for pasta products is reasonably predictable over time. The degree of loss is inevitably influenced by the environment in which it is stored. The studies summarized below are based both on "real world" data in the retail marketing chain and studies designed to simulate these conditions.

The 1989 study is the result of a thoughtful, comprehensive approach that remains relevant today. The packaging used for pasta products has not changed since this study was conducted, nor have the packing methods. Also, the findings of the 1989 study are consistent with more recent, discrete data.

1. NDSU 1989 Study

A published study (hereinafter "Dick and Shelke study") evaluating the moisture loss of products in a typical retail storage situation recommended the establishment of a net weight allowance of 5.0 percent for pasta packaged in paperboard cartons and 3.2 percent for pasta packaged in flexible bags. 19/ The authors reached this conclusion after reviewing (1) the results of an FDA survey of moisture loss in flour packaged in Kraft paper bags, (2) FDA guidelines for moisture-loss surveys, (3) guidelines offered to the NPA by FDA officials on March 30, 1981, (4) the results of a 1981 NPA Packaging Survey, and (5) the unpublished results of a private manufacturer's research and development study on pasta net weight.

Importantly, NPA conducted the 1981 packaging study in accordance with FDA guidelines for moisture-loss surveys. This study monitored the moisture loss of pasta products in three typical storage sites: a retail supermarket in metropolitan New Jersey, a warehouse in metropolitan New Jersey, and a warehouse in Minneapolis, Minnesota. The retail store was a large air conditioned facility, representative of typical supermarkets used to display the bulk of the pasta sold in the U.S. The moisture loss of the pasta stored in the retail stores and the warehouses ranged from 2.24 to 5.02 percent for the pasta in paperboard packaging and from 1.22 to 3.18 percent for pasta sold in flexible packaging.

Additionally, the Dick and Shelke study reported the results from a private research and development study that monitored moisture loss over a 16-week period under the following controlled conditions: desert (90º F, 10% R.H.), ambient (70º F, 50% R.H.) and tropical (80º F,

19/ Dick, Joel; Shelke, Kantha; "Net Weight Variation in Packaged Pasta," *Cereal Foods World*, Vol. 34, No. 2, pg. 201 (February 1989).

80% R.H.). The pasta had a moisture loss of greater than 6 percent under desert conditions, a moisture loss of greater than 1 percent under ambient conditions, and a moisture gain of greater than 1 percent under tropical conditions.

It is also reported that, because pasta is hygroscopic, it eventually reaches an equilibrium with the surrounding atmosphere. The final equilibrium depends upon the temperature, the relative humidity of the ambient air, and the initial moisture content of the pasta. Further, pasta in paperboard cartons loses weight relatively fast within the first two to three months after production. After that, its weight fluctuates up and down with the change in ambient conditions. Pasta packaged in flexible bags loses weight at a rate which is more gradual and less responsive to change in ambient storage conditions than paperboard cartons.

After reviewing the available data on the moisture loss in pasta, Dick and Shelke concluded that it would be appropriate to establish a net weight allowance of 5.0 percent for pasta packaged in paperboard and 3.2 percent for pasta packaged in flexible bags.

2. Industry Studies on Moisture Loss

The pasta industry has conducted several moisture loss studies in recent years. The results of these studies are consistent with Dick and Shelke and indicate that no technological developments have occurred to alter the validity of Dick and Shelke's findings today. The series of studies discussed below demonstrate a good correlation between moisture loss and weight loss. Given both variation in product age at the time of purchase and the impact of environmental and geographic conditions, loss of weight due to moisture at retail can vary more than 4 percent. Similar losses can be seen in both very dry environments and other areas, depending on product age and local conditions.

The studies, drawn largely from company-specific analyses considered proprietary and confidential, validate the published studies and further support the following conclusions:

- Weight loss in pasta is directly related to moisture loss.
- Moisture loss from the time of production to the customer at the retail outlet shows considerable variation.
- The manufacturer cannot make process adjustments based on average loss in dealing with moisture loss extremes.
- Moisture loss occurs for pasta products that are packed in both film and cartons.
- Pasta products moved from warehouse storage to an air conditioned environment begin to show immediate moisture loss.
- Average weight loss was found to be between 2-3%, but when product was moved into a simulated retail environment, it reached 4% and in extreme cases 5%.

i. Study One: Deviation of Actual Net Weight from Declared Label Weight

One industry study sought to determine, by manufacturer and on the average, how the actual net weight of each sample deviates from the declared label weight. Retail product samples were collected from five U.S. manufacturers in film and cartons from ten geographic areas throughout the United States. The products were long and short goods in cartons and film and cartons of lasagna. 20/ These samples were sealed in plastic to retain ambient humidity for each geographic area. After shipping to a testing facility, the products were immediately weighed.

In this study, the retail samples collected demonstrated that products packed in paperboard cartons generally weighed less with respect to labeled weight in hot, dry environments and at higher altitudes. Humidity change is part of the reason for variability in moisture loss in different geographical areas. However, not all of the extremes in moisture loss were found in hot, dry, or high altitude locations. This would suggest that the conditions under which pasta is stored and held for sale, among other factors, also influence moisture loss in pasta.

The average retail moisture across brands for products packaged in cartons was roughly 2% below typical production moistures (12+%) and extremes are 4% below. This study did not have access to the actual pack weight at the time of production.

ii. Study Two: Immediate Weight Loss After Production

Another experiment was designed to understand the immediate weight loss after production of pasta products and to simulate the impact of moving product from one warehouse to another in a significantly different geographic region. Three cases of production samples of 5 products in cartons and film were pulled from the production line and weighed at 0 and 3 days and every 7 days thereafter. Initial moisture was also taken. Moistures were also tested every month throughout the testing period. Following 30 days, two of the cases from each shape and package type were shipped to other product plants for continued testing every 7 days. At the end of 60 days, the samples are tested for moisture and weight monthly through 6 months from production. The plants used in the study are located in various regions of the U.S., including the desert and the coasts.

The results of this study show that products packed in film remain reasonably stable with little moisture loss while that in cartons drops by 1-1.5% within the first two weeks following production. This supports the data seen with the retail samples. As this trend continues, weight loss approaches 2.5% at 2 months, on the average, in a warehouse environment, and continues when product is uncased and subjected to a retail environment. Additional testing over the course of a year would, in all probability, show more impact from geography as seasonal low temperature and humidity extremes begin to take effect.

iii. Study Three: Impact of Retail Environment

An additional industry experiment sought to understand over the short-term how package weight changes when moved from a non-climate controlled environment to an air-conditioned retail outlet. In this study, one case of 5 products in cartons and film was pulled from a Midwest production facility and similar cases at least 80 days old were pulled from the production facility

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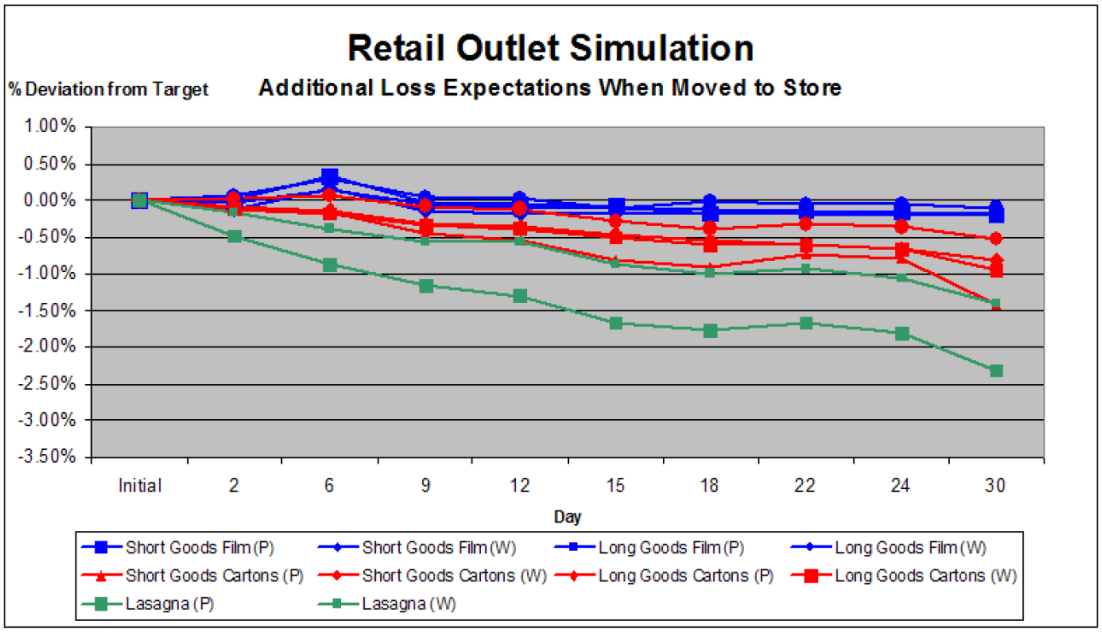
20/ Although lasagna is tested in this study, it is not included in most of the data regarding weight loss in finished packages.

warehouse. All of these cases were moved to an air conditioned environment and weighed initially and every three days for 2 weeks to simulate the retail environment.

The moisture loss in products packaged in cartons ranged between 0.5 and 1.5%. The study also determined that both freshly packed samples ("P" on chart below) and older warehouse samples ("W" on chart below) tend to lose 0.5-1.0% when removed from cases and placed individually in an air conditioned retail environment.



iv. Study Four: Moisture Loss Over Product Life Cycle

Another industry experiment was designed to measure moisture loss over the average life of one company's pasta products through their distribution cycle from packaging to consumer sale. This study was designed to test the "worst case" scenario, using paperboard cartons and conducting the study during the fall and winter, the seasons with the lowest relative humidity in warehouses and retail stores. The pasta was stored at ambient conditions in the distribution system for about 8 weeks and then for another 4 weeks to simulate distribution on its path to the consumer. The product was then held in an air conditioned environment (a plant lab) simulating the store shelf for an additional three weeks. Actual moisture loss over the 15 week study at each location was 2.5% (Midwest), 3.38% (Eastern Seaboard), and 5% (Eastern Canada).

D. Proposed Amendment to Handbook 133

NPA requests that Handbook 133 be amended as follows to incorporate a 3 percent moisture allowance for pasta products, adding the language in bold below:

- On page 17 (in Section 2.3), *Moisture Allowances*:
  - *What is the moisture allowance for flour*, ***pasta products,*** *and dry pet food?* The moisture allowance for flour**, pasta products,** and dry pet food is 3% of the labeled net weight.
  - **Note: Pasta products means all macaroni, noodle, and like products packaged in kraft paper bags, paperboard cartons, and/or flexible plastic bags with a moisture content of 13% or less at the time of pack.**

- On page 18 (in Section 2.3), *How is the average error for the moisture allowance corrected?*:
  - This handbook provides "moisture allowances" for some meat and poultry products, flour, **pasta products,** and dry pet food.

- On page 3 (in Section 1.2), *Why do we allow for moisture loss or gain?*
  - This handbook provides "moisture allowances" for some meat and poultry products, flour, **pasta products,** and dry pet food.
  - Test procedures for flour, **pasta products,** some meat, and poultry are based on the concept of a "moisture allowance" also known as a "gray area" or "no decision" area.

E. Requested Interim Action

NPA requests that, while this proposal is under consideration, NCWM issue a letter or formal memorandum to all state weights and measure officials advising them that a 3 percent moisture loss allowance is appropriate for pasta products. Such an action would ensure an end to state and local enforcement that yields flawed findings of a legal violation when moisture loss is not considered. NIST's Weights and Measures Division has stated that it "considers the need for allowances for affected commodities to be pressing and believes that States must make some allowance for these commodities until other data can be obtained for the respective commodities." 21/ Interim guidance would serve the weights and measures regulatory community, the pasta industry, and consumers alike.

* * *

NPA requests that the NCWM establish a moisture loss allowance of 3 percent for pasta products. The historical and most recent data affirm that a 3 percent moisture loss allowance is appropriate and scientifically valid and justified. We look forward to working with the

21/ NCWM Laws and Regulation Committee, 2008 Interim Meeting Agenda, Work Group on Moisture Loss, available at http://www.ncwm.net/pdf/LR-08-Pub15-Final.pdf.

Conference and NIST on this initiative and to reaching an agreeable conclusion for this longstanding topic of concern for the pasta industry.

Please do not hesitate to contact me if you have questions after you have had an opportunity to review the enclosed materials. Thank you for your attention to this proposal. We look forward to working with NCWM on this initiative.

Sincerely,

Gary Jay Kushner
General Counsel
National Pasta Association

Enclosure

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Net Weight Variation in Packaged Pasta[1]

Joel W. Dick
Kantha Shelke
North Dakota State University
Fargo, ND

The U.S. Food and Drug Administration (FDA) in 1980 proposed amendments in the net weight labeling regulations (1) that would quantitatively define permissible variations from stated net weights for several food categories, including foods subject to moisture loss. However, while recognizing that macaroni and noodle products lose moisture during storage, FDA did not propose a moisture-loss tolerance for pasta, because while "macaroni and noodle products have been reported to lose moisture during storage, a reasonable judgment regarding an acceptable level of moisture loss could not be made for one of the following reasons: Adequate data quantifying moisture loss were not provided to FDA, conditions for data acquisition were improper or ill-defined, or reported ranges of observed moisture loss were too broad to support recommendation for a proposed level of moisture loss" (1). FDA further stated that, "providing a sufficiently narrow range of moisture loss for a food under well-defined conditions enables a critical evaluation of the data to be made. This, in turn, enables a tolerance to be proposed that is intended to protect consumer interests while not creating undue hardships for manufacturers and packagers."

Based on the apparent lack of adequate data to defend a specific change in net weight due to changes in moisture content during distribution and storage, the National Pasta Association (NPA) initiated a study to provide data about variations between net weight stated on the package and the actual weight of the pasta.

Basis for Design of Net Weight Study

The design of the study was based on a) the results of an FDA survey of moisture loss in flour packaged in Kraft paper bags (2), b) FDA guidelines for moisture-loss surveys (3), c) guidelines offered to the NPA by FDA officials on March 30, 1981 (4), d) the results of a 1981 NPA Packaging Survey (5), and e) the unpublished results of a private manufacturer's R&D study on pasta net weight.

The results of the private R&D study showed the influence of storage conditions over a 16-week period on net weight variations of different pasta products (shapes and formulations) and package sizes. Controlled storage environments used for the study included desert (90° F, 10% R.H.), ambient (70° F, 50% R.H.), and tropical (80° F, 80% R.H.) conditions. Paperboard containers in 8, 12, and 16 oz sizes were used to package the commercial pasta used in the study. Conclusions from the study were:

a) Pasta packaged and stored in paperboard cartons gains or loses moisture depending on environmental temperature and humidity;
b) The commercial pasta products tested exhibited weight loss of >6% under desert conditions, >1% under ambient conditions, and showed a weight gain of >1% under tropical conditions;
c) Neither product size, shape, composition, nor source of manufacturer showed a significant effect on weight gain or loss.

Published data (6) also indicate that pasta is hygroscopic and eventually reaches an equilibrium with the atmosphere surrounding it. That equilibrium point varies depending on the temperature and relative humidity of the ambient air as well as the initial moisture content of the pasta.

Realizing that not all manufacturers used the same type of containers for packaging retail pasta, the NPA conducted a survey of the pasta industry in 1981 to determine the most commonly used packaging materials and package sizes (5). Responses from companies representing 75% of the domestic pasta production at that time indicated that paperboard cartons made up 42% of the total retail volume, and flexible bags (mostly polyethylene) accounted for the remaining 58%. A report in the literature (7) shows that the loss or gain of moisture in pasta is affected by the water vapor permeability of the material in which it is packaged.

Design of the Study

Commercially produced and packaged pasta was to be examined periodically for net weight under environmental conditions typically encountered in the United States grocery product distribution system. Since previous work showed that pasta weight gain or loss was not affected by product shape or package size, 16 oz samples of spaghetti were chosen to be studied. Spaghetti was packaged in the two most common retail pasta packaging materials—paperboard cartons and flexible polyethylene bags.

Two well-known brands of spaghetti were tested. Brand A was produced and packaged in flexible bags on January 25, 1984 at a midwestern manufacturing location. Brand B was produced and packaged in paperboard cartons on January 28, 1984 by a manufacturer located in the northeastern U.S. Oven moisture content (8) for spaghetti samples taken after exiting from the

[1]Published with the approval of the Director of the Agricultural Experiment Station as Journal Series No. 1709.

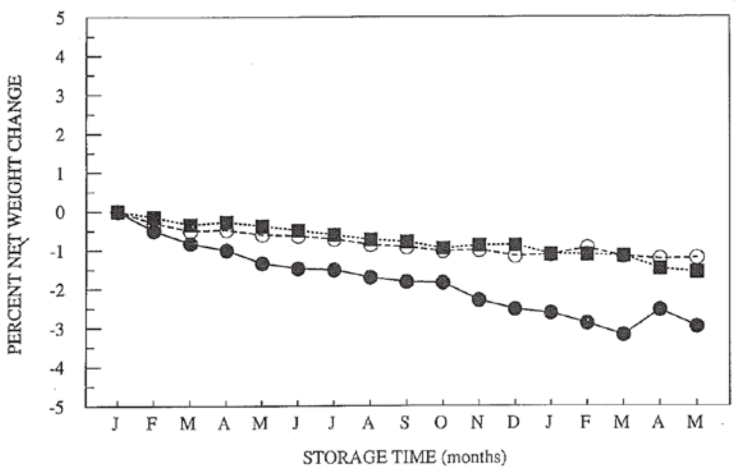

Fig. 1. Net weight change in spaghetti in flexible bags during storage under ambient conditions, in NJ retail store (•), NJ warehouse (o), and MN warehouse (■).

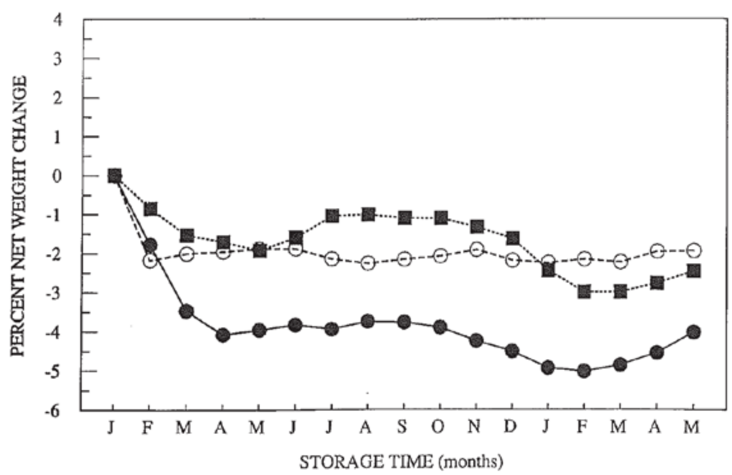

Fig. 2. Net weight change in spaghetti in paperboard cartons during storage under ambient conditions, in NJ retail store (•), NJ warehouse (o), and MN warehouse (■).

Table I. Average Net Weights of Spaghetti from Initial Production to Completion of 15-month Storage in Three Locations

Time Identity	Brand A (Midwestern U.S. manufacture) NJ Retail	NJ Warehouse	MN Warehouse	Brand B (Northeastern U.S. manufacture) NJ Retail	NJ Warehouse	MN Warehouse
Initial Production:						
Gross weight, g	465.69	465.14	467.28	493.13	494.75	491.32
Tare weight, g	4.31	4.10	4.31	20.40	20.40	20.40
Net weight, g	461.38	461.04	462.97	472.73	474.35	470.92
Initial Storage, g (2 weeks post production)	459.08	459.68	462.30	464.34	464.04	466.90
Final (15 mo.) net weight, g	447.72	455.52	455.76[c]	453.74	465.12	459.32
15 mo. weight loss, g	13.66	5.52	7.21	18.99	9.23	11.60
15 mo. weight loss, %	2.96	1.20	1.56	4.02	1.95	2.46
Maximum weight loss, %	3.18	1.22	1.56	5.02	2.24	2.99
Shown after (mo.)	13	14	15	12	6, 11	12, 13

dryer was 12.4% (Brand A) and 12.5% (Brand B), which met the federal standard of identity specification of 13.0% maximum moisture content for dry pasta.

One randomly selected case of spaghetti each of Brand A (24 package case) and Brand B (20 package case) was shipped from the manufacturers to three typical storage sites: a retail supermarket in metropolitan New Jersey and warehouses in metropolitan New Jersey and Minneapolis, MN. Each case was labeled "Test Sample—Not for Sale" and was accompanied by ten empty 16 oz-size containers to be used for determining tare weight. Storage locations were selected to represent neither environmental extremes of desert nor tropical conditions.

The New Jersey retail store used in this study was a large air-conditioned facility, chosen because it was thought to represent a supermarket situation typical of the storage conditions used to display the bulk of the pasta sold in the U.S. domestic market. The test package (labeled "Not for Sale") of pasta was placed in a location adjacent to the pasta displayed for sale in the store. Because the store was air-conditioned, it was assumed *not* to be a "worst case" situation for net weight variation in a retail storage situation.

Initial storage weights (to the nearest 0.1 g) for individual packages in each of the cases tested were determined on February 11, 1984, and at approximately the same day of the month for the next 15 months. Each periodic measurement included both the actual gross weight of each 16 oz-size package, and the tare weight, the average weight of ten empty 16 oz-size containers. Net weight of each package was the actual gross weight minus the mean tare weight.

Net weight measurements were submitted monthly to the Department of Cereal Science and Food Technology at North Dakota State University for tabulation. The accumulated measurements were analyzed upon completion of the 15-month storage survey to obtain the final data now published.

Results of the Net Weight Study

The results of the study are shown graphically in Figures 1 and 2, and summarized numerically in Tables I and II. Highlights of the study have been presented previously (9).

Table I shows the maximum percentage change in pasta weight over time from the three storage locations and two packaging materials. Pasta stored in all three locations and in both packaging materials showed a net loss in weight when compared to the initial net weight at the time of production. The retail storage location showed a larger percentage change in pasta net weight than either warehouse storage location. Pasta stored in paperboard cartons showed a larger percentage change in net weight than did pasta stored in flexible bags. Maximum loss in pasta net weight ranged from a low of 1.2% when stored in flexible bags at the New Jersey warehouse location, to a high of 5.0% when stored in paperboard cartons at the New Jersey retail store.

Figures 1 and 2 show graphically the percentage change in pasta net weight when compared with the initial net weight at the time of production. Pasta packaged in paperboard cartons loses weight relatively fast within the first two to three months after production, then fluctuates up and down thereafter with the change in ambient conditions (Fig. 1). Pasta packaged in flexible bags loses weight at a rate which is more gradual and less responsive to change in ambient storage conditions than paperboard cartons (Fig. 2).

Discussion of Results

Since FDA is unlikely to be concerned with testing packages from the warehouse, discussions about this study will be based on the retail storage data.

It is likely that the initial weight loss rate for pasta is dependent on climatic conditions during manufacture as well as on the original pasta moisture. Nonetheless, the pasta would be expected at some time to reach an equilibrium point of minimum net weight, with the higher the initial moisture content of the pasta at the time of manufacture, the greater the maximum weight loss expected. Had the initial moisture content of the pasta studied been 13.0%—the maximum allowed by the federal standard of identity—instead of 12.4% (Brand A) or 12.5% (Brand B), a greater maximum loss in net weight would have been expected than was actually observed. Even under conditions of this study, which were not necessarily conducive to dehydration, pasta lost up to 5% new weight.

Keeping the above comments in mind, the results of this study should represent a retail storage situation not atypical for dry pasta in the U.S., although typical shelf storage time is difficult to predict because of differences in shelf stocking methods. Based on the result of this study and on additional supporting information not presented here, it would seem appropriate for FDA to consider establishing a net weight tolerance for pasta manufacturers of 5.0% of the labeled weight for pasta packaged in paperboard cartons and 3.2% of the labeled weight for pasta packaged in flexible bags. Thus, for a 16 oz (1 lb) paperboard package of pasta, a minimum net weight of 15.2 oz at the point of purchase should be allowed, and for a 16 oz (1 lb) flexible bag package of pasta, a minimum net weight of about 15.5 oz (15.49 oz) should be allowed. Institution of these net weight tolerance limits would seem to afford the pasta manufacturers the benefit of the doubt in being found "under weight" in a retail situation in which they have little or no control of ambient conditions, and at the same time assure consumers that they are not purposely being shorted by the manufacturer.

Table II. Summary of 15-Month Pasta Net Weight Study

Package and Location	Net Weight Maximum g (oz)	Net Weight Minimum g(oz)	Loss %
Flexible bags			
NJ - Retail	461.38 (16.27)	446.71 (15.76)	3.2
NJ - Warehouse	461.04 (16.26)	455.42 (16.06)	1.2
MN - Warehouse	462.97 (16.33)	455.76 (16.07)	1.6
Paperboard cartons			
NJ - Retail	472.73 (16.68)	448.98 (15.84)	5.0
NJ - Warehouse	474.35 (16.73)	463.73 (16.36)	2.2
MN - Warehouse	470.92 (16.61)	456.84 (16.11)	3.0

The Authors

Dr. **Joel W. Dick** is an associate professor in the Department of Cereal Science and Food Technology at North Dakota State University, Fargo, ND, where he received his Ph.D. degree in cereal chemistry and technology. Dick now directs the quality evaluation and testing program for durum wheat utilization at NDSU. In addition, he is active in teaching, research, and service activities. He previously held the positions of food technologist with the USDA Spring Wheat Quality Laboratory in Fargo and director of Quality Assurance with the Rahr Malting Co. in Shakopee, MN. Since joining NDSU, he has traveled extensively internationally, promoting wheat on behalf of U.S. wheat producers. Dick has directed the the AACC short course, *Pasta and Durum Wheat Quality* and is coauthor of chapters in the AACC books, *Durum Wheat: Chemistry and Technology*, and, *Wheat: Chemistry and Technology*.

Dr. **Kantha Shelke** is a research associate in the Department of Grain Science and Industry at Kansas State University, Manhattan, KS, and also serves as an instructor for a newly introduced class, entitled "Principles of Pasta and Noodle Technology." Shelke received a Ph.D. degree from NDSU and has M.S. degrees in both food and nutrition and in organic chemistry. She previously worked as an instructor in the Department of Food and Nutrition at North Dakota State University, Fargo, and was a staff nutritionist for the Fargo Senior Commission on Aging. Her current research principally involves cake batters, with a special emphasis on their rheology. She has also done research on pasta and noodle technology. Besides AACC, Shelke is a member of the Institute of Food Technologists.

Acknowledgment

The authors wish to recognize and thank the following: 1) The National Pasta Association for initiating and supporting this study; and 2) the Food and Drug Administration for guidance offered to make the study technically acceptable.

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Specifications and Tolerances Committee
Interim Agenda

Brett Saum, Chairman
San Luis Obispo County, California
Weights and Measures

Reference
Key Number

300 INTRODUCTION

The Specifications and Tolerances (S&T) Committee ("Committee") will address the following items at its Interim Meeting. All items are listed below in Table A by Reference Key Number. The headings and subjects apply to NIST Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices." The Appendices to the Report are listed in Table B. The acronyms for organizations and technical terms used throughout the agenda are identified in a glossary in Table C. In some cases, background information will be provided for an item. The fact that an item appears on the agenda does not mean that the item will be presented to the Conference for a vote. The Committee will review its agenda at the Interim Meeting and may withdraw some items, present some items for information meant for additional study, issue interpretations, or make specific recommendations for change to NIST Handbook 44 which will be presented for a vote at the Annual Meeting.

The recommendations are statements of proposals and are not necessarily those of the Committee. Suggested revisions to the handbook are shown in **bold face print** by **~~striking out~~** information to be deleted and **underlining** information to be added. Requirements that are proposed to be nonretroactive are printed in **bold-faced *italics.***

Note: The policy of NIST is to use metric units of measurement in all of its publications; however, recommendations received by the NCWM technical committees have been printed in this publication as submitted. Therefore, the report may contain references to inch-pound units.

Table A
Index to Reference Key Items

Table B
Appendices

Table C
Glossary of Acronyms

AWS	Automatic Weighing Systems	NEWMA	Northeastern Weights and Measures Association
AWWA	American Water Works Association	NIST	National Institute of Standards and Technology
BCS	Belt-Conveyor Scales	NTEP	National Type Evaluation Program
CC	Certificate of Conformance	NTETC	National Type Evaluation Technical Committee
CWMA	Central Weights and Measures Association	NW&SA	National Weighing and Sampling Association
EPO	Examination Procedure Outline	OEM	Original Equipment Manufacturer
GS	NTETC Grain Analyzer Sector	Pub 14	NCWM Publication 14
GMM	Grain Moisture Meters	RMFD	Retail Motor-Fuel Dispenser
GPMA	Gasoline Pump Manufacturers Association	SI	International System of Units
HB 44	NIST Handbook 44	SMA	Scale Manufacturers Association
HB 130	NIST Handbook 130	SWMA	Southern Weights and Measures Association
LMD	Liquid-Measuring Device	WG	Work Group
LPG	Liquefied Petroleum Gas	WMD	NIST Weights and Measures Division
MDMD	Multiple Dimension Measuring Devices	WS	NTETC Weighing Sector
MFM	Mass Flow Meter	WWMA	Western Weights and Measures Association
MMA	Meter Manufacturers Association	USNWG	NIST/OIML U.S. National Working Group
MS	NTETC Measuring Sector	VTM	Vehicle-tank Meters
NCWM	National Conference on Weights and Measures, Inc.		

"Handbook 44" (HB 44) means the 2009 Edition of NIST Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices"
"Handbook 130" (HB 130) means the 2009 Edition of NIST Handbook 130, "Uniform Laws and Regulations in the Areas of Legal Metrology and Fuel Quality"

Note: NIST does not imply that these acronyms are used solely to identify these organizations or technical topics.

Details of All Items
(In Order by Reference Key Number)

310 GENERAL CODE

310-1 G-S.8. Provision for Sealing Electronic Adjustable Components, G-S.8.1. Access to Calibration and Configuration Adjustments, and G-S.8.2. Automatic or Semi-automatic Calibration Mechanism

Source: 2009 Carryover Item 310-1. This item originated from the Southern Weights and Measures Association (SWMA) Committee and first appeared on the Committee's 2008 agenda.

Purpose: Amend General Code paragraph G-S.8. to clarify what is considered an effective method of sealing, and requirements for indicating and recording appropriate information when a device is in a metrological adjustment mode.

Item Under Consideration: After the 2009 Interim Meeting, the Committee agreed that the proposal *was not ready* for a vote and consequently did not include proposed language in its Interim and Annual Reports. However, the Committee agreed to keep this item on its agenda with the expectation that proposed language will be submitted for the 2010 Interim Meeting.

Background/Discussion: At its 2007 Annual Meeting, the SWMA received a proposal to add requirements to G-S.8. to assure that a device could not be sealed in the configuration mode and continue to operate normally. Such a condition could facilitate fraud. The proposal, as submitted, required that a device continuously indicate when access to the set-up mode was not disabled.

At the 2008 Interim Meeting, the Committee reviewed the comments received during the open hearing and discussed the alternate proposals provided by NIST Weights and Measures Division (WMD) and Scale Manufacturers Association (SMA). The Committee agreed that if a device designed for commercial applications is capable of being "sealed" with external or remote access to the calibration or configuration mode, it is clearly in violation of the current G-S.8. Provision for Sealing Electronic Adjustable Components and G-S.2. Facilitation of Fraud and, therefore, no change to the existing language is needed. However, because of the ongoing disagreement on the interpretation of G-S.8. among the National Type Evaluation Program (NTEP) laboratories, the Committee agreed to make changes to the proposal based on the concerns raised during the open hearing.

The changes to the original proposal made a distinction between configuring a device to either enable or disable external or remote access to the calibration and configuration modes and taking the device out of a normal mode of operation and putting it into a special mode of operation where adjustments are made to calibration and configuration parameters. In other words, if the internal position of a switch or jumper enables external access to the calibration and configuration modes, the device will operate normally until an operator takes action, such as entering a pass code, depressing and holding down a specific key, or uses other means to enter a special operating mode to make adjustments to calibration and configuration parameters. The device must be equipped with an approved audit trail, or that a physical seal is required to be broken before any metrological adjustments to comply G-S.8. The Committee also believes that an indication for the adjustment mode of operation is only necessary for devices with approved category 1, 2, or 3 audit trails and that it not be operable in normal weighing or measuring operation.

The proposal as revised in 2008 stated that:

- In the case of a device with a physical security seal, the application of the seal means that the external or remote access that enables the calibration and configuration modes is automatically disabled.

- In the case where a device has an approved audit trail, the device would be required to clearly and continuously indicate on the display (and printed if equipped with a printer) that it is in a calibration mode and not the normal operating mode.

At the 2008 Annual Meeting, the Committee heard comments from WMD which noted that the alternate language submitted by SMA would require that *all* devices provide the operator with indications in the calibration mode. This would encompass mechanical and electronic devices and devices that use category 1 physical seals. Additionally, WMD believes that a device does not need indications that it is in a calibration or configuration mode if it is incapable of providing indications that can be interpreted, printed, or transmitted to a memory device as a correct measurement value. WMD suggested that the Committee amend the recommendation to address some of the concerns noted by the Central Weights and Measures Association (CWMA), NTEP participating laboratories, and WMD since the 2008 Interim Meeting.

The Committee agreed with the comments from the CWMA and WMD and amended paragraph G-S.8.1. to:

- delete the references to the sealing categories of device,
- clarify printing requirements, and
- include an option that the device not operate or provide metrological indications that can be interpreted, or transmitted into memory or to recording elements while in this mode.

Just prior to the 2008 voting session, the Committee noted that the revised language in G-S.8.1.(a) was inadvertently changed to where it could be literally read that the physical seal itself disabled access to the adjustment mechanisms instead of preventing access to the mechanism. Consequently, the Committee changed the status of the item from Voting to "Informational." The Committee believed that the intent of the recommendation is to ensure that the access to the calibration and configuration modes is disabled.

The Committee redrafted the language in paragraph G-S.8.1. and submitted the following revised language for G-S.8.1. to the regional weights and measures associations for further review and consideration.

<u>G-S.8.1. Access To Calibration and Configuration Adjustments - Electronic Devices. – An electronic device shall be so designed that access to calibration and configuration modes, including external and remote access, are only permitted when:</u>

(a) <u>the application of the physical security seal shall ensure that the access to the calibration and configuration modes is disabled, or</u>

(b) <u>the calibration and configuration adjustments are protected by an approved category 1, 2, or 3 audit trail, and the device shall clearly and continuously indicate and print, if equipped with a printer, that the calibration and configuration adjustment modes are enabled.</u>

<u>During the calibration and configuration adjustment mode, electronic devices shall either;</u>

- ***<u>not provide metrological indications that can be interpreted, or transmitted into memory, or printed while it is in the calibration and/or configuration adjustment mode as a correct measurement value, or</u>***

- ***<u>clearly and continuously indicate that it is in the calibration and/or configuration adjustment mode and record such message if capable of printing in this mode.</u>***

<u>(Nonretroactive as of January 1, 201X)</u>

At its 2008 fall meeting, the SMA supported the intent of the item and recommends the following language:

<u>G-S.8.1. Access to Calibration and Configuration Adjustments. – A device shall be so designed that:</u>

<u>(a) The application of the physical security seal shall ensure that the calibration and configuration modes are disabled, or</u>

<u>(b) The calibration and configuration adjustments are protected by an approved category 1, 2, or 3 method of sealing, and the device shall clearly and continuously indicate and print, if equipped with a printer, that the calibration and configuration adjustment modes are enabled.</u>

<u>During the calibration and configuration adjustment mode, electronic devices shall either;</u>

- ***<u>The device shall not provide metrological indications that can be interpreted, or transmitted into memory, or printed while it is in the calibration and/or configuration adjustment mode as a correct measurement value, or</u>***

- ***<u>The device shall clearly and continuously indicate that it is in the calibration and/or configuration adjustment mode and record such message if capable of printing in this mode.</u>***

<u>Nonretroactive as of January 1, 201X)</u>

<u>(Added 201X)</u>

During the 2009 NCWM Interim Meeting open hearing, the committee reviewed comments from the fall 2008 Western Weights and Measures Association (WWMA), CWMA, and Northeastern Weights and Measures Association (NEWMA) meetings that supported the language in the Committee's Interim Agenda and recommended that this item move forward as an Informational item to allow further review, comments and recommendations by the other regional associations, and other interested parties.

The SWMA heard no specific recommendations for change to the proposal during its 2008 Annual Meeting open hearings. The SWMA heard that the SMA plans to further review the item and may have additional recommendations to propose for consideration. The Committee supported the changes proposed by the NCWM

S&T Committee at the July 2008 Annual Meeting, noting that there were some comments regarding portions of the language that may need to be addressed. If an agreement cannot be reached on proposed changes to these paragraphs, the SWMA recommended that additional work is needed before the item is ready for a vote and that the NCWM S&T Committee may wish to consider at least incorporating interpretations and guidelines for the existing language in its reports. Consequently, the SWMA recommended maintaining this as an Informational item on its agenda.

At its 2008 fall meeting, the SMA supported the intent of the item and suggested an alternate proposal for consideration.

At the 2009 Interim Meeting, WMD added that it had received comments questioning how the application of a physical seal (as recommended by the manufacturer and listed on the Certificate of Conformance (CC) ensures that the calibration and configuration modes are disabled. Specifically, what does that presence of the physical seal (pressure sensitive or lock and wire) do to the device that disables the calibration and configuration modes?

In considering these comments, WMD suggested that the Committee consider the following changes:

- Modify G-S.8. Provision for Sealing Electronic Adjustable Components to clarify the differences in requirements between physical seals and electronic seals (audit trails);
- Add new specifications for externally and remotely configurable devices;
- Amend G-UR.4.5. Security Seal to require the user to verify that the device is correctly configured to disable external configuration;
- Add definitions from the white paper on the "Metrological Requirements for Audit Trails" adopted by NCWM in July 1993; and
- Add a new definition for externally configurable devices.

Mr. Patoray, Consultants on Certification (CoC), LLC, related discussions from the NTETC Weighing Sector where it was reported that service agents were leaving scales configured with external calibration capability and then applying a security seal, which did not follow the manufacturer's instructions. He also expressed concerns that the language proposed in the 2009 Interim Agenda would require a manufacturer to design a device where the application of the physical seal (e.g., lock and wire, pressure sensitive) would disable external access to the configuration mode. Currently, all that a physical seal does is provide an indication that the seal has been broken and thus leave a device subject to adjustment. He believes that the language in the proposal would force the manufacturer to redesign access covers to devices so that the cover disables the external adjustment capability. Consequently, the application of the security seal secures the cover in place and then, if broken, provides an indication that the device may have been adjusted.

The Committee also received a comment from Mr. Will Wotthlie, Maryland, stating that he was concerned with the language that requires that the physical seal "shall ensure" that external access to the configuration mode is disabled. He provided examples of a mechanical automatic temperature compensation (ATC) element where a specially designed sealing pin had to be installed before the physical seal could be applied and where electronic motor-fuel devices have a specially designed cover plate where the closing of the cover plate disables the electronic configuration. The manufacturer has the option under this proposal to either specially design the device with a physical seal as a method of sealing (e.g., a specially designed sealing pin on the aforementioned mechanical ATC element) or design the device with an electronic method of sealing (i.e., an approved audit trail).

Several manufacturers stated that this proposal was not ready and that designs for the method of providing security to the metrological adjustments should be left to the manufacturers. Mr. Darrell Flocken, Mettler-Toledo, added that the intent of the proposal is that the manufacturer can either design a device so that a security seal cannot be applied without placing the device into the proper mode *or* design the device so that it has an approved audit trail.

The Committee agreed with the comments that the proposal ***is** not ready* to become a Voting item and suggested that further development to the proposal address the following concerns:

1. Avoid language that allows the indication of usable metrological values while a device is in the adjustment mode for devices that do not have an event logger.

2. Recognize that more than one method of sealing is acceptable on a single device; for example, using a lock and wire seal for the mechanical adjustments and an audit trail for electronic adjustments.

3. Recognize that some specific codes in HB 44 do not have language for device categories and corresponding methods of sealing.

4. Require an obvious indication when a device is being adjusted if its method of sealing is a physical security seal.

5. Clarify that the application of a physical security seal to a specially designed and sealable plate or cover that disables external access to the configuration and adjustment mode is not the only method to seal adjustable components.

Consequently, the Committee recommended that this item remain Informational. See the 2008 NCWM Annual Report for additional background information.

After the 2009 Interim Meeting, the NIST technical advisor developed language that could be further developed by the regional weights and measures associations, (NTETC) sectors, and other interested parties with the intent that a revised proposal can be forwarded to the Committee for consideration at the 2010 NCWM Interim Meeting. The NIST WMD proposal would reformat G-S.8.1. for easier reading, recommended language for device indications and recorded representations while in the adjustment mode, and proposed language to recognize that devices may have both audit trails and physical seals for different components of a device (e.g., a physical seal for meter adjustments and an event counter for blend settings).

G-S.8. Provision for Sealing Electronic Adjustable Components. *– A device shall be designed with provision(s) for:*

(a) *applying a* ***physical*** *security seal that must be broken, or*

(b) *using other approved means of providing security (e.g., data change audit trail available at the time of inspection)*

before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism.

[Nonretroactive as of January 1, 1990]

(Amended 20XX)

A device may be fitted with an automatic or a semi-automatic calibration mechanism. This mechanism shall be incorporated inside the device. After sealing, neither the mechanism nor the calibration process shall facilitate fraud.

(Added 1985) (Amended 1989 and 1993)

G-S.8.1. Multiple Weighing or Measuring Elements that Share a Common Provision for Sealing. **- (Unchanged)**

G-S.8.2. Multiple Sealing Methods. – Weighing and measuring devices may be approved for use with multiple methods for sealing adjustable components, such as physical seals for calibration adjustment (e.g., load cells, meters, etc.) and event counters or event logger for the configuration parameters (e.g., capacity, interval size, octane blend settings, etc.).

[Nonretroactive as of January 1, 201X]

(Added 201X)

G S.8.3. Adjustment Mode Indications. – During the calibration and configuration adjustment mode, the device shall:

(a) Not provide metrological indications that can be interpreted, or transmitted into memory, or printed while it is in the calibration and/or configuration adjustment mode as a correct measurement value, or

(b) Clearly and continuously indicate that it is in the calibration and/or configuration adjustment mode, and record such message if capable of printing in this mode.

Nonretroactive as of January 1, 201X)

(Added 201X)

At its 2009 Annual Meeting, the CWMA supported the intent of the SMA proposed language from its 2009 spring meeting and believed that the specific wording should be thoroughly reviewed and that the terms "calibration and configurations modes" are not widely understood. The CWMA suggested that the definitions for the word "adjustment" and "adjustment mode" from the 1993 white paper on Audit Trails be included in HB 44 so that the proposed SMA language might read ". . . the calibration and/or configuration adjustment modes . . ."

At its 2009 Annual Meeting, NEWMA supported the intent of this item. However, NEWMA is concerned that this item is getting over-complicated and asks the Committee to consider requiring that a simple enunciator indicating the device is in "cal mode" might be sufficient.

At the 2009 Annual Meeting, the Committee reviewed comments from the SMA 2009 spring meeting supporting the intent of the items submitted the revised proposal to the Committee. Mr. Stephen Patoray, CoC submitted comments and additional background information on how some devices can have external access to the adjustment mode after the application of a physical seal (and is not equipped with an audit trail). In his letter to the Committee, he states that some devices are designed with a switch (not momentary) or jumper inside the case (that enables or disables external access to the adjustment mode). This switch or jumper has two positions, on or off. When the switch is in the off position, the device cannot be put into a calibration or configuration adjustment mode and is in the normal weighing mode. When the switch is in the on position, the device shows no apparent indication of being in anything other than the normal weighing mode. However, with a certain sequence of keyboard entries, and possibly a password from the keyboard, the indicating element can be placed into calibration or configuration adjustment mode. After the steps are completed from the keyboard and the operator is done with whatever adjustments in calibration or configuration are needed, the device will return to normal weighing mode. The switch is still on. The instructions say (or the design provisions state) that the switch is to be turned off before the case is put back together and the device is sealed. In jurisdictions where a registered service technician is able to seal a device, he/she can decide not to turn the switch off. The device works normally. However, upon his/her return, the service technician does not need to break the seal on the case to enter the calibration/configuration mode; they only need to enter the keystroke sequence (or possibly the password) from the keyboard. This saves them time by not having to remove the seal and the case to flip the switch or set the switch to on position. This is not how the device was "designed" to work, but this is a method that has been in use in many indicating elements for many years. One could argue this is an enforcement issue.

CoC added that the NTEP labs were and still are in a bad position. If an applicant for an NTEP CC describes the method of how the device is to be sealed, this is what the lab evaluator is going to evaluate. While in some cases, the lab evaluator may attempt to simulate other scenarios, it is not possible to ask the lab evaluator to attempt to evaluate all possible scenarios that could happen with a device in the field. Also, it was/is the opinion of some of the lab evaluators that they have no clear method or description in HB 44 to not allow a design as described above. However, all lab evaluators believe that the method described above does not provide a truly "effective method of sealing." That is why several years ago the NTEP labs asked for clarification of G-S.8. To date there has been much work on this item, with several failed attempts to rewrite this section, but at this time, this is still an Informational_item and there are still indicating elements out in the field with this ineffective method of sealing. There is the appearance that the device is sealed with a physical seal that must be broken; however, the device can be calibrated or configured from the keyboard because the proper method of sealing has not been followed by registered service technicians.

CoC believes there may be nothing wrong with the current G-S.8. wording, as part of the general code. However, this issue does need to be addressed in each of the individual or specific codes. There may be several solutions for newly designed devices, but it is not the role of HB 44 to attempt to actually put design constraints on manufacturers only to place requirements that must be met by some type of design solution.

During the 2009 NCWM Annual Meeting, the Committee received comments during the open hearing that no action may be needed and that the existing language in HB 44 is sufficient. Additional comments indicated that other proposals are overly complex. Oregon and Maryland believe that amended requirements for sealing are needed by the NTEP labs and field officials in order to consistently interpret and apply sealing requirements.

The Committee believes that all parties agree with the intent of the proposal. Both the WMD and SMA proposals include language that restates the existing language in G-S.8. but is essentially reformatted for clarification. Additionally, both proposals include new requirements for providing indications when a device is in adjustment mode. WMD included further language to address devices that may have more than one method of sealing.

The Committee recommended that this item remain Informational.

At its 2009 meeting, the NTETC Weighing Sector (WS) reviewed the comments from the S&T Committee, the background information in the NCWM 2008 Annual and 2009 Interim Reports, and the summary of proposals provided by the NIST Technical Advisor. The WS believes that existing language in HB 44 is sufficient and that the Sectors review existing type evaluation criteria to verify that devices shall be designed with:

1. provision(s) for applying a physical security seal that must be broken before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism, or

2. other approved means of providing security to document any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism (e.g., data change audit trail available at the time of inspection).

At its 2009 Interim Meeting, the CWMA commented that the Committee's "redrafted" language in the 2009 NCWM Interim Report still had some contradictory language, and did not define what is considered a clear printed indication of a devices calibration or configurations status. The CWMA recommends this item remain Informational and amended the Committee's recommendation as follows:

G-S.8.1. Access to Calibration and Configuration Adjustments - Electronic Devices. – An electronic device shall be so designed that access to calibration and configuration modes, including external and remote access, are only permitted when:

(a) the application of the physical security seal shall ensure that the access to the calibration and configuration modes is disabled, or

(b) the calibration and configuration adjustments are protected by an approved category 1, 2, or 3 audit trail, and the device shall clearly and continuously indicate and print, if equipped with a printer, that the calibration and configuration adjustment modes are enabled.

During the calibration and configuration adjustment mode, electronic devices shall not provide metrological indications that can be interpreted, or transmitted into memory, or printed while it is in the calibration and/or configuration adjustment mode as a correct measurement value
(Nonretroactive as of January 1, 201X)

During the 2009 WWMA Annual Technical Conference, Mr. Darrell Flocken, Mettler Toledo, speaking as chairman of the WS, reported the Sector's position as stated above, and noted that the Sector can develop additional guidance in NCWM Publication 14 to ensure uniform interpretation of the requirement during type evaluation. Mr. Lou Straub, representing SMA, stated that SMA supported the intent of the proposed changes, but had presented specific suggestions for modifying the language to the NCWM S&T Committee. Mr. Straub noted that SMA has not met since prior to the 2009 NCWM Annual Meeting, so SMA would need to reconsider any additional thoughts presented during that meeting and the August 2009 WS meeting.

In its review of this issue, the WWMA expressed concerns about a device which could be sealed in a mode that would allow access to calibration or configuration changes without breaking a seal. The WWMA agrees with the position of the NCWM S&T Committee that the current language in paragraph G-S.8. requires that a security seal be broken before a metrological change can be made to a device (or other approved means of security, such as an audit trail provided). Thus, once a security seal is applied, for example, it should not be possible to make a metrological change to the device without breaking that seal. Since this philosophy addresses provisions for protecting access to metrological adjustment, the philosophy should be applied consistently to all device types. Therefore, the Committee recommends this remain an Informational item.

At its October 2009 meeting, the NTETC Measuring Sector agreed that Measuring Devices with NTEP CCs have been evaluated to either:

1. not function in the calibration or configuration mode;
2. not be sealed in the calibration or configuration mode; or
3. clearly indicate the device is in the calibration or configuration mode.

The MS agreed that these options reflect the intent of paragraph G-S.8. and, because the intent of the paragraph is understood and appropriately applied by the measuring community, the Sector recommends that no changes be proposed to paragraph G-S.8.

The SWMA recommends that this proposal be made Informational. The SWMA agreed that a device should be designed so that it can either not operate or not be capable of indications that might be interpreted as a valid measurement while it is in the calibration or configuration mode. The SWMA S&T Committee is concerned that a device left to operate while in this mode may facilitate fraud since adjustments might be inadvertently or intentionally made to metrologically significant features.

The SWMA is interested in the input the NCWM S&T Committee receives from the fall 2009 Technical, Industry, and Regional Weights and Measures Association meetings on this issue for the 2010 NCWM Interim Meeting. The Committee recommends that the final modifications to the General Code ensure the intent of the requirement is clear and is uniformly interpreted.

NEWMA supported this item remaining as Informational at its 2009 Interim Meeting.

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

310-2 Appendix D – Definition of Electronic Devices, Software-Based and Built-For-Purpose Device

Source: 2009 Carryover Item 310-2. This item originated from the NTETC Software Sector and first appeared on the Committee's 2007 agenda as Developing Item Part 1, Item 2.

Purpose: This proposal deletes the current term and definition of "built-for-purpose device" and replaces it with the term and definition for "software-based electronic devices." The proposed definitions are intended to clarify that all electronic weighing and measuring devices include software and to classify the types of software based on the way the software is installed or modified.

Item Under Consideration: Delete the current definition of built-for-purpose device as follows:

> **~~built-for-purpose device. Any main device or element which was manufactured with the intent that it be used as, or part of, a weighing or measuring device or system. [1.10]~~**
>
> **~~(Added 2003)~~**

Add a new definition and a cross-reference to Appendix D in HB 44 for "Electronic devices, software-based" as follows to replace the current definition of "built-for-purpose device":

<u>Electronic devices, software-based. – Weighing and measuring devices or systems that use metrological software to facilitate compliance with Handbook 44. This includes:</u>

<u>(a) Embedded software devices (Type P), aka built-for-purpose. – A device or element with software used in a fixed hardware and software environment that cannot be modified or uploaded via any interface without breaking a security seal or other approved means for providing security and will be called a "P," or</u>

<u>(b) Programmable or loadable metrological software devices (Type U), aka not-built-for-purpose. – A personal computer or other device and/or element with PC components with programmable or loadable metrological software and will be called "U." A "U" is assumed if the conditions for embedded software devices are not met.</u>

<u>Software-based devices – See Electronic devices, software-based.</u>

Background/Discussion: In 2005, the Board of Directors established an NTETC Software Sector. One of the tasks of the Sector is to develop a clear understanding of the use of software in today's weighing and measuring instruments.

At the Software Sector's October 2007 meeting, it was initially suggested that the term "not-built-for-purpose" be removed from the wording in NIST HB 44 paragraph G-S.1.1. since there is no definition for a not-built-for-purpose device in HB 44. After a lengthy discussion related to the terms "built-for-purpose" and "not-built-for-purpose," the Sector agreed these terms were not clear and should be replaced with the terminology proposed above. The proposed definitions are based on the revision of OIML R 76 Non-automatic weighing instruments Subsections 5.5.1. (Type P) and 5.5.2. (Type U).

At the 2008 Annual Meeting, the Committee heard comments from the former Software Sector Chairman indicating that the Sector had completed its review of this item and could not develop it any further. The Chairman requested that the Committee consider moving the item from the Developing items section of the agenda and at least make it an Informational item to facilitate discussion and comment on the proposed language. Consequently, the Committee agreed to change the status of the item from Developing to Informational in its agenda.

At its 2008 Annual Meeting, the WWMA agreed to propose this item remain Informational, based on comments heard supporting the item, until other interested parties had the opportunity to provide comments.

At its 2008 Interim Meeting, the CWMA heard comments during their open hearings in favor of the item and no comments were made in opposition. The CWMA recommends this item go forward as a Voting item.

At its 2008 Interim Meeting, NEWMA discussed how this item would affect field examination and verification of software. NEWMA recommends this item move forward as Informational.

At its 2008 Annual Meeting, the SWMA heard comments indicating that the Software Sector is seeking additional input on the proposed definitions and views the proposed changes as a first step in developing wider changes to the General Code and Definitions to better accommodate software-based devices. The SWMA agrees that additional review and study is needed before the proposal can be forwarded as a Voting item and therefore, is maintaining this item as an Informational item on its agenda. The SWMA encourages people to review this proposal and the proposal in Item 310-3 and provide input to the NCWM S&T Committee and the Software Sector. The SWMA is interested in comments from other organizations, including SMA. In the meantime, the Committee also offers the following comments for consideration:

- The term "software-based electronic devices" is not currently included in NIST Handbook 44. The Committee acknowledges that this proposal is a step toward a broader proposal; however, it believes it is inappropriate to include a definition for a term that is not currently used in the handbook.

- There needs to be a definition and/or cross-reference for the terms "Type P" and "Type U." A better approach might be to add a reference for "not-built-for-purpose;" include cross-references for terms "Type P" and "Type U" to the terms "built-for-purpose" and "not-built-for purpose;" and develop proposed changes to the General Code to incorporate the new terms "Type P" and "Type U." This would ensure references to terminology that is being used in Handbook 44.

At the 2009 NCWM Interim Meeting, the Committee received comments from the SMA stating that it now opposes this item since there is no technological justification for making a distinction in software-based device types. Mr. Flocken, Mettler-Toledo speaking on behalf of the SMA added that the SMA can only provide limited responses; SMA continues to support the efforts of the Software Sector and the SMA response is based on the concern that the proposed definitions in this recommendation and the marking requirements proposed in agenda Item 310-3 will make a weighing device more complex than what is currently produced. The Meter Manufacturers Association (MMA) indicated that it supports the item as written in the recommendation.

Mr. Wotthlie, Maryland, does not agree with the SMA position that there are no technological differences between the types of software-based devices. He added that Type P devices and separable elements have limited flexibility in changing software and indications and frequently include the sensing elements necessary for the measurement (e.g., load cells, meters, etc.), whereas Type U devices and separable elements are typically devices that:

1. do not contain measuring elements;

2. can be replaced with compatible equipment and display devices purchased from any number of sources; and

3. only process metrological information received from measuring and other sensing elements.

Mr. Patoray, CoC, LLC, agrees with the SMA that there are few differences between Type P and U software-based devices. However, there are significant differences between Type P and U devices in that a Type P device is defined as an instrument that requires a security means since the instrument has fixed hardware (including sensing components), where the metrological software is ***embedded*** into the instrument. Type U devices do not include fixed components, and metrological software cannot be sealed using physical security seals or the minimum form of an audit trail (i.e., two event counters).

Software Sector Co-chair, Mr. Jim Pettinato, FMC Technologies, added that international recommendations recognize the differences between embedded software and programmable/loadable software. Additionally, the Software Sector recommends that this item remain Informational to allow conference members to further study the proposed definitions.

The Committee agreed with the comments received during the open hearing and the request from the Co-chairman of the Software Sector and agreed that this item should remain an Informational item for further review.

At its 2009 Spring Meeting, the SMA opposed this item, restating its point that there is no longer a technological basis for making this distinction in device types.

At its 2009 Spring Meeting, the Software Sector stated that it seems resistance to this item stems not from a disagreement with the intention, but from either a misunderstanding of the applicability or unrelated concerns over marking requirements. Further discussion was related to how to best present the opinion/goals of the Sector to the interested external parties, such as the NCWM standing committees and the individual states. Some discussion on the wording of the definitions took place as well, with the slightly modified version being discussed. However, no consensus was reached on any language change. The Sector did agree that including the reason(s) for proposing these definitions as part of the effort to educate/promote external parties would be beneficial; and that we should attempt to explain the reasoning/intent of the proposed definitions together with/as part of the action items for Item 1.

At their 2009 spring meetings, the CWMA and NEWMA supported this item as being Informational and understands a report is coming from the Software Sector, which should be reviewed prior to any further recommendations. The CWMA heard comments from SMA in opposition of this item. Additionally, Mr. Patoray, CoC, strongly supported the proposed definitions and stated the Sector needed to continue to work on this item.

During the 2009 NCWM Annual Meeting, the Committee considered the comments from the SMA on the language in the Committee's Interim Report, the report from Mr. Patoray, and the Software article in the Spring NCWM newsletter. The Committee agreed to keep this item Informational to allow updated comments from the regional weights and measures associations and other interested parties based on information in the summary of the March 2009 meeting of the Software Sector.

At its 2009 Interim Meeting, the CWMA received comments that the proposal is sufficiently developed and recommends moving this item forward as a Voting item on the Committee's agenda.

At its 2009 Annual Technical Conference, the WWMA received comments from Mr. Straub, speaking on behalf of SMA, indicating the SMA continues to oppose this item, noting that requirements should apply equally to the two different device types described. The WWMA received no other input on this item and recommends this item should remain Informational until the Software Sector has had an opportunity to review comments from the 2009 NCWM Annual meeting and any comments made at subsequent regional weights and measures association meetings.

At its 2009 Annual Meeting, the SWMA recommended keeping the status of this proposal to delete the current definition of built-for-purpose device and add a new definition and a cross-reference to Appendix D in HB 44 for "Electronic devices, software-based" to replace the current definition of "built-for-purpose device" as an Informational item. The SWMA agreed that the Software Sector should continue to work on the proposal until it arrives at some final language.

During its 2009 Interim Meeting, NEWMA stated that it supports the Committee's decision to keep this item Informational to allow updated comments from the regional weights and measures associations and other interested parties based on information in the summary of the March 2009 meeting of the Software Sector.

Additional background information on this item can be reviewed in the 2008 Final Report of the Committee.

310-3 G-S.1. Identification. – (Software)

Source: 2009 Carryover Item 310-3. This item originated from the NTETC Software Sector and first appeared on the Committee's 2007 agenda as Developing Item Part 1, Item 1.

Purpose: This proposal is intended to amend the identification requirements for all electronic devices manufactured after a specified date by requiring metrological software version or revision information. Additionally, the proposal will list methods, other than "permanently marked," for providing the required information.

Item Under Consideration: Amend G-S.1. Identification and G-S.1.1. Location of Marking Information for Not-Built for-Purpose, Software-Based Devices as follows:

> **G-S.1. Identification. – <u>For the purposes of identification, all equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect and manufactured on or after January 1, 201X, shall be clearly marked as specified in Table G-S.1. Identification and explained in the accompanying notes in Table G-S.1. Notes:</u>**
>
> All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect **<u>and manufactured prior to January 1, 201X</u>**, 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 Type U (not-built-for-purpose) software-based devices;
[Nonretroactive as of January 1, 1968]

(Amended 2003 **and 201X**)

(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 ***Type U*** ***(not-built-for-purpose) software-based*** *devices;*
[Nonretroactive as of January 1, 2004]

(Added 2003) **(Amended 201X)**

(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)

(e) an NTEP CC number or a corresponding CC Addendum Number for devices that have a CC. 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 201X**)

G-S.1.1. Location of Marking Information for Type U (Not-Built-For-Purpose), Software-Based Devices. – *For* ***Type U*** ~~*not built for purpose, software based*~~ *devices* ***manufactured prior to January 1, 201X,*** *either:*

(a) The required information in G-S.1. Identification. (a), (b), (d), and (e) shall be permanently marked or continuously displayed on the device; or

(b) The CC Number shall be:

(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."

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.*

[Nonretroactive as of January 1, 2004]

(Added 2003) (Amended 2006 **and 201X**)

Table G-S.1. Identification for Devices Manufactured on or after January 1, 201X (For applicable notes, see Table G-S.1. Notes on Identification)			
Required Marking	**Full Mechanical Devices and Separable Mechanical Elements**	**Type P Electronic Devices and Separable Elements**	**Type U Electronic Devices and Separable Elements**
Name, initials, or trademark of the manufacturer or CC holder	**Hard-Marked**	**Hard-Marked or Continuously Displayed**	**Hard-Marked, Continuously Displayed, or Via Menu (display) or Print Option (8)**
Model identification information that positively identifies the pattern or design of the device (1)	**Hard-Marked**	**Hard-Marked or Continuously Displayed**	**Hard-Marked, Continuously Displayed, or Via Menu (display) or Print Option (8)**
Non-repetitive serial number (2)	**Hard-Marked**	**Hard-Marked or Continuously Displayed**	**Not Acceptable**
Software version or revision (3)	**Not Applicable**	**Hard Marked (5), Continuously Displayed, or by Command (operator action) (6)**	**Continuously Displayed or Via Menu (display) or Print Option (8)**
CC number or corresponding CC Addendum (4)	**Hard-Marked**	**Hard-Marked or Continuously Displayed**	**Hard-Marked (7) or Continuously Displayed**
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.			

(Added 201X)

Table G-S.1. Notes on Identification For Devices Manufactured on or after January 1, 201X
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.** **2. Except for equipment with no moving or electronic parts, the serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.** **- 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.).** **3. Metrologically significant software shall be clearly identified with the software version. The identification may consist of more than one part but one part shall be dedicated to the metrologically significant portion.** **- 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.** **- 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.).** **4. An NTEP CC number or a corresponding CC Addendum Number for devices that have a CC. 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.).** **5. If the manufacturer declares that the primary sensing element "software" is integral, has no end user interface and no print capability, the version/revision shall be hard-marked on the device. Example: Primary sensing element may be Positive Displacement (P.D.) meter with integral correction, digital load cell (only for reference, not limiting).** **6. Information on how to obtain the Version/Revision shall be included on the NTEP CC.** **7. Hard-marking of the CC Number is permitted if no means of displaying this information is available.** **8. Information on how to obtain the name, initials, or trademark of the manufacturer or CC holder, model designation, and software version/revision information shall be included on the NTEP CC.**

(Added 201X)

Background/Discussion: In 2005, the Board of Directors established an NTETC Software Sector. One of the Sector's tasks is to develop a clear understanding of the use of software in today's weighing and measuring instruments.

During its October 2007 meeting, the Sector discussed the value and merits of required markings for software. This included the possible differences in some types of devices and marking requirements. After hearing several proposals, the Sector agreed to the following technical requirements applicable to the marking of software.

1. The NTEP CC Number must be continuously displayed or hard-marked;

2. The version must be software-generated and shall not be hard-marked;

3. The version is required for embedded (Type P) software;

4. Printing the required identification information can be an option;

5. Command or operator action can be considered as an option in lieu of a continuous display of the required information; and

6. Devices with Type P (embedded) software must display or hard-mark make, model, S.N. to comply with G-S.1. Identification.

At the 2008 NCWM Annual Meeting, the Committee heard comments from the former NTETC Software Sector Chairman indicating that the Sector had completed its review of this item and could not develop it any further during its May 2008 Sector meeting. He requested that the Committee consider moving the item from the Developing section of the agenda and make it an Informational item on the Committee's agenda to facilitate discussion and comment on the proposed language. Consequently, the Committee agreed to forward the item to the regional weights and measures associations for consideration and included this item on its 2009 Interim Agenda.

After the 2008 Annual Meeting, WMD reviewed the following Software Sector Proposal to amend G-S.1. Identification and/or G-S.1.1. Location of Marking Information for Not-Built-for-Purpose, Software-Based Devices in the Committee's 2008 Interim Report:

Method	**NTEP CC No.**	**Make/Model/Serial No.**	**Software Version/Revision**
TYPE P electronic devices shall meet at least one of the methods in each column:			
Hard-Marked	X	X	Not Acceptable[1]
Continuously Displayed	X	X	X
By command or operator action	Not Acceptable	Not Acceptable	X[2]

[1] If the manufacturer declares that the primary sensing element "software" is integral, has no end user interface and no print capability, the version/revision shall be hard marked on the device. Example: Primary sensing element may be Positive Displacement (P.D.) meter with integral correction, digital load cell (only for reference, not limiting).

[2] Information on how to obtain the Version/Revision shall be included on the NTEP CC.

Metrologically significant software shall be clearly identified with the software version. The identification may consist of more than one part, but one part shall be only dedicated for the metrologically significant portion.

Method	**NTEP CC No.**	**Make/Model**	**Software Version/Revision**
TYPE U electronic devices shall meet at least one of the methods in each column:			
Hard-Marked	X[3]	X	Not Acceptable
Continuously Displayed	X	X	X
Via Menu (display) or Print Option	Not Acceptable	X[4]	X[4]

[3] Only if no means of displaying this information is available.

[4] Information on how to obtain Make/Model, Version/Revision shall be included on the NTEP CC.

Metrologically significant software shall be clearly identified with the software version. The identification may consist of more than one part, but one part shall be only dedicated for the metrologically significant portion.

WMD agreed that the proposed language has merit. However, the Software Sector did not include a recommendation on how to incorporate the proposal into existing G-S.1. and G-S.1.1. language. WMD studied the current and proposed language and was not sure how to address the various existing requirements and multiple non-retroactive dates. Consequently, WMD suggested changes to the General Code language on Identification be considered in the further review of this item by the Committee. In brief, the WMD proposed language that divides the identification and marking location requirements for all devices and separable elements manufactured prior to and after a date adopted by the Conference. WMD developed two versions of proposed Table G-S.1. (with the only difference being that the rows and columns are reversed as shown in the Committee's 2008 Annual Report) for consideration by the Conference and forwarded these to the regional weights and measures associations.

At their September 2008 meetings, the WWMA and CWMA reviewed the WMD suggested changes for G-S.1. and Tables G-S.1.a. and G-S.1.b. and supported the proposal to amend G-S.1. and to include the marking requirements in a table format similar to other specific device codes. The WWMA also expressed a preference for the alternate Table G-S.1.a. and recommends that this item remain Informational for further review and discussion.

At their October 2008 Interim Meeting, NEWMA also recommended this item move forward as Informational.

At its 2008 Annual Meeting, the SWMA heard comments during its open hearings from Mr. Gordon Johnson, Gilbarco, proposing that the words "not acceptable" in the third column for the entry "By command or operator action" be replaced with an "X" and a reference to footnote 2. Mr. Wotthlie, Maryland, stated that he would support the change to an "X," but that a new footnote should be created; Will noted that, if the information is not going to be physically marked on a plate, the inspector would need a means to find the information without having to go to a CC to find out how to call it up. The SWMA acknowledged that this variation is already permitted for computer-based systems, but acknowledged that additional review is needed before proposing such a change. The SWMA believes that additional input is needed on this issue before it is ready to move forward as a Voting item. The SWMA S&T Committee is interested in comments from other organizations, including SMA on this issue. Consequently, the SWMA made this an Informational item on its agenda.

At the 2009 Interim Meeting, SMA commented that it has consistently opposed having different requirements between embedded and downloadable/programmable software-based devices and added that it continues to support the intent of the proposal and will continue to participate in the Software Sector discussions to develop alternate proposals for the marking of software-based devices. Several weights and measures officials expressed concerns that the proposed language does not specify how the identification information is to be retrieved if it is not continuously displayed noting this could result in several ways to access the information (e.g., passwords, display checks, dropdown menus). SMA added that the identification location information on the NTEP CC will become outdated anytime a manufacturer changes the way the information can be retrieved. They suggested that a limited number of methods to access the identification information be developed and specified as the only acceptable methods to retrieve identification information. This would make it easier for the inspector to verify the required identification information.

WMD noted that in 1992, the NCWM adopted S&T Committee agenda Item 320-6, S.6.3. Marking Requirements; Capacity by Division and recommended that Tables S.6.3.a. and S.6.3.b. (note 3) be interpreted to permit the required capacity and scale division markings to be presented as part of the scale display (e.g., displayed on a video terminal or in a liquid crystal display), rather than be physically marked on the device. WMD agrees with the interpretation and suggests that this interpretation could be expanded to other marking requirements (e.g., flow rates capacity, interval, etc.) and codes on a case-by-case basis, and that specific language (based on the above interpretation) be added to the applicable sections in HB 44.

Software Sector Co-chairman Mr. Jim Pettinato, FMC Technologies, stated that the Software Sector recommends that this item remain Informational to allow conference members to further study the proposal in order to develop a consensus on the format for Table G-S.1. Identification.

The Committee agreed with the format of the first version of Table G-S.1. Identification since the format matches the style of similar tables in HB 44. Consequently, the Committee agreed that this item should remain an Informational item for further review.

At the 2009 spring Software Sector Meeting, it was noted by several Sector members that the perceived scope of the original proposal has been extended by the modifications made by WMD and now appears to exceed both the purview and the intent of the Sector, and it has become difficult to discern its intentions. Based on the fact that the proposed table seems to have actually made the Sector's intent less clear, it was proposed by the chair to revisit this item in relation to the current text of G-S.1. to clarify exactly what real changes to Handbook 44 would be required to achieve the intent of the Sector. It was also noted that there was some validity to the SMA argument that there is no justification for differentiation of marking requirements based on device type (P or U). After additional lengthy discussions, the following modified versions of G-S.1 and or G-S.1.1 were drafted:

G-S.1. Identification. – All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect **<u>and manufactured after January 1, 201X</u>**, 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~~*** ***<u>software that is not part of a Type P (built-for-purpose) device.</u>;***
[Nonretroactive as of January 1, 1968]

(Amended 2003 **<u>and 201X</u>**)

(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~~*** ***<u>software-based electronic</u>*** *devices;*
[Nonretroactive as of January 1, 2004]

(Added 2003) **<u>(Amended 201X)</u>**

(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)

(e) *an NTEP CC number or a corresponding CC Addendum Number for devices that have a CC. 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 201X**)

G-S.1.1. ~~Location~~ Method of Marking Information for ~~Not-Built-For-Purpose~~ all Software-Based Devices. – *For* ***~~not-built-for-purpose, software-based~~*** *devices* ***manufactured after January 1, 201X,*** *either:*

(a) *The required information in G-S.1. Identification.* ***~~(a), (b), (d), and (e)~~*** *shall be permanently marked or continuously displayed on the device; or*

(b) *The CC Number shall be:*

(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."*

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.*

[Nonretroactive as of January 1, 2004]

(Added 2003) (Amended 2006 **and 201X**)

The Sector noted that though currently it is allowable to display the CC number via a menu, there has been some challenges locating this information in the field due to the vagueness of the term "easily recognized." Hence, since it is left to the interpretation of the NTEP laboratory to ascertain whether a device's method for displaying the CC number meets the requirements, this vagueness has not been addressed in this new recommendation.

Mr. John Roach (California NTEP Lab) indicated that if the proposed table, or some version thereof, is not eventually included as part of G-S.1. that it may be useful to incorporate a suitable table into Publication 14.

The Software Sector concluded that it does not wish to debate the merits of general marking requirements beyond that related to software identification and wishes only to address concerns related specifically to software. The Sector feels its proposed changes above better reflect the Sector's position. The Sector suggests that the following simplified version may better suit the purpose if WMD, and the Committee believes a table outlining general marking requirements would clarify the intent of paragraph G-S.1.

Table G-S.1.~~a~~ Identification
for Devices Manufactured on or after January 1, 201X

Required Marking	**Full Mechanical Devices and Separable Mechanical Elements**	**Electronic Devices, Software Based**
Manufacturer or CC holder ID	**Hard Marked**	**Hard Marked, Continuously Displayed, or Via Menu (display) or by command or operator action**
Model identification	**Hard Marked**	**Hard Marked, Continuously Displayed, or Via Menu (display) or by command (operator action)**
Serial number	**Hard Marked**	**Hard Marked, Continuously Displayed** [1]
Metrologically Significant Software version	**Not Applicable**	**Continuously Displayed, Via Menu (display) or by command (operator action)** [2]
CC number	**Hard Marked**	**Hard Marked or Continuously Displayed, or Via Menu (display) or by command (operator action)**[3]

[1]**Type 'U' devices need not have a non-repetitive serial number.**

[2]**If the manufacturer declares that the primary sensing element "software" is integral, has no end user interface and no print capability, the version/revision shall be hard marked on the device. Example: Primary sensing element may be Positive Displacement (P.D.) meter with integral correction, digital load cell (only for reference, not limiting).**

[3]**If the CC number is to be displayed via menu and/or submenu, the means of access must be easily recognizable. In addition, instructions on how to obtain the remaining required information not hard-marked or continuously displayed shall be included on the NTEP CC.**

(Added 201X)

Note that this new version of the table reflects the aforementioned changes proposed for the language in paragraph G-S.1. as well, homogenizing Type P and Type U requirements, with the exception of the serial number requirement being waived for standalone software. It was also noted that much of the information previously included in the separate proposed Table G-S.1.(b) was redundant as it is already stated verbatim in the text of G-S.1; hence the Sector questions the benefit of the WMD - proposed separate Table G-S.1.(b).

In an April 2009 letter to the Committee, Mr. Patoray, CoC, agrees with the recommendation of the Software Sector. In order for CoC to fully endorse this recommendation, CoC suggests one change for the NOTE in G-S.1.1. to read as follows:

> ***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.*

In the "***Note***" for paragraph G-S.1.1., there remains one item that is inconsistent with all other requirements for marking. It is noted that it indicates **only** the information in G-S.1. (a), (b), and (d), which intentionally leaves out information in G-S.1. (c) Serial Number. It is the position of CoC that there should be NO limitation, which is any different from other markings, on the marking of the serial number of a device in the General Code. As written, it would require only the serial number to be permanently marked or continuously displayed. Since this is the General Code Section of HB 44, CoC sees no reason to create this limitation. CoC recommends that this can be handled in the device specific code if there are any issues that might arise with allowing the serial number to be display via menu. CoC stated that is could fully support this item incorporating the above change.

At its 2009 Annual Meeting, the CWMA agreed with comments from weights and measures officials that there is a need to easily identify the software for the proposed software-based devices, especially during field inspections for "Type U" devices. They believe that a uniform or standard method for easily accessing identification information is needed to aid field inspections. The SMA stated there is no distinction between the proposed Type P and Type U devices and marking requirements should be the same for both devices. It was reported that the Software Sector had met a few weeks before the CWMA Annual meeting and that the Sector recommendations would be submitted to the committee and its report posted on the NCWM website prior to the NCWM Annual Meeting. Consequently, the CWMA recommends this item remain Informational.

At the 2009 NEWMA Annual Meeting, the members received similar comments from SMA and the Software Sector and took no position on this item pending its member review of the Software Sector's report.

At the 2009 NCWM Annual Meeting, the Committee reviewed the recommendations in the previous paragraphs from:

- the 2009 meeting of the Software Sector,

- a report of the 2009 spring meeting of the SMA opposing the marking requirement differences for "Type P" and "Type U" devices, and

- comments from Mr. Patoray, CoC, supporting the Software Sector's position with his suggested changes.

During the open hearings, the Committee received comments from the SMA, Stephen Patoray, and the Chairman of the Software Sector restating their previous positions and recommendations.

NIST WMD commented that some terminology in both the Software Sector's proposed "Table G-S.1. Identification" may need to be further defined. For example, what is meant by the term "hard-marked?" WMD believes that "hard marked" is the same as "permanently marked," which is already used in other sections of HB 44. If Committee believes a table outlining general marking requirements would clarify the intent of G-S.1., WMD recommends that the words "hard marked" be replaced by "permanently marked".

Consequently, the Committee agreed that this item remain Informational and that the regional weights and measures associations review the above information and provides the Committee with comments and recommendations.

At its 2009 Interim Meeting, the CWMA had lengthy discussions about providing the required identification information in a single uniform method. Some of the topics addressed were:

- A single operation or button is needed to view all software version information.

- Use a single function key to access or continuously display software version information.

- Electronic data for both Type U and Type P devices could be Hard Marked, Continuously Displayed or accessed by Command (operator action).

- The data is useless if it is not easy to access in the field.

- Concern about the cost of requiring a single designated button to access software version information.

The CWMA recommends this item remain Informational with the following changes to the Committee's recommendations in its 2009 Interim Report:

1. In proposed paragraph G-S.1.1.(a), add "or accessed by a command (operator action)" **and** delete subparagraph G-S.1.1.(b) (3) to read as follows:

   G-S.1.1. Location of Marking Information for Type U (Not-Built-For-Purpose), Software-Based Devices. – *For* ***Type U*** ~~***not-built-for-purpose, software-based***~~ *devices* ***manufactured prior to January 1, 201X,*** *either:*

   (a) The required information in G-S.1. Identification. (a), (b), (d), and (e) shall be permanently marked or continuously displayed on the device~~;~~ ***or accessed by a command (operator action);***

   (b) The CC Number shall be:

   (1) permanently marked on the device; ***or***

   *(2) continuously displayed**.***

2. Delete note 8 in "Table G-S.1. Notes on Identification."

3. Amend "Table G-S.1. Identification . . ." by deleting the three references to "via menu display," "Print Option (8)," adding "by command (operator action)," and deleting the language at the bottom of the table as shown in following revised table.

Table G-S.1. Identification
for Devices Manufactured on or after January 1, 201X
(For applicable notes, see Table G-S.1. Notes on Identification)

Required Marking	**Full Mechanical Devices and Separable Mechanical Elements**	**Type P Electronic Devices and Separable Elements**	**Type U Electronic Devices and Separable Elements**
Name, initials, or trademark of the manufacturer or CC holder	**Hard-Marked**	**Hard-Marked or Continuously Displayed**	**Hard-Marked, Continuously Displayed, or by command (operator action)**
Model identification information that positively identifies the pattern or design of the device (1)	**Hard-Marked**	**Hard-Marked or Continuously Displayed**	**Hard-Marked, Continuously Displayed, or (operator action)**
Non-repetitive serial number (2)	**Hard-Marked**	**Hard-Marked or Continuously Displayed**	**Not Acceptable**
Software version or revision (3)	**Not Applicable**	**Hard Marked (5), Continuously Displayed, or by Command (operator action) (6)**	**Continuously Displayed or (operator action)**
CC Conformance number or corresponding CC Addendum (4)	**Hard-Marked**	**Hard-Marked or Continuously Displayed**	**Hard-Marked (7) or Continuously Displayed**

(Added 201X)

During the open hearings at the 2009 WWMA Annual Technical Conference, Mr. Straub, speaking on behalf of SMA, indicated SMA continues to oppose this item, referring to comments made in conjunction with Item 310-2. He also noted that even if the designations of "Type U" and "Type P" were adopted, SMA would continue to oppose the proposed changes to G-S.1., noting that requirements should apply equally to the two different device types described. The WWMA also heard from Mr. Johnson, Gilbarco, who agreed with SMA's assessment. He also indicated that it would be desirable to have the option of using a menu to provide information, citing increasingly limited space in which to provide marking information, and noted it would be virtually impossible for their company to provide a full time display.

Based on the comments received and its position on Item 310-2 relative to corresponding definitions for the device types referenced in Item 310-3, the WWMA believes this item should remain Informational until the Software Sector has had an opportunity to review comments from the 2009 NCWM Annual meeting and any comments made at subsequent regional weights and measures association meetings.

At its 2009 Annual Meeting, the SWMA agreed that the Software Sector should continue to work on the proposal until it arrives at some final language for amending paragraphs G-S.1. Identification and G-S.1.1. Location of Marking Information for Not-Built-For Purpose, Software-Based Devices. The Software Sector should work with manufacturers in its development of the requirement and any table or other tools should provide further clarity on the intent of the marking requirements.

During its 2009 Interim Meeting, NEWMA stated that is supports the Committee's decision to keep this item Informational to allow updated comments from the regional weights and measures associations and other interested parties based on information in the summary of the March 2009 meeting of the Software Sector.

Additional background information on this item can be reviewed in the Committee's 2008 Final Report.

310-4 G-A.6. Nonretroactive Requirements (Remanufactured Equipment)

Source: WWMA and SWMA

Purpose: Clarify the application of nonretroactive requirements to devices which have been determined to have been "remanufactured."

Item Under Consideration: Amend HB 44 General Code paragraph G-A.6. Non retroactive Requirements by adding a new bullet (d) as follows:

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

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

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

(c) devices used in noncommercial applications ~~**which**~~ **<u>that</u>** are placed into commercial use after the effective date; **<u>and</u>**

(d) <u>devices remanufactured after the effective date.</u>

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

WWMA and SWMA proposal: Amend HB 44 General Code paragraph G-A.6. by adding the words "and remanufactured" as follows:

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

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

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

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

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

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

- Paragraph G-S.1.2. Remanufactured Devices and Remanufactured Main Elements is a non-retroactive requirement enforceable as of January 1, 2002. WMD believes that this paragraph was intended to apply to remanufactured devices and remanufactured main elements that have been placed into commercial service as of the effective date of the requirement, which is January 1, 2002.

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

Since G-A.6. is silent with respect to remanufactured devices and remanufactured main elements, G-S.1.2., in WMD's opinion, cannot be applied. This was clearly not the intent since, as indicated by its title, it was designed to apply to "remanufactured" equipment.

Because remanufactured devices compete with newly manufactured devices, WMD believes the intent of G-A.6. Nonretroactive Requirements is intended to include such equipment in the scope of the paragraph. That is, remanufactured devices and remanufactured main elements should have to comply with the most current nonretroactive requirements in effect as of the date the devices or elements are remanufactured.

A change is needed to G-A.6. to clarify the application of G-S.1.2. and other nonretroactive requirements, which WMD believes should apply to remanufactured devices and remanufactured main elements.

An additional reason to adopt the proposed language is that the proposed modification to G-A.6. would clearly support their actions in the event that weights and measures officials are challenged regarding the application of G-S.1.2. or other nonretroactive paragraphs,

It should be noted that device owners and remanufacturers may experience difficulty in complying with applicable nonretroactive requirements in instances where states have not previously applied them to remanufactured equipment. The extent to which this has occurred may become more evident as this issue is discussed within the regional weights and measures and industry associations and alternatives to alleviate this burden on existing equipment could be considered.

While developing this proposal, WMD contacted two retail motor fuel dispenser (RMFD) original equipment manufacturers and representatives from those companies both indicated that remanufactured RMFD's should comply with the most recent HB 44 nonretroactive requirements in effect as of the date they are remanufactured.

WMD also contacted the chairman of the Remanufactured Device Task Force that was formed by the NCWM BOD in 1999. The chairman indicated, that to the best of his recollection, there was no conscious discussion from the task force of how nonretroactive requirements were to apply to remanufactured equipment. He believes that different states may be enforcing nonretroactive requirements differently with respect to remanufactured equipment.

Research into past NCWM Conference Reports indicates that a proposal to change the NIST Handbook (HB44) definition of "manufactured device" was adopted by the NCWM in 2001. The previous definition, shown below and identified as the "2001 HB44 definition," included text which was intended (WMD believes) to include remanufactured devices. The new definition deleted that text ("new device or any other device") to the extent that the definition from 2002 forward only applies to devices shipped as new from the OEM.

2001 HB 44 Definition

> **manufactured device.** Any new device or any other device that has been removed from service and substantially altered or rebuilt.

2010 HB 44 definition

> **manufactured device.** Any commercial weighing or measuring device shipped as new from the original equipment manufacturer

The following is a brief history of paragraph ***G-S.1.2. Remanufactured Devices and Remanufactured Main Elements:***

- 1997 – A proposal to add a new paragraph addressing the required marking on RMFD's that had been resold for placement into service first appeared as an Informational item on the NCWM Specifications and Tolerances Committee agenda.

- 1999 – The NCWM appoints a task force to examine the required marking issues of remanufactured equipment. The primary responsibility of the task force was to develop a marking requirement proposal for NCWM consideration.

- 2001 – The task force proposed to add several new definitions and a General Code requirement (G-S.1.2.) to NIST Handbook 44. They also proposed changing the definition of "manufactured device" which already appeared in HB 44. Of importance, they removed from the definition language that linked devices that had been substantially altered or rebuilt to G-A.6.

- 2002 – The first year the marking requirement for remanufactured devices and remanufactured main elements appeared in HB 44 along with new definitions.

The proposed change will clarify how nonretroactive paragraphs apply to remanufactured equipment.

WMD notes that the issue of applying G-A.6. to remanufactured equipment is separate from that of determining when a device or element has been "remanufactured." Definitions found in Appendix D of HB 44 along with guidance developed by the NCWM Remanufactured Equipment Task Force can be used to assist jurisdictions in determining when a device or main element has been "remanufactured." The proposed change does not suggest changing these tools or their application. The proposed change is only to clarify the application of G-A.6. to devices that have been determined to have been "remanufactured."

Even if the proposed direction of solving this problem is not supported as written, WMD believes that some alternate language needs to be added to G-A.6. to clarify its application to remanufactured equipment.

At its 2009 Interim Meeting, the CWMA recommended that this item be given Developmental status. The CWMA states that the following questions need to be addressed prior to considering this as an Informational item.

1. How would the remanufacture date be verified?

2. Is there enough of a metrological change to a device to warrant a new CC?

3. Are the current definitions for remanufactured devices in HB 44 adequate to support this proposal?

4. Would the device be out of service pending a possible NTEP approval?

During their 2009 Annual Meeting, the WWMA and SWMA agreed that nonretroactive requirements are applicable to remanufactured equipment that is remanufactured after the effective date. The WWMA states it believes these items are competing with new and used devices and should, therefore, be subject to the same requirements. The WWMA and SWMA support the proposed NIST WMD language but ask the Committee to consider the alternative language proposed by the CWMA as shown in "Item Under Consideration."

The WWMA and SWMA recommend the proposal be included as a Voting item on the Committee's 2010 Agenda.

At its 2009 Interim Meeting, NEWMA stated it does not support this proposal because it is not clear what problem the proposal is trying to solve. Additionally, NEWMA stated that this proposal is redundant, since a remanufactured device is considered a new device with its own CC and, therefore, already has to meet code requirements.

320 SCALES

320-1A S.2.3.4. through S.2.3.7. Value of Tare Indication and Recorded Representations, and Appendix D. Definitions for Gross Weight Value, Net Weight Value, Net Weight, Tare, and Tare Weight Value

Source: 2009 Carryover Item 320-1C. (This item originated from the NTETC WS and first appeared on the Committee's 2007 agenda.)

Purpose: The tare proposals and proposed definitions are intended to provide uniform application of tare requirements during field inspections and additional support for the requirements for the operation of tare and preset tare, indications recorded representation of tare during NTEP evaluation that are currently based on interpretations of General Code requirements and NCWM Report of the 65th Committee on Specifications and Tolerances agenda Item 320-1 Tare (Pages 246-218).

Item Under Consideration: Add new paragraphs S.2.3.2. through S.2.3.6., and new "gross weight," "net weight," "net weight value", "tare," and "tare weight value" definitions to Appendix D.

Add new paragraphs S.2.3.2. through S.2.3.6. as follows:

> **S.2.3.4. Visibility of Operation. – Operation of the tare mechanism shall be visibly indicated on the instrument. In the case of instruments with digital indications, this shall be done by marking the indicated net value with the word "NET" or the symbol "N." "NET" may be displayed as "NET," "Net," or "net." If a scale is equipped with an indicator that allows the gross value to be displayed temporarily while a tare mechanism is in operation, the "NET" symbol shall disappear while the gross value is displayed.**
>
> **(Added 201X)**

S.2.3.5. Subtractive Tare Mechanism. – After any tare operation and while tare is in effect, an indicating or recording element shall not display nor record any values when the gross load (not counting the initial dead load that has been canceled by an initial zero-setting mechanism) is in excess of 105 % of scale capacity after tare has been taken.

(Added 201X)

S.2.3.6. Consecutive Tare Operations. – Repeated operation of a tare mechanism (including preset tare) is permitted for single transactions with one gross, one net, and multiple tare values. If more than one tare mechanism is operative at the same time, tare weight values shall be clearly designated (identified) with either "T" for tare or "PT" for preset tare, as appropriate, when indicated or printed.

(Added 201X)

S.2.3.7. Indication and Printing of Weighing Results.

(a) Gross weight values may be printed without any designation or by using a complete word or symbol. For a designation by a symbol, only uppercase "G" is permitted.

(b) If only net weight values are printed without corresponding gross or tare values, they may be printed without any designation or by using a complete word or symbol. The complete word "Net" or symbol "N" shall be used to designate a net weight as shown in S.2.3.3. Visibility of Operation. This applies also where semi-automatic zero-setting and semi-automatic tare balancing are initiated by the same key.

(c) Gross, net, or tare values determined by a multiple range instrument or by a multi-interval instrument need not be marked by a special designation referring to the (partial) weighing range.

(d) If net weight values are printed together with the corresponding gross and/or tare values, the net and tare values shall be identified at least by the corresponding symbols "N" and "T" or by complete words using all upper-case letters, all lower-case letters, or a combination of upper- and lower-case letters.

(e) If net weight values and tare values determined by different tare mechanisms are printed separately for single transactions with multiple gross, tare, and net values, they shall be suitably identified (e.g., vehicle sequentially loaded with mixed commodities).

(Added 201X)

Add the following new definitions to Appendix D:

gross weight value. Indication or recorded representation of the weight of a load on a weighing device, with no tare mechanism in operation. [2.20, 2.24]

(Added 201X)

net weight (net mass). The weight of a commodity excluding any materials, substances, or items not considered to be part of the commodity. Materials, substances, or items not considered to be part of the commodity include, but are not limited to, containers, conveyances, bags, wrappers, packaging materials, labels, individual piece coverings, decorative accompaniments, and coupons, except that, depending on the type of service rendered, packaging materials may be considered to be part of the service. For example, the service of shipping includes the weight of packing materials. [2.20, 2.24]

(Added 201X)

net weight value. Indication or recorded representation of the weight of a load placed on a weighing device after the operation of a tare mechanism. [2.20, 2.24]

(Added 201X)

tare. The weight of packaging material, containers, vehicles, or other materials that are not intended to be part of the commodity included in net weight determinations. [2.20, 2.24]
(Added 201X)

tare weight value. The weight value of a load determined by a tare mechanism. [2.20, 2.24]
(Added 201X)

Background/Discussion: Background information on this item can be found in the Background/Discussion paragraphs on agenda Item 320-1A in the 2009 Committee's Interim and Annual Reports.

During the NIST presentation on Tare during the 2009 Interim Meeting, the Committee heard several questions that indicated the need for additional clarification on:

- the justification for limiting the acceptable words and abbreviations for Gross, Tare, Preset Tare, and Net;
- what is meant by consecutive tare operations;
- whether or not itemized indications and recorded representations are required for each tare; and
- whether or not different indications and recorded representations are required for each tare value when tare and preset tare are used in the same transaction.

Consequently, the Committee recommended that this proposal remain an Informational item in its Interim Report and suggested that the WS further clarify the proposed language and consider providing examples of; 1) indications and recorded representations of tare and preset tare in consecutive tare transactions; and 2) the justification for limiting the acceptable words and abbreviations for Gross, Tare, Preset Tare, and Net.

During the 2009 Annual Meeting, the Committee received no additional comments on this proposal. However, "Tare: items 320-1A and 320-1B" on the 2009 Committee's agenda were not adopted, and consequently, the Committee recommended that the WS discuss and provide the Committee with an update on the WS position on the remaining Tare "Information" proposals for the Committee's 2010 Interim Agenda.

At its August 2009 Annual Meeting, the WS reviewed the background information regarding comments and actions during the 2009 NCWM Annual Meeting. The WS recommends that the remaining tare items (320-1A, 320-1B, 324-2A, 324-2B, and 324-C in the Committee's 2009 agenda) should be Withdrawn from the 2010 S&T Committee Agenda since the NCWM agreed with the SMA position that the tare proposals are not needed for HB 44.

Based upon comments received during their respective fall 2009 meetings and the 2009 NCWM Annual Meeting, the CWMA, WWMA, SWMA, and NEWMA recommends the remaining tare items be Withdrawn from the NCWM S&T Committee's 2010 Interim Agenda.

320-1B S.2.4. Preset Tare Mechanism and Appendix D – Definitions for Preset Tare

Source: 2009 Carryover Item 320-1D. (This item originated from the NTETC WS and first appeared on the Committee's 2007 agenda.)

Purpose: The tare proposals and proposed definitions are intended to provide uniform application of tare requirements during field inspections, allow the identification and printing of preset tares with the abbreviation "PT," and additional support for the requirements for the operation of tare and preset tare, indications recorded representation of tare during NTEP evaluation that are currently based on interpretations of General Code requirements and NCWM Report of the 65th Committee on Specifications and Tolerances agenda item 320-1 Tare (Pages 246-218).

Items Under Consideration: Add new paragraph S.2.4. and new preset tare definitions as follows:

S.2.4. Preset Tare Mechanism, Operation. – In addition to the provisions of paragraphs S.2.3. Tare and S.2.3.1. Scale Interval, a preset tare mechanism may be operated together with one or more tare devices provided:

(a) the preset tare mechanism complies with paragraph S.2.3.6. Consecutive Tare Operations,

(b) the preset tare operation cannot be modified or cancelled as long as any tare mechanism operated after the preset tare operation is still in use,

(c) the preset tare associated with a price look-up (PLU) shall be automatically cancelled at the same time a PLU is cancelled, and

(d) the preset tare values are designated by the symbol "PT"; however, it is permitted to replace the symbol "PT" with complete words.

A preset tare may operate automatically only if the preset tare value is clearly identified with the load to be measured (e.g., part of the product look-up information).

(Added 201X)

S.2.4.1. Indication of Operation. – It shall be possible to temporarily indicate the preset tare value (e.g., pressing a tare display button or by indicating a negative net weight with no load on the load-receiving element). In addition to the provisions of paragraph S.2.3.7. Indication and Printing of Weighing Results, the net value and at least the preset tare value is printed, with the exception of:

(a) a Class II or a Class III instrument and point-of-sale systems with a maximum capacity not greater than 100 kg (200 lb) used in direct sales to the public,

(b) price computing scales, and

(c) nonautomatic weigh/price labeling scales.

(Added 201X)

Add new preset tare definitions to Appendix D as follows:

preset tare. A numerical value, representing a weight that is entered into a weighing device (e.g., via keyboard entry, recalling from stored data, or entered through an interface) and is intended to be applied to weighings without determining individual tares.

(Added 201X)

preset tare mechanism. A part of a weighing system for subtracting a preset tare value from a gross or net weight value and indicating the result of the calculation as a net weight. The weighing range for net loads is reduced accordingly.

Types of preset tare mechanisms include:

keyboard tare. The operation of keys on a keyboard. For example: On a scale where d = 0.01 with a typical 10-key keyboard with values 0 through 9, pushing numbered key 5, or pressing the 0 then 5 keys results in a 0.05 tare value.

digital tare. By the repeated operation of a particular key, tare values are entered in amounts equal to the value of a scale division. For example, on a 25 lb x 0.01 lb scale, each time a specifically marked key is depressed, a tare is entered equal to 0.01 lb. If that key were depressed five times, the tare value would be equal to 0.05 lb.

programmable tare. Preset (predetermined) tare values that are stored in memory for multiple transactions. They may be part of the product information on PLU (product look-up), preset product, or tare keys.

stored tare. Preset (predetermined) tare values that are stored in memory for multiple transactions and are used predominately in vehicle scale applications.

percentage tare. A preset tare value, expressed as a percentage (i.e., 5.6 %), that represents the percentage of tare material compared to the gross or net weight of the commodity. A percentage tare is one form of proportional tare.

proportional tare. A preset tare value, automatically calculated by the scale, proportional to the gross weight indicated by the scale. A proportional tare can be a percentage tare or a fixed tare value relative to a range of gross weights (i.e., a 10 g tare for gross weights between 0 and 2 kg, a 20 g tare for gross weights from 2 and 4 kg, etc.). A proportional tare is, therefore, not limited to being a percentage tare.

[2.20, 2.24]

(Added 201X)

Background/Discussion: Background information on this item can be found in the Background/Discussion paragraphs on agenda Item 320-1A in the 2009 Committee's Interim and Annual Reports.

During the NIST presentation on Tare during the 2009 Interim Meeting, the Committee heard several questions that indicated the need for additional clarification on the justification for limiting the acceptable words and abbreviations for Preset Tare. Consequently, the Committee recommended that this proposal remain an Informational item in its Interim Report.

During the 2009 Annual Meeting, the Committee received no additional comments on this proposal. However, "Tare: items 320-1A and 320-1B" on the Committee's 2009 agenda were not adopted and consequently, the Committee recommended that the WS provide the Committee with an update on the WS position on the remaining Tare "Information" proposals for the Committee's 2010 Interim Agenda.

At its August 2009 Annual Meeting, the NTETC WS reviewed the background information regarding comments and actions during the 2009 NCWM Annual Meeting. The WS recommends that the remaining tare items (320-1A, 320-1B, 324-2A, 324-2B, and 324-C in the Committee's 2009 agenda) should be Withdrawn from the 2010 S&T Committee Agenda since the NCWM agreed with the SMA position that the tare proposals are not needed for HB 44.

Based upon comments received during their respective fall 2009 meetings and the 2009 NCWM Annual Meeting, the CWMA, WWMA, SWMA, and NEWMA recommends the remaining tare items be Withdrawn from the NCWM S&T Committee's 2010 Interim Agenda.

320-2 S.2.1.7. Automatic Zero-Setting Mechanism

Source: 2009 Carryover Item 320-3. This item originated from the NTETC Weighing Sector and S&T Committee and first appeared on the Committee 2009 Interim Agenda.

Purpose: Many scales throughout the world are equipped with an automatic zero-setting feature that is typically disabled for the U.S. marketplace. This feature is not addressed or defined in HB 44, is not listed on NTEP CCs.

This proposal is intended to:

1. Establish automatic zero-setting limits to be consistent with the international recommendations in OIML R 76,
2. Add a new definition for automatic zero-setting mechanism,
3. Amend the definition for automatic zero-tracking mechanism by deleting "automatic" since the word is repeated in the definition,
4. Move the definition for automatic zero-tracking mechanism to a stand-alone definition as to clarify that zero tracking does is intended to maintain a zero condition and not set the device to zero, and
5. Move the current definition for initial zero-setting mechanism under the broad definition of "zero-setting mechanism."

Item Under Consideration: Add a new paragraph S.2.1.7. and definition for Automatic Zero-Setting Mechanism as follows:

S.2.1.7. Automatic Zero-Setting Mechanism. – If equipped, an automatic zero-setting mechanism shall operate only when the indication has remained;

(a) stable according to S.2.5. Damping Means, and

(b) below zero for at least 5 seconds.

The maximum effect of automatic zero-setting mechanism is limited to 4 % of the nominal capacity of the scale and is a sealable parameter.
(Added 201X)

Amend paragraph S.2.1.3.3. as follows:

S.2.1.3.3. Means to Disable ~~Automatic~~ Zero-Tracking *and* ***Automatic Zero-Setting Mechanisms on Class III L Devices. –*** *Class III L devices equipped with ~~**an**~~ ~~**automatic**~~ zero-tracking* ***and automatic zero-setting*** *mechanism**s** shall be designed with a sealable means that would allow zero-tracking* ***and automatic zero-setting*** *to be disabled during the inspection and test of the device.*
[Nonretroactive as of January 1, 2001]

(Amended 201X)

Amend HB 44 Appendix D by adding a new definition for automatic zero-setting mechanism, move the current definition for initial zero-setting mechanism under the broad heading of type of zero-setting mechanism, and move the definition for automatic zero-tracking mechanism to a stand-alone definition as follows:

zero-setting mechanism. Means provided to attain a zero balance indication with no load on the load-receiving element. **Four** ~~Three~~ types of these mechanisms are: [2.20]

automatic zero-setting mechanism. Automatic means provided to maintain the zero balance indication without the intervention of an operator. [2.20, 2.22, 2.24]

(Added 201X)

~~**automatic zero-tracking mechanism.** Automatic means provided to maintain the zero balance indication, within certain limits, without the intervention of an operator. [2.20, 2.22, 2.24]~~

initial zero-setting mechanism. Automatic means provided to set the indication to zero at the time the instrument is switched on and before it is ready for use. [2.20]

(Added 1990)

manual zero-setting mechanism. Nonautomatic means provided to attain a zero balance indication by the direct operation of a control. [2.20]

semiautomatic zero-setting mechanism. Automatic means provided to attain a direct zero balance indication requiring a single initiation by an operator. [2.20]

(Amended 2010)

~~**automatic**~~ **zero-tracking mechanism. Automatic means provided to maintain the zero balance indication, within certain limits, without the intervention of an operator.** ~~**See "automatic zero-tracking mechanism" under "zero-setting mechanism."**~~[2.20, 2.22, 2.24]

(Amended 2010)

Background/Discussion: At its 2008 Annual Meeting, the NTETC WS discussed an issue on an increasing number of scales submitted for NTEP evaluations that include an "automatic zero-setting" feature not addressed in NIST HB 44. It has been noted that many devices are built for a global marketplace and that the operation of this "automatic zero-setting" device may be functional on the device when installed in the United States. Currently, HB 44 does not define this function and NCWM Publication 14 has no test to determine if the device submitted for evaluation has such a function, or if it is sealable. Additionally, NTEP reported that, on a scanner/scale that had been submitted for NTEP evaluation, the automatic zero-setting feature was discovered and found to work in both the positive and negative directions and could be activated or deactivated without breaking a security seal or changing the audit trail information. The operation of the feature in the positive direction does not even comply with R 76. Competitors have also commented to NTEP that they had to disable this feature because it was not allowed by other NTEP weighing labs.

In the past, several of the NTEP labs, when asked about this "feature," have indicated that since it does not meet the definition of an "automatic zero-tracking mechanism," it is not allowed. Additionally, the NTETC WS agreed that HB 44 does not clearly state that this function is not allowed. This led to incorrect interpretations of Section 2.20. Scales paragraphs S.1.1.(c) (Zero Indication – ". . . return to a continuous zero indication") and S.1.1.1.(b) (Digital Indicating Elements – *"a device shall either automatically maintain a "center-of-zero" condition. . ."*) and could also be interpreted to allow the automatic zero-setting device as described in R 76. This interpretation was not the intent of the HB 44 requirements referenced above.

The WS concluded the following:

1. There is a problem that needs to be solved, based on the current information or lack of information in HB 44.

2. There are no technical reasons why the feature automatic zero-setting as described in OIML R 76 should not be included in NIST Handbook 44.

3. The feature may not be suitable for all applications if it is allowed to function with both positive and negative weight indications.

4. Language will need to be developed for NCWM Publication 14 to either test for the correct function of "automatic zero-setting" or test to determine that the device does not have "automatic zero-setting" and it is a sealable parameter.

The WS established a small WG to develop language to be submitted to the NCWM S&T Committee and to make a recommendation addressing the suitability of scales with the capability to automatically set a positive weight indication to zero. This group, which included Mr. Scott Davidson (Mettler-Toledo), Mr. Scott Henry (NCR), Mr. Steve Cook (NIST Technical Advisor), and Mr. Stephen Patoray (CoC, LLC), volunteered to develop a proposal for the S&T Committee. (Todd Lucas, Ohio NTEP laboratory, and Jim Truex, NTEP Administrator, also contributed to the discussions and subsequent proposal.) Additionally, the WS agreed to review the language developed by the WG to confirm its support of the proposed language.

In the process of developing the proposal, the WG recommended the following:

1. Make the proposal to add automatic zero-setting "retroactive" since the group is aware that the feature has been included on several scales for nearly 20 years and may not have been activated. The group considered alternate retroactive dates, but felt that the proposed requirements for the feature should be applicable to all scales incorporating this feature. Additionally, NCWM Publication 14 NTEP technical policies state that only the standard features and options that have been evaluated will be included on the CC. As a result, an NTEP applicant will have to submit an application to NTEP in order to have the automatic zero-setting feature listed on an existing CC.

2. The automatic zero-setting mechanism shall be limited to operating only when the scale indication is below zero. The group discussed allowing the feature to operate in both directions. Although there may be valid reasons for allowing it in the positive direction, the group felt that legitimate objects on a scale could be inadvertently (or intentionally) zeroed without an obvious indication to the customer or operator when the scale was indicating zero at the start of a transaction.

3. The automatic zero-setting mechanism should be considered as a "sealable parameter" since there are applications where it is required to be disabled, or scale parameters, such as the time before initiating automatic zero-setting, motion detection, and capacity limitations can be adjusted beyond the requirements in the proposal.

4. Publication 14 evaluation and field examination procedures should be amended to verify that the automatic zero-setting mechanism cannot set the scale to a zero indication in less than five seconds; it can only operate if it complies with motion detection requirements, and its effect on the nominal scale capacity is no larger than 4 %.

5. The automatic zero-setting mechanism should be capable of being disabled for testing purposes for the same reasons that zero-tracking is capable of being disabled for Scales Code Class III L devices.

6. The group noted the current definition for initial zero-setting mechanism as a type of zero mechanism and should be included with the definition on zero-setting mechanism as shown in the recommendation.

7. The Committee is asked to consider recommending changing "automatic zero-tracking" to "zero-tracking" throughout the weighing codes in order to reduce confusion with the term and definition for "automatic zero-setting." Additionally, the word "automatic" is redundant for zero-tracking since it is used in its definition.

The WG did not have sufficient time to both develop the proposal and ballot the NTETC WS prior to the cutoff date for submitting items to the Committee. The responses to the ballot indicated that eight WS members responded to the ballot of which six voted in favor of the proposed language. It should be noted that two of the affirmative votes stated that their vote was provisional on the basis that the reference to the 4 % of scale capacity limitation be removed from the proposal. Two members opposed that item stating that the language should not be rushed through the S&T Committee and that the feature should operate with either negative or positive weight indications.

At the 2009 NCWM Interim Meeting, the Committee heard comments from the SMA stating that it was in favor of the proposal, provided the reference to the 4 % of scale capacity limitation is removed from the proposal. Mr. Paul Lewis, Rice Lake Weighing, recommended that the proposal be discussed by the regional weights and measures associations before it is ready for a vote. Mr. Ted Kingsbury, Measurement Canada (MC), stated that the language in the proposal is identical to Canadian requirements and that it is consistent with the recommendations in R 76. Any changes to the proposal involving the 4 % capacity limitation and the ability to operate in the positive direction would require that MC perform additional testing for devices submitted under the United States/Canada Mutual Recognition Agreement. Mr. Flocken, Mettler-Toledo, also pointed out the inclusion of the term and definition for "automatic zero-tracking mechanism" should stand-alone and not be included as a type of zero-setting mechanism in order to be consistent with OIML R 76. Mr. Cook, NIST Technical Advisor, added that he had received an earlier comment that the word "automatic" should be deleted from the term since the word is used in the definition and that it is not used in the corresponding term in R 76 and suggested that the Committee consider developing a proposal to delete the word "automatic" in the term "automatic zero-tracking" throughout HB 44.

The Committee reviewed the WS ballot results and comments it received during the open hearing. The Committee agreed that there was no clear consensus among the WS members and recommended that this proposal remain an Informational item. The Committee agreed with Mr. Flocken to move the definition of "automatic zero-tracking." The Committee also asked that the NTEP labs and the WS further discuss this item, develop a consensus position, and forward its recommendations to the Committee and that they also consider the suggestion from Mr. Cook to amend the term "automatic-zero tracking."

At its 2009 Spring Meeting, SMA opposed the language in the Interim Report and took the position that to be fair to the buyer and seller, the recommendation should include the ability to zero the indication in both a positive and negative direction.

During their 2009 Annual Meetings, CWMA and NEWMA heard comments from SMA in opposition of this item. Other comments supporting the proposal indicated there is a potential to zero off a load intended to be weighed if the feature were allowed to be operate in the positive direction. It was also reported that test weights were inadvertently zeroed during a routine increasing-load by several NTEP certified scanner/scales that were configured with this feature (i.e., zero-setting was configured to operate in the positive direction). Consequently, the CWMA agreed that automatic zero-setting mechanism should operate only in a negative condition or that the feature be prohibited, and they recommended the item stay "Informational." NEWMA supports the continued review, comments, and work on this item.

During the 2009 NCWM Annual Meeting open hearing, the Committee heard support of the SMA position on this item from several scale manufacturers. WMD stated that if the Committee chooses to allow automatic zero-setting feature, the language should be consistent with R76 in regards to the stipulation that only the negative weight indication permitted to automatically rezero and added that there is too great a potential for a load that is intended to be weighed to be unintentionally (or fraudulently) zeroed. Should the Committee choose to not allow this feature, WMD recommends that the Committee develop a proposal that expressly prohibits the automatic zero-setting feature. In either case, access to enable or disable the feature should be protected by an approved security means on any scale that can be configured with this feature. Additionally, the Committee agrees that the WS needs support from HB 44 in order to evaluate the feature if the requirement is adopted or verify that it can be disabled if the feature is to be prohibited on weighing devices.

The Committee agreed to leave this proposal on the agenda as an Informational item and requested that the NTETC WS discuss the comments and suggestions from the 2009 Interim and Annual Meetings and provide additional feedback to the Committee on the recommendation that either supports the proposal or recommends language for HB 44 prohibiting the feature.

At the August 2009 NTETC WS Meeting, the NIST Technical Advisor provided the WS with an update on the status and additional discussions on this item since the 2009 Interim and Annual Meetings and suggested that the WS develop a consensus position on this item and forward its conclusion to the S&T Committee. The WS discussed the following possible positions to forward to the S&T Committee.

1. Allow the feature to operate only when below zero with a capacity limit (as shown in 2009 NCWM Annual Report Committee Recommendation).

2. Consider the Spring 2009 SMA position to allow the feature to operate in either direction with no capacity limit.

3. Consider HB 44 language to prohibit the feature.

4. Make no changes to HB 44.

5. Make an alternate suggestion to amend the proposal by limiting the feature to Point-of-Sale systems interfaced with scales.

The WS discussed the options in great detail and reached a consensus among the attendees that this feature does not have any value in the U.S. marketplace, and can potentially facilitate inaccurate weight determinations against either the buyer or the seller. The WS changed its 2008 position and now recommends that no changes are needed in to address this feature in HB 44.

At its 2009 Interim Meeting, the CWMA recommended that this item remain "Informational." The CWMA added that this feature should be disallowed and recounted comments from its 2009 Annual Meeting about the accidental zeroing of weights during an inspection. The CWMA believes that the potential for this to happen still exists.

During the open hearings at the 2009 WWMA Annual Technical Conference, Lou Straub, representing SMA, indicated that SMA opposes this item, noting that a scale should be able to zero off loads in both positive and negative directions. Darrell Flocken, speaking on behalf of the WS, indicated that the WS originally proposed this issue to address a situation in which one company's device was permitted to automatically re-zero unlimited amounts of weight from the scale after a programmable period of time. While the WS was not comfortable with the operation of this feature when it was ultimately brought to light, they made an attempt to propose the addition of language to NIST Handbook 44 to recognize the feature in order to avoid putting other manufacturers at a competitive disadvantage. After much discussion and hearing many comments on this issue, the WS has since reconsidered its position and believes that its original inclination to oppose the recognition of the feature was correct. The WS feels it can address this through the type evaluation process and believes that the proposed changes to HB 44 are no longer necessary.

Based upon the comments received during this meeting and the 2009 NCWM Annual Meeting, the WWMA recommends this item and corresponding items in Item 322-1 and Item 324-1 be Withdrawn from the NCWM S&T Committee's 2010 Interim Agenda.

At its 2009 Annual Meeting, the SWMA recommended making the proposal to add a new paragraph S.2.1.7. and associated definition for Automatic Zero-Setting Mechanism an Informational item. The SWMA heard the feature conflicts with the current operation of zero-tracking and the feature is not clearly defined. Furthermore, one manufacturer has configured the feature to operate with both positive and negative weight indications, thus conflicting with R 76 requirements. If the NCWM S&T Committee agrees to address this feature, the language should harmonize with R 76.

During its 2009 Interim Meeting, NEWMA agreed with the comments and recommendations from the WWMA and recommends this item be Withdrawn.

320-3 T.N.4.5.1. Time Dependence: Class II, III, and IIII, T.N.4.5.2. Time Dependence: Class III L, and T.N.4.5.3. Zero Load Return: Non-automatic Weighing Instruments.

Source: National Type Evaluation Technical Committee - Weighing Sector

Purpose: This proposal is intended to align creep recovery tolerances on scales with the equivalent tolerances for load cells that were adopted at the 2009 NCWM Annual Meeting.

Item Under Consideration: Amend Handbook 44 Section 2.20 Scales Code paragraphs T.N.4.5.1. Time Dependence: Class II, III, and IIII Non-Automatic Weighing Instruments, and T.N.4.5s.2. Time Dependence: Class III L Non-Automatic Weighing Instruments, and add new paragraph T.N.4.5.3. Zero-Load Return - Non- Automatic Weighing Instruments as follows:

T.N.4.5.1. Time Dependence: Class II, III, and IIII Non-automatic Weighing Instruments. – A non-automatic weighing instrument of Classes II, III, and IIII shall meet the following requirements at constant test conditions. During type evaluation, this test shall be conducted at 20 °C ± 2 °C (68 °F ± 4 °F):

(a) When any load is kept on an instrument, the difference between the indication obtained immediately after placing the load and the indication observed during the following 30 minutes shall not exceed 0.5 e. However, the difference between the indication obtained at 15 minutes and the indication obtained at 30 minutes shall not exceed 0.2 e.

(b) If the conditions in (a) are not met, the difference between the indication obtained immediately after placing the load on the instrument and the indication observed during the following 4 hours shall not exceed the absolute value of the maximum permissible error at the load applied.

~~**(c) The deviation on returning to zero as soon as the indication has stabilized, after the removal of any load which has remained on the instrument for 30 minutes, shall not exceed 0.5 e.**~~

~~**For a multi-interval instrument, the deviation shall not exceed 0.5 e_1 (where e_1 is the interval of the first partial weighing range or segment of the scale).**~~

~~**On a multiple range instrument, the deviation on returning to zero from Max_i (load in the applicable weighing range) shall not exceed 0.5 e_i (interval of the weighing segment). Furthermore, after returning to zero from any load greater than Max_1 (capacity of the first weighing range) and immediately after switching to the lowest weighing range, the indication near zero shall not vary by more than e_1 (interval of the first weighing range) during the following 5 minutes.**~~

(Added 2005) (Amended 2006 **and 2010**)

T.N.4.5.2. Time Dependence: Class III L Non-automatic Weighing Instruments. – A non-automatic weighing instrument of Class III L shall meet the following requirements:

(a) When any load is kept on an instrument, the difference between the indication obtained immediately after placing the load and the indication observed during the following 30 minutes shall not exceed 1.5 e. However, the difference between the indication obtained at 15 minutes and the indication obtained at 30 minutes shall not exceed 0.6 e.

(b) If the conditions in (a) are not met, the difference between the indication obtained immediately after placing the load on the instrument and the indication observed during the following 4 hours shall not exceed the absolute value of the maximum permissible error at the load applied.

~~**(c) The deviation on returning to zero as soon as the indication has stabilized, after the removal of any load which has remained on the instrument for 30 minutes, shall not exceed one-half of the absolute value of the applicable tolerance for the applied load for Class III L devices.**~~

(Added 2005) **(Amended 2010)**

T.N.4.5.3. Zero Load Return: Non-automatic Weighing Instruments. – A non-automatic weighing instrument shall meet the following requirements at constant test conditions. During type evaluation, this test shall be conducted at 20 °C ± 2 °C (68 °F ± 4 °F). The deviation on returning to zero as soon as the indication has stabilized, after the removal of any load which has remained on the instrument for 30 minutes shall not exceed:

(a) 0.5 e for Class I, II, and IIII devices,

(b) 0.5 e for Class III devices with 4000 or fewer divisions,

(c) 0.83 e for Class III devices with more than 4000 divisions, or

(d) one-half of the absolute value of the applicable tolerance for the applied load for Class III L devices.

For a multi-interval instrument, the deviation shall not exceed 0.83 e_1 (where e_1 is the interval of the first partial weighing range or segment of the scale).

On a multiple range instrument, the deviation on returning to zero from Max_i (load in the applicable weighing range) shall not exceed 0.83 e_i (interval of the weighing segment). Furthermore, after returning to zero from any load greater than Max_1 (capacity of the first weighing range) and immediately after switching to the lowest weighing range, the indication near zero shall not vary by more than e_1 (interval of the first weighing range) during the following 5 minutes.

(Added 20XX)

Background/Discussion: During the 2009 Annual Meeting, the Committee agreed with the comments that the relaxation of tolerances may impact existing zero-tracking and creep recovery requirements for scales and may result in increased rejection rates unless the language is amended. The Committee encouraged the NTETC WS or other interested parties to submit proposals that address areas affected by this change.

The recently adopted changes to zero-load return tolerance for load cell created a technical inconsistency between load cells and scales that incorporate these scales (i.e., in some cases, the tolerance is larger for the load cell that the equivalent tolerance for the scale). This proposal will correct the inconsistencies to ensure that scales will not fail creep recovery due to the increased tolerance applicable to a suitable and appropriate load cell installed in the scale.

At is 2009 meeting, the NTETC WS reviewed the report of the S&T Committee and the language adopted by the NCWM. The WS noted that the Committee discussion included comments that there is a relationship between load creep recovery and a scales ability to return to a zero-balance condition after a load had been on the load-receiving element over a period of time, and that the WS should review the zero-tracking requirements and creep recovery tolerances for scales.

The WS agreed that HB 44 Scales Code paragraph T.N.4.1. should be amended to coincide with the changes to T.N.4.6. Mr. Nigel Mills (Hobart) submitted a proposal to the WS to amend creep recovery requirements for scales to coincide with the creep recovery tolerance adopted for load cells. The WS agreed with the proposed language and requested that Mr. Cook (NIST) and Mr. Davidson (Mettler-Toledo) develop the proposal as shown above and submit to the Committee.

The WS considered the Committee's comments on the impact of the amended load cell creep recovery tolerance and agreed zero-tracking requirements due to manufacturers designing scales and separable weighing/load-receiving elements with load cell capacities that are typically larger than the scale capacities, and that loading a scale to 90 % capacity for 30-minutes (a test conducted during type evaluation) rarely occurs in most Class III applications.

320-4 UR.2.6. Approaches.

Source: Western Weights and Measures Association

Purpose: This proposal is intended to provide clear guidelines for the width, and length, a level plane for approaches at temporary vehicle scale installations of less than six months.

Item Under Consideration: Amend Scales Code paragraph UR.2.6.1. as follows:

UR.2.6.1. Vehicle Scales. *– On the entrance and exit end(s) of a vehicle scale* ~~***installed in any one location for a period of 6 months or more***~~*, there shall be a straight approach as follows:*

(a) *the width at least the width of the platform,*

(b) *the length at least one-half the length of the platform but not required to be more than 12 m (40 ft), and*

(c) *not less than 3 m (10 ft) of any approach adjacent to the platform shall be* ***constructed*** ***~~of concrete or similar durable material to ensure that this portion remains smooth and level and in the~~*** **<u>on the</u>** *same plane as the platform****.*** ***~~However, grating of sufficient strength to withstand all loads equal to the concentrated load capacity of the scale may be installed in this portion.~~*** *Any slope in the remaining portion of the approach shall ensure (1) ease of vehicle access, (2) ease for testing purposes, and (3) drainage away from the scale.*

<u>Scales installed in any one location for a period of 6 months or more shall have approaches constructed of concrete or similar durable material to ensure that this portion remains smooth and level and in the same plane as the platform; however, grating of sufficient strength to withstand all loads equal to the concentrated load capacity of the scale may be installed in this portion.</u>
[Nonretroactive as of January 1, 1976]

(Amended 1977, 1983, 1993, **~~and~~** 2006**, and 201X**)

Background/Discussion: At its 2009 Annual Meeting, Doug Deiman, Alaska Department of Transportation submitted the above proposal stating that this amendment to Scales Code paragraph UR.2.6.1. will give clear design and instruction for approaches at temporary vehicle scale installations of less than six months. Currently, HB 44 leaves approaches for temporary vehicle scales unregulated and does not address: a) safety; b) access to testing; and c) scale perseveration issues that were originally considered when adopting UR.2.6.1. in 1975. Doug added that discussions with two scale manufacturers have indicated that there would be universal agreement to this addition to the scale code. Additionally, costs to scale owners are not anticipated as manufacturers' approach installation instructions are usually more stringent than this proposed change. The benefits will be measured in greater scale longevity, reduced maintenance costs, greater safety for employees, and better access for calibration and testing.

The WWMA agreed to recommend that the NCWM S&T Committee include the above proposal to amend Scales Code paragraph UR.2.6.1. Vehicle Scales, to provide clear guidelines for installing approaches at temporary vehicle scale installations of less than six months.

321 BELT-CONVEYOR SCALE SYSTEMS

321-1 N.3.1.4. Check for Consistency of the Conveyor Belt Along Its Entire Length

Source: Carryover Item 321-1. This item originated from the 2008 Western Weights and Measures Association (WWMA) (This item first appeared on the 2008 Committee's Developing Items Section of its agenda as Item 360-2 Part 3 Item 2)

Purpose: The BCS Work Group agrees that the existing language in N.3.1.4. results in an excessive allowance for the variation in a belt with larger minimum division sizes. Conversely, the 3 division requirement can impose an excessively narrow restriction for belt-conveyor scales with smaller minimum divisions. The proposed amendment corrects the issue and makes the allowable variation independent of division size.

Item Under Consideration: Amend NIST Handbook 44, Section 2.21. Belt Conveyor Scales (BCS) Systems Code, paragraph N.3.1.4. as follows:

N.3.1.4. Check for Consistency of the Conveyor Belt Along Its Entire Length. – <u>During a zero-load test, the total change indicated in the totalizer during one revolution of the belt shall not exceed 0.18 % of the load that would be totalized at scale capacity for the duration of the test. The end value of the zero-load test must meet the ± 0.06 % requirement of paragraphs N.3.1.2. Initial Stable Zero and N.3.1.3. Test for Zero Stability.</u> ~~After a zero-load test with flow rate filtering disabled, the totalizer shall not change more~~

~~than plus or minus (± 3 d) 3.0 scale divisions from its initial indication during one complete belt revolution.~~

(Added 2002) (Amended 2004 **and 201X)**

Background/Discussion: At its 2007 Annual Meeting, the WWMA received a proposal from the Belt-Conveyor Scale Work Group (BCS WG) to amend paragraph N.3.1.4. The BCS WG stated that existing language in N.3.1.4. results in an excessive allowance for the variation in a belt. However, for belt-conveyor scales that can benefit from a smaller minimum division, the 3-division requirement can impose an excessively narrow restriction. It should be noted that variations in belt weight tend to be sinusoidal. In other words, the error caused by belt variations would be canceled if the material test were conducted using complete revolutions. The maximum belt variation would occur at 0.5, 1.5., 2.5, etc., revolutions. However, material tests are rarely conducted using complete revolutions of the belt.

During the 2008 NCWM Interim Meeting, the Committee was informed that the USNWG on Belt-Conveyor Scales was planning to further develop the proposal during their February 2008 meeting. During that meeting, the WG discussed this item and concluded that the language needs further development before a consensus can be reached and recommended this item remain as a Developing item.

At its 2008 Annual Meeting, the WWMA heard comments that the item is sufficiently developed and is an improvement over the existing language in HB 44. The Committee agreed and recommended that this proposal move forward as a Voting item.

During the 2009 NCWM Interim Meeting, the Committee heard a comment from Bill Ripka, Thermo Ramsey, supporting the proposal as written in the Committee's recommendation and adding that the current language in HB 44 stating the current 3 scale interval deviation from an initial indication can lead to significant errors in scale accuracy. The Committee agreed with the comments from Bill Ripka and recommended this item move forward as a Voting item.

At the 2009 Annual Meeting, the Committee received comments and recommendations from the February 2009 meeting of the BCS WG. The members of the WG came to general agreement that with regard to these systems, the conveyor belt needs to be uniform (minimum variations in the weight per unit of length of the belt), but the statement as it exists in the Committee's Interim Report is not well understood. The variation during a revolution of the belt is most important and will exhibit the most impact for BCS applications that may use a portion of a belt revolution to deliver a weighment (e.g., 2.5 belt revolutions). This could occur when loading individual trucks or railcars, or in some cases, could occur with the quantity for verification testing. For large quantities, such as loading a unit train, the error becomes insignificant.

The BCS WG reported that, after their meeting adjourned, an extended session of the meeting took place with a smaller group. The smaller group developed an amended proposal. However, the smaller group recommended that this item not go forward as a Voting item, but be given Informational status to allow more time to consider developing a revised proposal and to conduct additional research the appropriate tolerance. The entire BCS WG was polled on the smaller group's recommendation. Two responses agreed with the recommendation that this item needed further review and development and its status be made "Informational."

During the open 2009 hearing, the Committee received comments from Bill Ripka, Thermo Ramsey and NIST WMD supporting the recommendation from the BCS WG. The Committee agreed that with the WG that this item needs more time to conduct additional research to determine the appropriate tolerance and revise the proposal and agreed to keep this item on its agenda as "Informational."

(See also the Committee's 2008 Annual Report for additional background information in Developing Item 360-2 Part 3 Item 2.)

322 AUTOMATIC BULK-WEIGHING SYSTEMS

322-1 S.2.1. Zero-Load Adjustment

Source: 2009 Carryover Item 322-1. This item originated from the NTETC Weighing Sector and S&T Committee and first appeared on the Committee's 2009 Interim Agenda.

Purpose: This proposal is intended to prohibit the automatic zero-setting mechanism for the same reasons that zero-tracking is prohibited (incorrect net weight determinations may occur when unintentional and unobserved zeroing or tracking off of material retained in a hopper).

Item Under Consideration: Amend HB 44 Section 2.22. Automatic Bulk-Weighing Systems by amending paragraph S.2.1.3.3. as follows:

> **S.2.1. Zero-Load Adjustment.** – The weighing system shall be equipped with manual or semiautomatic means by which the zero-load balance or no-load reference value indication may be adjusted. ~~An a~~**<u>A</u>**utomatic zero-tracking **<u>and automatic zero-setting</u>** mechanism**<u>s</u>** ~~is~~**<u>are</u>** prohibited.
>
> **(Amended 201X)**

Background/Discussion: At its 2008 Annual Meeting, the NTETC Weighing Sector held a discussion about the increasing number of scales submitted for NTEP evaluations that include an "automatic zero-setting" feature, which is not addressed in NIST HB 44. It has been noted that many devices are built for a global marketplace and that the operation of this "automatic zero-setting" device may be functional on the device when installed in the United States. Currently, HB 44 does not define this function. NCWM Publication 14 has no test to determine if the device submitted for evaluation has such a function or if it is sealable. Additionally, NTEP reported that, on a scanner/scale that had been submitted for NTEP evaluation, the automatic zero-setting feature was discovered and found to work in both the positive and negative directions and could be activated or deactivated without breaking a security seal or changing the audit trail information.

The 2008 NTETC WS established a small WG to develop language to be submitted to the NCWM S&T Committee and make recommendations addressing the suitability of scales with the capability to automatically set a positive weight indication to zero. The group, which included Mr. Davidson (Mettler-Toledo), Mr. Henry (NCR), Mr. Cook (NIST Technical Advisor), and Mr. Patoray (CoC, LLC), volunteered to develop a proposal for the S&T Committee. (Mr. Lucas, Ohio NTEP laboratory, and Mr. Truex, NTEP Administrator, also contributed to the discussions and subsequent proposal.) Additionally, the WS agreed to review the language developed by the WG to confirm its support of the proposed language.

In the process of developing the proposal, the WG recommended that the automatic zero-setting mechanism be prohibited for devices covered by Section 2.22. Automatic Bulk-Weighing Systems for the same reasons that zero-tracking is prohibited (incorrect net weight determinations may occur when unintentional and unobserved zeroing or tracking off of material retained in a hopper between drafts).

At the 2009 NCWM Interim Meeting, the Committee agreed that this item should remain as an Informational item pending the development of the proposal to add the term "automatic zero-setting mechanism" in agenda Item 320-2.

At the August 2009 NTETC WS Meeting, the NIST Technical Advisor provided the WS with an update on the status and additional discussions on this item since the 2009 Interim and Annual Meetings, and suggested that the WS develop a consensus position on this item and forward its conclusion to the S&T Committee. The WS discussed the possible positions to forward to the S&T Committee (see agenda Item 320-2).

The WS discussed the options in great detail and reached a consensus among the attendees that this feature does not have any value in the U.S. marketplace, and can potentially facilitate inaccurate weight determinations against either the buyer or the seller. The WS changed its 2008 position and now recommends that no changes are needed in order to address this feature in HB 44.

Based upon the comments received at the 2009 WWMA Annual Technical Conference and the 2009 NCWM Annual Meeting, the WWMA recommends this item and corresponding items in Item 320-3 and Item 324-1 be Withdrawn from the NCWM S&T Committee's 2010 Interim Agenda.

At its 2009 Interim Meeting, the CWMA supported the language as shown above and recommends this move forward as a Voting item.

During its 2009 Interim Meeting, NEWMA agreed with the comments and recommendations from the WWMA and recommends this item be Withdrawn.

See agenda Item 320-2 for additional discussions and background information on the development of this proposal.

324 AUTOMATIC WEIGHING SYSTEMS

324-1 S.2.1.3. Automatic Zero-Setting Mechanism

Source: 2009 Carryover Item 324-1. This item originated from the NTETC Weighing Sector and S&T Committee and first appeared on the Committee's 2009 Interim Agenda.

Purpose: Automatic zero-setting mechanism is a feature used in many scales throughout the world. This feature is not addressed or defined in HB 44 nor is it listed on NTEP CCs. This proposal is intended to establish automatic zero-setting limits to be consistent with the international recommendations in OIML R 51.

Item Under Consideration: Amend HB 44 Section 2.24. Automatic Weighing Systems by adding new paragraph S.2.1.3. as follows:

S.2.1.3. Automatic Zero-Setting Mechanism – If equipped, an automatic zero-setting mechanism shall operate only when the indication has remained:

(a) stable according to paragraph S.4.2. Damping, and

(b) below zero for at least 5 seconds.

The maximum effect of automatic zero-setting mechanism is limited to 4 % of the nominal capacity of the scale and is a sealable parameter.
(Added 201X)

Background/Discussion: At it 2008 Annual Meeting, the NTETC Weighing Sector discussed an issue about the increasing number of scales submitted for NTEP evaluations that include an "automatic zero-setting" feature not addressed in NIST HB 44. It has been noted that many devices are built for a global marketplace and that the operation of this "automatic zero-setting" device may be functional on the device when installed in the United States. Currently, HB 44 does not define this function. NCWM Publication 14 has no test to determine if the device submitted for evaluation has such a function or if it is sealable. Additionally, NTEP reported that, on a scanner/scale that had been submitted for NTEP evaluation, the automatic zero-setting feature was discovered and found to work in both the positive and negative directions and could be activated or deactivated without breaking a security seal or changing the audit trail information.

The 2008 NTETC WS established a small WG to develop language to be submitted to the NCWM S&T Committee and make recommendations addressing the suitability of scales with the capability to automatically set a positive weight indication to zero. The group (Mr. Davidson, Mettler-Toledo; Mr. Henry, NCR; Mr. Cook, NIST Technical Advisor; and Mr. Patoray, Consultants on Certification, LLC) volunteered to develop a proposal for the S&T Committee. (Todd Lucas, Ohio NTEP laboratory, and Jim Truex, NTEP Administrator, also contributed to the discussions and subsequent proposal.) Additionally, the WS agreed to review the language developed by the WG to confirm its support of the proposed language.

In the process of developing the proposal, the WG recommended that the automatic zero-setting mechanism should be permitted for devices covered by Section 2.24. Automatic Weighing Systems since equivalent requirements can be found in OIML R 51 Recommendation for Automatic Catchweighing Instruments.

The Committee agreed that this item should remain as an Informational item pending the development of the proposal to add the term "automatic zero-setting mechanism" in agenda Item 320-2.

At the August 2009 NTETC WS Meeting, the NIST Technical Advisor provided the WS with an update on the status and additional discussions on this item since the 2009 Interim and Annual Meetings and suggested that the WS develop a consensus position on this item and forward its conclusion to the S&T Committee. The WS discussed the possible positions to forward to the S&T Committee (see agenda Iitem 320-2).

The WS discussed the options in great detail and reached a consensus among the attendees that this feature does not have any value in the U.S. marketplace, and can potentially facilitate inaccurate weight determinations against either the buyer or the seller. The WS changed its 2008 position and now recommends that no changes are needed in to address this feature in HB 44.

Based upon the comments received at the 2009 WWMA Annual Technical Conference and the 2009 NCWM Annual Meeting, the WWMA recommends this item and corresponding items in Item 320-2 and Item 322-1 be Withdrawn from the NCWM S&T Committee's 2010 Interim Agenda.

During its 2009 Interim Meeting, NEWMA agreed with the comments and recommendations from the WWMA and recommends this item be Withdrawn.

See agenda Item 320-2 for additional discussions and background information on the development of this proposal.

324-2A S.2.2.4. Visibility of Operation and S.2.2.5. Subtractive Tare Mechanism

Source: 2009 Carryover Item 324-2C. (This item originated from the S&T Committee and first appeared on the Committee's 2007 agenda.)

Purpose: The tare proposals are intended to provide uniform application of tare requirements during field inspections and additional support for the requirements for the operation of tare indications and recorded representation of tare during NTEP evaluation that are currently based on interpretations of General Code requirements and NCWM Report of the 65th Committee on Specifications and Tolerances agenda Item 320-1 Tare (Pages 246-218).

Item Under Consideration: This recommendation clarifies the requirements for tare by adding new paragraphs S.2.2.4. and S.2.2.5. that provide new requirements for visibility and subtractive tare (i.e., balancing off tare objects does not increase the nominal scale capacity).

> **S.2.2.4. Visibility of Operation. – Operation of the tare mechanism shall be visibly indicated on the instrument. In the case of instruments with digital indications, this shall be done by marking the indicated net value with the word "NET" or the symbol "N". "NET" may be displayed as "NET.", "Net" or "net". If a scale is equipped with an indicator that allows the gross value to be displayed temporarily while a tare mechanism is in operation, the "NET" symbol shall disappear while the gross value is displayed.**
>
> **(Added 201X)**
>
> **S.2.2.5. Subtractive Tare Mechanism. – After any tare operation and while subtractive tare is in effect, an indicating or recording element shall not display nor record any values when the gross load (not counting the initial dead load that has been canceled by an initial zero-setting mechanism) is in excess of 105 % of scale capacity after tare has been taken.**
> **(Added 201X)**

Background/Discussion: Additional background information on this item can be found in the Background/Discussion paragraphs on agenda Item 320-1 in the 2009 Committee's Interim and Annual Reports.

After the NIST presentation on Tare during the 2009 Interim Meeting, several questions were asked that indicated the need for additional clarification on the indications. Consequently, the Committee recommended that this proposal remain an Informational item and suggested that the WS clarify the proposed language and consider providing examples of indications and recorded representations when multiple tares are used to determine net weights and provide the justification for limiting the acceptable words and abbreviations for the word "Net."

During the 2009 Annual Meeting, the Committee received no additional comments on this proposal. However, "Tare: Items 320-1A and 320-1B" were not adopted in the Committee's 2009. Consequently, the Committee "withdrew" the corresponding items in 324 Series "Voting items" and recommended that the NTETC WS discuss and provide the Committee with an update on the WS position on the remaining Tare "Information" proposals for the Committee's 2010 Interim Agenda.

At its August 2009 Annual Meeting, the WS reviewed the background information regarding comments and actions during the 2009 NCWM Annual Meeting. The WS recommends that the remaining tare items (Items: 324-2A, 324-2B, and 324-C in the Committee's 2009 agenda) should be Withdrawn from the 2010 S&T Committee Agenda since the NCWM agreed with the SMA position that the tare proposals are not needed for HB 44.

Based upon comments received during their respective fall 2009 association meetings and the 2009 NCWM Annual Meeting, the CWMA, WWMA, SWMA, and NEWMA recommends the remaining tare items be Withdrawn from the NCWM S&T Committee's 2010 Interim Agenda.

324-2B S.2.2.6. Consecutive Tare Operations and S.2.2.7. Indication and Printing of Weighing Results

Source: 2008 Carryover Item 324-2D. (This item originated from the S&T Committee and first appeared on the Committee's 2007 agenda.)

Purpose: The tare proposals and proposed definitions are intended to provide uniform application of tare requirements during field inspections, allow the identification and printing of preset tares with the abbreviation "PT," and additional support for the requirements for the operation of tare and preset tare, indications recorded representation of tare during NTEP evaluation that are currently based on interpretations of General Code requirements and NCWM Report of the 65th Committee on Specifications and Tolerances agenda Item 320-1 Tare (Pages 246-218).

Item Under Consideration: (**NOTE:** This item will be considered jointly with Item 320-1A.) This recommendation clarifies the requirements for tare by adding new paragraphs S.2.2.6. and S.2.2.7. that clarify the requirements for transactions that use multiple tare, tare mechanisms, and the indications and recording of weighing results.

<u>**S.2.2.6. Consecutive Tare Operations. – Repeated operation of a tare mechanism (including preset tare) is permitted for single transactions with one gross, one net, and multiple tare values. If more than one tare mechanism is operative at the same time, tare weight values shall be clearly designated (identified) with either "T" for tare or "PT" for preset tare, as appropriate, when indicated or printed.**</u>

<u>**(Added 201X)**</u>

<u>**S.2.2.7. Indication and Printing of Weighing Results.**</u>

(a) <u>**Gross weight values may be printed without any designation or by using a complete word or symbol. For a designation by a symbol, only uppercase "G" is permitted.**</u>

(b) <u>**If only net weight values are printed without corresponding gross or tare values, they may be printed without any designation or by using a complete word or symbol. The complete word (as shown in S.2.2.3. Visibility of Operation) or symbol "N" shall be used to designate a net weight.**</u>

This applies also where semi-automatic zero-setting and semi-automatic tare balancing are initiated by the same key.

(c) **Gross, net, or tare values determined by a multiple range instrument or by a multi-interval instrument need not be marked by a special designation referring to the (partial) weighing range.**

(d) **If net weight values are printed together with the corresponding gross and/or tare values, the net and tare values shall be identified at least by the corresponding symbols "N" and "T" or by complete words using all upper-case letters, all lower-case letters, or a combination of upper- and lower-case letters.**

(e) **If net weight values and tare values determined by different tare mechanisms are printed separately for single transactions with multiple gross, tare, and net values, they shall be suitably identified (e.g., vehicle sequentially loaded with mixed commodities).**

(Added 201X)

Background/Discussion: Additional background information on this item can be found in the Background/Discussion paragraphs on agenda Item 320-1A in the 2009 Committee's Interim and Annual Reports.

During the NIST presentation on Tare during the 2009 Interim Meeting, the Committee heard several questions that indicated the need for additional clarification on the value of specifying acceptable words and abbreviations for Gross, Tare, Preset Tare, and Net and what constitutes "consecutive tare operations." Consequently, the Committee recommended that this proposal remain an Informational item and suggested that the WS further clarify the proposed language and consider providing examples of 1) indications and recorded representations of tare and preset tare in consecutive tare transactions; and 2) indications and recorded representations when multiple tares and preset tares are used to determine net weights.

During the 2009 Annual Meeting, the Committee received no additional comments on this proposal. However, "Tare: Items 320-1A and 320-1B" in the Committee's 2009 agenda were not adopted. Consequently, the Committee "withdrew" the corresponding items in 324 Series "Voting items" and recommended that the NTETC WS discuss and provide the Committee with an update on the WS position on the remaining Tare "Information" proposals for the Committee's 2010 Interim Agenda.

At its August 2009 Annual Meeting, the WS reviewed the background information regarding comments and actions during the 2009 NCWM Annual Meeting. The WS recommends that the remaining tare items (Items: 324-2A, 324-2B, and 324-C in the Committee's 2009 agenda) should be Withdrawn from the 2010 S&T Committee Agenda since the NCWM agreed with the SMA position that the tare proposals are not needed for HB 44.

Based upon comments received during their respective fall 2009 association meetings and the 2009 NCWM Annual Meeting, the CWMA, WWMA, SWMA, and NEWMA recommends the remaining tare items be Withdrawn from the NCWM S&T Committee's 2010 Interim Agenda.

324-2C S.2.3. Preset Tare Mechanism and S.2.3.1. Indication of Operation

Source: 2009 Carryover Item 324-2E. (This item originated from the S&T Committee and first appeared on the Committee's 2007 agenda.)

Purpose: The tare proposals and proposed definitions are intended to provide uniform application of tare requirements during field inspections; allow the identification and printing of preset tares with the abbreviation "PT" and additional support for the requirements for the indications, and recorded representation of tare and preset during NTEP evaluation that are currently based on interpretations of General Code requirements and NCWM Report of the 65th Committee on Specifications and Tolerances agenda Item 320-1 Tare (Pages 246-218).

Item Under Consideration: (**NOTE:** This item will be considered jointly with Item 320-1B.) This recommendation clarifies the requirements for tare by adding new paragraphs S.2.3. and S.2.3.1. that provide new requirements for metrological tare (e.g., tare objects weighed or balanced off at the time of the transaction), tare accuracy, operating range, visibility, and preset tares (e.g., manually entered or stored tares for multiple transactions).

Add new paragraphs S.2.3. and S.2.3.1. as follows:

S.2.3. Preset Tare Mechanism, Operation. – In addition to the provisions of paragraphs S.2.2. Tare and S.2.2.1. Scale Interval, a preset tare may be operated together with one or more tare devices provided:

- **(a) the preset tare mechanism complies with paragraph S.2.2.6. Consecutive Tare Operations,**
- **(b) the preset tare operation cannot be modified or cancelled as long as any tare mechanism operated after the preset tare operation is still in use,**
- **(c) the preset tare associated with a price look-up (PLU) shall be automatically cancelled at the same time a PLU is cancelled, and**
- **(d) the preset tare values are designated by the symbol "PT;" however, it is permitted to replace the symbol "PT" with complete words.**

A preset tare may operate automatically only if the preset tare value is clearly identified with the load to be measured (e.g., part of the product look-up information).

S.2.3.1. Indication of Operation. – It shall be possible to temporarily indicate the preset tare value (e.g., pressing a tare display button or a negative net weight indication with no load on the load-receiving element). Additionally, paragraph S.2.2.7. Indication and Printing of Weighing Results applies accordingly, provided the calculated net value is printed and at least the preset tare value is printed, with the exception of:

- **(a) a Class II or a Class III automatic weighing system with a maximum capacity not greater than 100 kg (200 lb) used in direct sales to the public, and**
- **(b) automatic weigh/price labeling systems.**

(Added 201X)

Background/Discussion: Background information on this item can be found in the Background/Discussion paragraphs on agenda Item 320-1A in the 2009 Committee's Interim and Annual Reports.

During the NIST presentation on Tare during the 2009 Interim Meeting, the Committee heard several questions that indicated the need for additional clarification on:

- whether or not itemized indications and recorded representations and required for each tare; and
- whether or not different indications and recorded representations are required for each tare value when tare and preset tare are used in the same transaction.

Consequently, the Committee recommended that this proposal remain an Informational item and suggested that the WS further clarify the proposed language and consider providing examples of indications and recorded representations of preset tare in consecutive tare transactions and provide the justification for limiting the acceptable words and abbreviations for the words "Preset Tare."

During the 2009 Annual Meeting, the Committee received no additional comments on this proposal. However, "Tare: Items 320-1A and 320-1B" were not adopted in the Committee's 2009. Consequently, the Committee "withdrew" the corresponding items in 324 Series "Voting items" and recommended that the NTETC WS discuss and provide the Committee with an update on the WS position on the remaining Tare "Information" for the Committee's 2010 Interim Agenda.

At its 2009 Annual Meeting, the NTETC WS reviewed the background information regarding comments and actions during the 2009 NCWM Annual Meeting. The WS recommends that the remaining tare items (Items: 324-2A, 324-2B, and 324-C) should be Withdrawn from the 2010 S&T Committee Agenda.

Based upon comments received during their fall 2009 regional association meetings and the 2009 NCWM Annual Meeting, the CWMA, WWMA, SWMA, and NEWMA recommends the remaining tare items (Items: 320-1B, 324-2A, 324-2B, and 324-2C) be Withdrawn from the NCWM S&T Committee's 2010 Interim Agenda.

330 LIQUID-MEASURING DEVICES

330-1 Temperature Compensation for Liquid-Measuring Devices Code

Source: 2009 Carryover Item 330-1. This item originated from the NCWM S&T Committee and first appeared on the Committee's 2007 agenda.

Purpose: The intent of this proposal is to establish specifications, tolerances, and other technical requirements that can be uniformly applied to retail liquid-measuring devices equipped with temperature compensation. The proposed changes are based on similar requirements for wholesale liquid-measuring devices.

Item Under Consideration: The Committee is considering the following proposed modifications to Section 3.30. Liquid-Measuring Devices (LMD) Code to recognize temperature compensation for retail devices. The Committee has modified earlier proposals based on comments received as of the 2009 NCWM Interim Meeting.

S.1.6.8. Recorded Representations from Devices with Temperature Compensation. – Receipts issued from devices or systems with activated automatic temperature compensation must include a statement that the volume of the product has been adjusted to the volume at 15 °C for liters or the volume at 60 °F for gallons.
[Nonretroactive as of January 1, 201X]

(Added 201X)

Renumber existing S.1.6.8. Lubricant Devices, Travel of Indicator to S.1.6.9., accordingly.

S.2.7. ~~Wholesale~~ Devices Equipped with Automatic Temperature Compensators.

S.2.7.1. Automatic Temperature Compensation. – A device may be equipped with an automatic means for ~~**adjusting**~~**conversion of** the indication and registration of the measured volume of product to the volume at 15 °C **for liters or** ~~(~~60 °F~~)~~ **for gallons.**

S.2.7.2. Display of Temperature. – For test purposes, on a device equipped with active automatic temperature compensation, means shall be provided to indicate or record the temperature determined by the system sensor to an a resolution of no greater than 0.2 °F.
[Nonretroactive as of January 1, 201X]

S.2.7.~~2~~3. Display of Net and Gross Quantity and Provision for Deactivating. – **A device or system equipped with an active electronic automatic temperature-compensating mechanism shall indicate or record both the gross (uncompensated) and net (compensated) volume for testing purposes.** On a device **or system** equipped with a~~n~~ **mechanical** automatic temperature-compensating mechanism that will indicate or record only in terms of ~~gallons~~**liters** compensated to 15 °C **or gallons compensated to** ~~(~~60 °F~~)~~, provision shall be made for deactivating the automatic temperature-compensating mechanism so that the meter can indicate~~,~~ ~~**and record if it is equipped to**~~**or** record~~,~~ in terms of the uncompensated volume. **It is**

not necessary that both net and gross volume be displayed simultaneously on a device or system equipped with either mechanical or electronic temperature-compensating mechanisms.

(Amended 1972 **and 201X**)

S.2.7.~~3~~4. Provision for Sealing Automatic Temperature-Compensating Systems. – Provision shall be made for applying security seals in such a manner that an automatic temperature-compensating system cannot be disconnected and that no adjustment **that detrimentally affects the metrological integrity of the device** may be made to the system without breaking the seal **or automatically providing a record (e.g., audit trail) of the action**.

(Amended 201X)

S.2.7.4.1. Provision for Sealing the Temperature Sensor. – Provision shall be made for applying security seals in such a manner that the temperature sensor cannot be removed or disabled without breaking the seal or providing a record (e.g., audit trail) of the action.
[Nonretroactive as of January 1, 201X]

S.2.7.~~4.~~5. Temperature Determination with Automatic Temperature Compensation. – For test purposes, means shall be provided (e.g., thermometer well) to determine the temperature of the liquid either:

(a) in the liquid chamber of the meter, or

(b) immediately adjacent to the meter in the meter inlet or discharge line.

(Amended 1987)

S.4.3.~~2.~~ Temperature Compensation. – If a device **or system** is equipped with **active** automatic temperature compensation, the primary indicating elements, recording elements, ~~or~~**and** recorded representation shall be clearly and conspicuously marked to show that the volume delivered has been adjusted to the volume at 15 °C **for liters or** ~~(~~60 °F~~)~~ **for gallons.**

(Amended 201X)

Renumber existing paragraphs and subparagraphs S.4.3. Wholesale Devices, Discharge Rates and S.4.4. Retail Devices accordingly.

N.4.1.1. ~~Wholesale~~ Devices Equipped with Automatic Temperature-Compensating Systems. – On ~~wholesale~~ devices equipped with **active** automatic temperature-compensating systems, normal tests shall be conducted:

(a) by comparing the **net (**compensated**)** volume indicated or recorded to the actual delivered volume ~~corrected~~ **adjusted** to 15 °C **for liters or** ~~(~~**60 °F**~~)~~ **for gallons, and**

(b) ~~with the temperature-compensating system deactivated,~~ comparing the **gross (**uncompensated**)** volume indicated or recorded to the actual delivered volume. **(For some devices this may require that the temperature compensator be deactivated.)**

The first test shall be performed with the automatic temperature-compensating system operating in the "as found" condition. On devices that indicate or record both the compensated and uncompensated volume for each delivery, the tests in (a) and (b) may be performed as a single test.

(Amended 1987 **and 201X**)

N.5. Change in Product Temperature ~~Correction on Wholesale Devices~~. – **~~Corrections~~ Adjustments** shall be made for any changes in volume resulting from the differences in liquid temperatures between time of passage through the meter and time of volumetric determination in the prover **or test measure**. When adjustments are necessary, appropriate petroleum measurement tables ~~should~~ **shall** be used.

(Amended 1974 **and 201X**)

UR.3.6. Temperature Compensation~~, Wholesale~~.

UR.3.6.1. Automatic.

UR.3.6.1.1. ~~When to be~~ Used~~d~~ of Automatic Temperature Compensation. – If a device is equipped with ~~a mechanical~~ **active** automatic temperature ~~compensator~~ **compensation**, it shall be connected, operable, and in use at all times. An electronic or mechanical automatic temperature-compensating system may not be removed, nor may a compensated device be replaced with an uncompensated device, without the written approval of the ~~responsible~~ weights and measures jurisdiction **with statutory authority over the device**.

[**Note:** This requirement does not specify the method of sale for product measured through a meter.]

(Amended 1989 **and 201X**)

OR

UR.3.6.1.1. ~~When to be~~ Used~~d~~ of Automatic Temperature Compensation. – If a device is equipped with a mechanical automatic temperature compensator, it shall be connected, operable, and in use at all times. **Once used,** ~~A~~**an** electronic or mechanical automatic temperature-compensating system may not be removed **nor deactivated**, nor may a compensated device be replaced with an uncompensated device, without the written approval of the ~~responsible~~ weights and measures jurisdiction **with statutory authority over the device**.

[**Note:** This requirement does not specify the method of sale for product measured through a meter.]

(Amended 1989 **and 201X**)

UR.3.6.1.2. Condition of Use. – At a business location which offers fuel products for retail sale on the basis of a temperature-compensated volume, all devices used for retail sales shall have active automatic temperature compensation and all fuel products offered for retail sale shall be dispensed on the basis of temperature-compensated volume.

UR.3.6.1.~~2~~3. Recorded Representations (Invoices, Receipts, and Bills of Lading).

(a) A**n** ~~written~~ invoice based on a reading of a device **or recorded representation issued by a device or system** that is equipped with an **active** automatic temperature compensator shall show that the volume delivered has been adjusted to the volume at 15 °C **for liters or** ~~(~~60 °F~~)~~ **for gallons and decimal subdivisions or fractional equivalents thereof.**

(b) The invoice issued from an electronic wholesale device equipped with an automatic temperature-compensating system shall also indicate:

(1) the API gravity, specific gravity or coefficient of expansion for the product;

(2) product temperature; and

(3) gross reading.

(Amended 1987 **and 201X**)

UR.3.6.1.4. Temperature Determination. – The means for determining the temperature of measured liquid in a device with an activated automatic temperature-compensating system shall

<u>be so located and designed that, in any "usual and customary" use of the system, the resulting indications and/or recorded representations are within applicable tolerances.</u>

<u>(Added 201X)</u>

<u>UR.3.6.4. Temperature-Compensated Sale. – All sales of products, when the quantity is determined by an approved measuring system with temperature compensation, shall be in terms of the liter at 15 °C or the U.S. gallon of 231 in^3 at 60 °F.</u>

<u>(Added 201X)</u>

Background/Discussion: Prior to the 2007 NCWM Interim Meeting, the Committee recognized, via reports from the regional L&R Committees and other sources, that there was increasing support within the weights and measures community to address temperature compensation features for the retail sale of petroleum products in the Liquid-Measuring Devices Code. In response to these concerns and to encourage uniformity in applications where temperature compensation is being used, the Committee developed a proposal to provide design, performance requirements, and testing criteria for retail metering systems that incorporate temperature compensation capability. The Committee was also concerned that if the current L&R Committee-proposed language for the Method of Sale of Commodities in NIST HB 130 is adopted, retail motor-fuel devices could be placed in service with no guidelines in NIST HB 44 for type approval and field testing. The language proposed by the L&R Committee at that time would permit the temperature-compensated sale of petroleum products at all levels of distribution. [Editor's note: Since that time, the language proposed by the L&R Committee was withdrawn from its agenda.]

At the 2007 Interim Meeting, the Committee considered moving the proposal forward as a priority Voting item. However, the Board instructed the Committee to retain the item as Informational and established a steering committee to provide the S&T and L&R Committees with guidance on temperature compensation issues.

At the 2008 Interim Meeting, the Committee made some additional modifications to the proposal and, believing the proposal to be essentially complete and based on urging from officials who anticipated installation of ATC equipment in their jurisdictions, the Committee agreed to designate Item 310-1 as a Voting item on its agenda for the 2008 Annual Meeting.

At the 2008 NCWM Annual Meeting, the Committee heard numerous comments on the proposed changes to include specifications, test procedures, and user requirements for devices equipped with automatic temperature compensation systems.

Based on the many suggestions that it heard between the 2008 Interim and Annual Meetings to allow time for additional study and development of the related method of sale requirements, the Committee decided to change the status of this item from Voting to Informational at the 2008 Annual Meeting.

See the 2007 and 2008 NCWM S&T Final Reports for additional details and background information.

During the 2008 WWMA Annual Technical Conference, an update on the California Energy Commission (CEC) cost benefit analysis was given. The WWMA was told that the study is being delayed due to difficulty in obtaining device information. The CEC report to the California legislature, due December 2008, was granted an extension until February 2009, after the NCWM Interim Meeting. Several industry members and weights and measures officials stated that the S&T and L&R Committees needed to work in concert; therefore, this item should remain Informational until the CEC and GAO reports are completed.

One jurisdiction stated during the WWMA meeting that they would like to see technically sound language in HB 44 in the event that temperature-compensated devices are installed and activated. No jurisdictions reported ATC devices in operation at this time. However, one jurisdiction stated that California type approved devices have been installed but the ATC feature has not been activated. Another jurisdiction stated that a company informed them they were considering ATC but would not take action until after the NCWM had made their decision on the L&R and S&T proposals. For these reasons, the WWMA agreed this item should remain "Informational."

At its 2008 Interim Meeting, the CWMA took the position that having guidelines in Handbook 44 does have a value in the event that a model law is passed. However, the CWMA believes that until a model law is passed, the guidelines cannot be fully drafted for this item. Therefore, the CWMA recommends this item be a Developing item.

At its 2008 Interim Meeting, NEWMA discussed the following points related to this item:

1. waiting for GAO and California study;
2. financial impact to consumer and retail station owners;
3. extra time for testing and cost of additional equipment;
4. several problems with language of item (e.g., 15.56 ºC versus 15 ºC, gravity to be used?);
5. connection to L&R item; and
6. possible perpetuation of fraud.

NEWMA recommends this item be made "Developing."

The SWMA heard comments during the open hearings at its 2008 Annual Meeting that the item should remain Informational to allow time for additional information to be gathered. The SWMA also heard that there may be additional information provided from the California Energy Commission study (due to be completed in February 2009, with a possible draft available in December 2008) and the GAO study (due to be completed in the fall of 2008). With regard to the proposed changes to the LMD Code, the SWMA heard suggestions that the requirements for indicating temperature-compensated deliveries be examined to ensure that existing equipment can meet the requirements, particularly with regard to the service station consoles. The SWMA also heard a suggestion that action on the proposed changes to the LMD Code be held off until the NCWM L&R Committee completes its deliberations on the method of sale issue. The SWMA noted the NCWM S&T Committee raised a number of questions during its deliberations in July and asks that, in addition to the NCWM ATC Steering Committee, people provide input to assist the National S&T Committee in its deliberations on this issue. Because of the comments received and the number of outstanding issues, the SWMA decided to maintain this item as Informational on its agenda.

The Committee received copies of the GAO study (available on the GAO website at www.gao.gov), as well as a draft of the California Energy Commission study. (Technical Advisor's Note: A final version of this report is now available from the CEC at www.energy.ca.gov.)

The Committee received comments from several members of the ATC Steering Committee in response to the questions it raised in July. A copy of these comments is included in Appendix B of the Committee's Interim Report.

Based on input from these Steering Committee members and the regional weights and measures associations, comments received at the 2009 Interim Meeting, and the Committee's deliberations at the 2009 Interim, the Committee addressed the points it raised in its 2008 Final Report as follows:

- **The reference to the word "active."** The Committee reviewed the paragraphs and inserted the word as appropriate. The Committee noted that the original intent of paragraph UR.3.6.1.1. was that mechanical compensators should be activated and in use at all times.

- **Division size of temperature sensor.** The Committee changed the reference to "resolution" rather than accuracy. (See S.2.7.3. below.)

- **Should there be a corresponding reference to the accuracy requirements for the temperature sensor in the Tolerances section?** The Committee changed the reference to "resolution" rather than accuracy. (See S.2.7.3. below.)

- **Should inspector test accuracy of temperature sensor?** There is no intention for an inspector to test the temperature sensor in the field. The proposed requirements will be patterned after other NIST Handbook 44 code references in which the results of gross and net test drafts are compared against a specified tolerance.

- **A User Requirement is needed to specify that, if a single business offers products for sale on the basis of a temperature-compensated volume, all devices in that business shall be equipped with active automatic temperature compensation systems.** The Committee agreed that a similar paragraph to that being considered in agenda Item 331-2 should be included in the LMD Code. The proposed paragraph is included as UR.3.6.1.2. as outlined in the recommendation above.

- **Reference to 15.56** ºC**.** The Committee agreed to change the reference to 15 ºC.

- **Ability to sense when a device is in the ATC mode.** The Committee heard mixed opinions on this issue, with some manufacturers and officials commenting that equipment should be able to automatically detect when in the ATC mode and print and display accordingly and some officials stating that equipment should not be required to automatically detect this. The Committee also noted that a longer lead time could be given on the non-retroactive status of the requirement. The Committee is interested in comments on how this point should be addressed.

- **UR.3.6.1.3. needs clarification.** The Committee made some changes to the language to improve the clarity of the paragraph, including clarifying that this requirement applies to systems with activated ATC.

At the 2009 NCWM Interim Meeting, the Committee heard a number of suggestions for changes to specific portions of the recommendation and addressed these comments in its recommendation as follows:

- **S.1.6.8. Recorded Representations from Devices with Temperature Compensation**

  - **Question/Comment:** Depending upon method of sale requirements adopted in a given jurisdiction, devices equipped with electronic temperature compensation systems may not be required to have the ATC feature activated. Should not the provision of S.1.6.8. only apply to systems with activated ATC?
  - **Conclusion:** The Committee agrees and added the word "activated" to clarify that the paragraph only applies to systems with the feature activated.

- **S.2.6. Temperature Determination**

  - **Question/Comment:** Should the term wholesale be deleted? If so, this will require a thermometer well even on non-ATC RMFDs.
  - **Conclusion:** The Committee agreed that the intent was not to require the installation of thermometer wells on existing RMFDs that are not equipped with ATC. Since S.2.7. includes provisions for a thermometer well, or other means, for determining the temperature at the meter on liquid-measuring devices equipped with ATCs, the Committee deleted the proposed change to S.2.6. and has eliminated the proposed change from the recommendation above.

- **S.7.2. Display of Net and Gross Quantity and S.2.7.4. Display and Provision to Deactivate**

  - **Question/Comment:** Is it necessary to have both paragraphs S.7.2. and S.2.7.4. as shown in the Publication 15 proposal? Could these paragraphs be combined?
  - **Conclusion:** The Committee agreed that the paragraphs can be combined, noting that the language needs to reflect the differences between provisions for mechanical and electronic ATC mechanisms. The proposed paragraph numbered S.2.7.2. in the Committee's Interim agenda has been deleted and its provisions incorporated into the existing S.2.7.2. In making these revisions, the Committee also noted that existing User Requirement paragraph UR.3.6.1.1. requires a mechanical compensator to be activated and in use at all times.

- **S.2.7.3. Display of Temperature**

  - **Question/Comment:** Is this paragraph intended to specify a tolerance for the temperature sensor? If so, will this be a field test?
  - **Conclusion:** Based on guidance provided by the ATC Steering Committee, the Committee agreed to change "accuracy" to "a resolution of no greater than" in proposed paragraph S.2.7.2. (shown as S.2.7.3. in the Committee's Interim agenda). The Committee also agreed that the intent was not to test the accuracy of the system's temperature sensor in the field. The approach for testing devices with ATCs will continue to be a comparison between compensated and non-compensated test drafts.

- **UR.3.6.1.1. Use of Automatic Temperature Compensation**

  - **Question/Comment:** Should the words "once used" be inserted prior to "it shall be connected" to clarify that some systems may be equipped with the feature, but the feature may not be activated.
  - **Conclusion:** The Committee notes that the intent of the original User Requirement paragraph UR.3.6.1.1. was that mechanical compensators should be activated and in use at all times.

- **References to 15.56 ºC:**

  - The Committee changed all references to 15 ºC to correspond with the proposals on the L&R Committee's agenda for method of sale. The Committee acknowledged that 15.56 ºC is an exact conversion for 60 °F. However, the Committee agreed that 15 ºC is more appropriate since this is the value used internationally and in light of comments from industry questioning whether or not existing equipment can display values to two decimal places.

- **The Committee also made the following editorial corrections/changes based on comments received:**

  - **UR.3.6. Temperature Compensation**. – The word "wholesale" should appear at the end of the title as struck, since it is currently in the code.
  - **S.4.3. Temperature Compensation.** – The word "active" should not be in italics.

The Committee discussed whether or not this item is ready to move forward for a vote at the 2009 Annual Meeting. The Committee recognizes the need for standards to be in place to encourage uniform evaluation of RMFDs equipped with ATC, and acknowledges that some jurisdictions are already facing the imminent possibility of such equipment in their jurisdictions. While the Committee believes that these standards are necessary whether or not the issue of a model method sale regulation has been resolved, based on the number of comments received on the proposed changes to the LMD code, the Committee believes that the item should be retained as an Informational item until the changes outlined above have been studied by interested stakeholders. The Committee also acknowledged that the General Code paragraph G-A.3. Special and Unclassified Equipment coupled with relevant provisions in existing code paragraphs can be used by jurisdictions to address equipment with ATC features in the meantime. The Committee also does not believe that delaying the revisions to the LMD code should delay a decision on the method of sale item before the L&R Committee.

(See also the Committee's 2007 and 2008 Final Reports for additional background information on this issue.)

Based on comments heard from the floor at the 2009 NCWM Annual Meeting, the Committee acknowledged that additional work may be needed to specific sections of the proposed changes to the code. Points raised and discussed by the Committee include the following:

- There was a question of whether to reference "15 ºC" or "15.56 ºC." The Committee agreed that industry practice has been to use "15 ºC" and that this is the reference used internationally; consequently, they believe it should be kept as "15 ºC." This is also supported by the L&R Committee's 2009 Interim Report which references a statement by the Meter Manufacturers' Association indicating that 15 ºC is used internationally and industry would likely follow that convention should SI units be used.

- Clarification is needed for the differences between wholesale devices and systems. Specific paragraphs in question were S.1.6.8. and S.2.7.2.
- Clarification is needed for how S.2.7.2. applies to electronic registers that can only indicate in terms of compensated quantities when the compensator is activated; the compensator would need to be activated and an additional run completed in order to view an uncompensated reading.
- Review the use of the term "invoice" and consider if the term is well understood for retail transactions which have typically used terminology, such as "printed receipt" or recorded representation.
- Review the language in the VTM code under Item 331-2 and consider where changes might be needed to ensure consistency.

The Committee decided to keep the status of this item as an Informational item and acknowledges that some jurisdictions are already facing the imminent possibility of such equipment in their jurisdictions. The Committee believes that these standards are necessary whether or not the issue of a model method sale regulation is adopted in NIST Handbook 130 since weights and measures jurisdictions may decide to permit this equipment based upon their individual State laws or regulations.

At their Fall 2009 meetings, the CWMA, NEWMA, and the SWMA agreed to recommend that this item be withdrawn from the Committee's agenda. The CWMA heard no comments in support of this item, but numerous comments in opposition. The SWMA indicated that it considered the NTETC Measuring Sector's need for procedures to evaluate temperature compensated retail devices, but concluded that it is highly unlikely such devices will be submitted for evaluation. The SWMA notes that the proposal was discussed at length during the past three NCWM sessions and appears no closer to resolution. The SWMA also cites the conclusion in the report issued by the California Energy Commission that there is no economic advantage to temperature compensation at the retail dispenser.

At its 2009 Annual Meeting, the WWMA heard comments suggesting that this item be withdrawn, that states should regulate temperature compensation individually, and that there is a need for a better definition distinguishing between wholesale and retail. There was concern about the display of temperature and display of net and gross, whether it needed to be deactivated and how this deviates from the Vehicle-Tank Meters code. Another comment heard was that there is confusion regarding the condition of use and the term "invoice" in UR.3.6.1.3. Further work is needed to clarify how paragraph UR.3.6.1.2. would apply in businesses locations that sell wholesale and retail from the same device.

The WWMA reported receiving the following written comments from Andrea Martincic, Executive Director of the Arizona Petroleum Marketers Association. At the request of Ms. Martincic, these comments were entered directly into the WWMA final report as submitted.

1) Item should be withdrawn given the NCWM's annual meeting outcome on ATC as a legal method of sale from L&R. Conflict for states that automatically adopt Handbook 44.

2) If an individual jurisdiction decides to allow the use of an ATC device, they should accept responsibility for the regulation of that equipment.

3) Would like better explanation for wholesale transactions using a liquid measuring device. Should there be a differentiation between a wholesale transaction made from a liquid measuring device versus a vehicle tank meter. Most background discussion and discussion on this issue seems to mostly reference retail.

4) 2.7.2 Display of temperature for testing: .2 degrees (This is the same tolerance being advocated for a mechanical ATC device for VTMs under 331-1) Would like to hear W&M debate on why this is the appropriate tolerance.

5) 2.7.3 Display net & gross for testing. Can this occur? Have not heard from the US manufacturers of this potential ATC device.

6) 3.6.1.2 Condition of use- At a business location all pumps and all fuel must be sold ATC---would this be problematic for E-85 or other alt. fuels.

7) 3.6.1.3 Recorded Representatives (Invoices, Receipts and BOL's) Retail transactions result in receipts for customers, on the wholesale side they result in Invoices for customers. BOL's are between a shipper on the pipeline and the distributor/jobber picking up the fuel at the rack.

The WWMA also forwarded the following written comments from Jay McKeeman, Vice President, Government Relations and Communications, California Independent Oil Marketers Association (CIOMA). These comments are included as written in the submission.

- We strongly recommend that WWMA withdraw additional discussion of ATC requirement development. It has become even clearer in these recent discussions that development of ATC requirements in Handbook 44 will legitimize the potential of dual distribution requirements in states where a permissive ATC condition is authorized or permitted. Having two distribution systems (gross and ATC) in place at the same time is the worse-case scenario for the distributing industry, the customer and the weights and measures officials. It creates confusion, competitive disadvantage, dual inspection and accuracy measurements and will sweep away the years of hard work and good efforts instilling consumer and industry confidence that there is a level, honest playing field in the purchase of motor fuels.

- States, such as California, are perfectly capable of issuing regulations if an ATC system, type-certified by the state, is put in place. We have had a long-standing offer to work with DMS and local agencies in the development of such regulations, but have not seen that offer taken up. Trying to take California's situation (CIOMA strongly believes state law prohibits ATC at retail) of a possible permissive condition and use it as justification for national standards is inappropriate and unwarranted.

- We strongly believe, based upon statements made in open session and during the S&T Committee deliberations that the national consensus will be to withdraw further discussion of ATC requirements in Handbook 44.

- We believe a table or matrix needs to be devised that better articulates the various Handbook 44 provisions related to petroleum sales ATC, with organization by transaction type (wholesale, retail), area of governance (accuracy testing, labeling, signage, conditions of use, invoice requirements, etc.) and which provides insight into stationary location vs. mobile fueling device requirements. This would be a useful guide for the regulated community, as well as a place where a state could determine what regulations might be needed to cover any gaps, if they needed to do their own regulations.

The WWMA acknowledges that this item needs further work. However, based on comments heard at the NCWM annual meeting and at the WWMA open hearings stressing that jurisdictions and manufacturers need criteria in HB 44 in order to ensure uniformity in instances where needed, the WWMA recommends it be maintained as an Informational item on the NCWM S&T Committee's Agenda.

330-2 Price Posting and Computing Capability and Requirements for a Retail Motor-Fuel Dispenser (RMFD)

Source: 2009 Carryover Item 330-3. This item originated from WMD and the regional associations and first appeared on the Committee's 2007 agenda.

Purpose: To review and update criteria in the LMD Code related to price posting and computing capability on RMFDs to reflect current market practices.

Item Under Consideration: The Committee is considering a proposal to make the following modifications to Section 3.30. Liquid-Measuring Devices (LMD) Code to address price posting and computing capability for retail motor-fuel dispensers as follows:

S.1.6.4. Display of Unit Price and Product Identity.

S.1.6.4.1. Unit Price.

(a) A computing or money-operated device shall be able to display on each face, the unit price at which the device is set to compute or to dispense.

*(b) Whenever a grade, brand, blend, or mixture is offered for sale from a device at more than one unit price, then all of the unit prices at which that product is offered for sale shall be displayed or shall be capable of being displayed on the dispenser using controls available to the customer prior to the delivery of the product. It is not necessary that all of the unit prices for all grades, brands, blends, or mixtures be simultaneously displayed prior to the delivery of the product. This subsection shall not apply to fleet sales, other contract sales, ~~or~~ truck refueling sales**, or all purchases of fuel accompanied by an automatically printed receipt of the transaction containing the discount unit price, the total gallons delivered, and total price of the sale**.*

[Effective and nonretroactive as of January 1, 1991]

(Amended 1989**,** ~~**and**~~ 1997**, and 201X**)

S.1.6.5.4. Selection of Unit Price. *– Except for dispensers used exclusively for fleet sales, other price contract sales, ~~**and**~~ truck refueling (e.g., truck stop dispensers used only to refuel trucks)**, and purchases where an automatic printed receipt of the transaction containing the discount unit price, the total gallons delivered, and total price of the sale**, when a product or grade is offered for sale at more than one unit price through a computing device, the selection of the unit price shall be made prior to delivery using controls on the device or other customer-activated controls.* A system shall not permit a change to the unit price during delivery of product.

[Nonretroactive as of January 1, 1991]

(Added 1989) (Amended 1991, 1992, 1993, ~~**and**~~ 1996**, and 201X**)

S.1.6.6. Agreement of Indications. – No changes.

***S.1.6.7. Recorded Representations.** – No changes.*

UR.3. Use of Device.

UR.3.2. Unit Price and Product Identity. – No changes.

UR.3.3. Computing Device. – Any computing device used in an application where a product or grade is offered for sale at one or more unit prices shall be used only for sales for which the device computes and displays the sales price for the selected transaction.

(Added 1989) (Amended 1992)

The following exceptions apply:

(a) Fleet sales and other price contract sales are exempt from this requirement.

(b) A truck stop dispenser used exclusively for refueling trucks is exempt from this requirement provided that:

(1) all purchases of fuel are accompanied by a printed receipt of the transaction containing the applicable price per gallon, the total gallons delivered, and the total price of the sale; and

(Added 1993)

(2) unless a dispenser complies with S.1.6.4.1. Display of Unit Price, the price posted on the dispenser and the price at which the dispenser is set to compute shall be the highest price for any transaction which may be conducted.

(Added 1993)

(c) All purchases of fuel accompanied by an automatically printed receipt of the transaction containing the discount unit price, the total gallons delivered, and total price of the sale.

(Added 201X)

UR.3.4. Printed ~~Ticket~~ Receipt. – Except for purchases conducted under UR.3.3(c) (*see note below), ~~T~~**t**he total price, the total volume of the delivery, and the price per **unit** ~~liter or gallon~~ shall be shown, **on a receipt by** either **being automatically** printed or **printed** in clear hand script~~, on any printed ticket issued by a device and containing any one of these values~~.

***Note: Purchases conducted under UR.3.3(c) shall only be automatically printed, containing at minimum the total price, the total volume of the delivery, and the discount price per unit.**

(Amended 2001 **and 201X**)

Background/Discussion: In the early 1990s, various sections of the Liquid-Measuring Devices Code in HB 44 (including paragraphs S.1.6.4. Display of Unit Price and Product Identity, S.1.6.5.4. Selection of Unit Price, UR.3.2. Unit Price and Product Identity, and UR.3.3. Computing Device) were modified to address multi-tier pricing applications, such as cash or credit. Since that time, marketing practices have evolved to include the addition of new practices, such as frequent shopper discounts and club member discounts. Numerous questions have been posed to WMD regarding the requirements for posting unit prices, calculation of total price, customer-operated controls, and other related topics, such as the definitions for associated terminology.

It is clear from these questions that changes are needed to HB 44 to ensure the requirements adequately address current marketplace conditions and practices. WMD has raised this issue with the Committee and has also discussed a variety of pricing practices with individual state and local weights and measures jurisdictions.

The WMD reviewed the existing requirements and their application to current market practices and collected information on a number of scenarios, including the following:

(1) Frequent shopper discounts
(2) Club member discounts
(3) Discount for prepaying cash (to prevent "drive-offs")
(4) Prepay at the cashier for credit sales
(5) Discounts for purchasing store products
(6) Discounts for purchasing a service (e.g., carwash)
(7) Targeted group discounts (e.g., Tuesday – ladies 5 cents off per gallon)
(8) Full service
(9) Self service
(10) Progressive discounts based on volume of motor-fuel purchased
(11) Coupons for discounts on immediate or future purchases
(12) Rebates (e.g., use of oil company credit card)
(13) Day-of-the-week discounts

Note: The conditions under some of these scenarios may not typically fall under the authority of weights and measures jurisdictions.

The WMD expressed an interest in receiving input from the weights and measures community about the various practices and pricing structures in use, and indicated it welcomed opportunities to discuss this item at regional weights and measures associations to ensure the item is adequately addressed.

The WWMA acknowledged that marketing practices change on a daily basis and the task to ensure HB 44 codes address each scenario is monumental. However, the WWMA encouraged NIST in its efforts to tackle this ongoing issue. Therefore, the WWMA recommended this item be considered and move forward to the national level as a Developing item as did the SWMA and NEWMA.

At its 2007 Annual Meeting, the SWMA was informed that the National Association of Convenience Stores recognized a problem with the current price posting and computing capability requirements in HB 44 and was currently working on information on this item to provide to the NCWM S&T Committee.

At the 2008 Interim Meeting, Ohio Weights and Measures submitted a proposal to the Committee that included specific language for modifying Section 3.30. to address the various pricing and marketing structures being used in retail motor-fuel applications. Based on its review of that proposal, the fact that a specific proposal has now been developed and presented, and the number of jurisdictions reporting a need to move forward with this item, the Committee decided to elevate the status of this item from Developing to "Informational." Consequently, the Committee is considering the specific language submitted by Ohio and encourages the weights and measures community to review the proposal and submit comments on this item.

At its spring 2008 meeting, the CWMA S&T Committee reported hearing comments that current language does not meet the needs of what is actually happening in the marketplace. Currently, there are economic issues dealing with fair competition, and there are numerous marketing techniques that the language in NIST HB 44 cannot address. The CWMA S&T Committee believes the item as proposed is a good start on addressing this issue, but it does not entirely provide adequate language to aid in enforcement. The CWMA S&T recommended that a WG be formed to further evaluate this item. Some examples of the panel discussion were, but not limited to:

1. discounts calculated at the pump and others at the counter,
2. level of consumer responsibility,
3. can the dispensers do tier pricing,
4. competitors complaining about non-uniformity of enforcement,
5. discounts should be done electronically, and
6. all is okay as long as the receipt explains the transaction.

NEWMA's spring 2008 meeting report stated that this is a very important item and NEWMA supports continued work on it as an Informational item. One member suggested that at the next NEWMA Interim Meeting, a WG spend some time coming up with suggestions for this item.

At the 2008 Annual Meeting, the Committee heard comments on the proposed changes to the Liquid-Measuring Devices Code. Several weights and measures officials expressed concern about the provision in the proposed language that would allow discounts to be calculated at the console after the customer has dispensed product. These officials felt that devices should be able to compute the total sales price at the unit price at which the product is offered for sale. Several industry members expressed support of the proposed language. One member stated that it is important for retailers with mechanical dispensers to be able to offer their customers a cash discount.

Current NIST Handbook 44 requirements state that the selection of the unit price must be made by the customer using controls on the device or other customer-activated controls. One industry member questioned whether making arrangements for a given method of payment at the console might be considered as satisfying that requirement since the customer is initiating the sale and the conditions of payment prior to the transaction. Weights and measures officials acknowledged the comment, but emphasized the need for the customer to retain control over the selection of the price, preferably by making a selection at the dispenser or using customer controls.

The Committee expressed appreciation for the work that had been done thus far, acknowledging that additional work is needed on this item and noted that a WG is being formed to develop this item. The Committee looks forward to receiving input and suggestions from the WG and encourages interested parties to participate in the WG and/or forward comments to the Committee.

A meeting was held on July 15, 2008, (in conjunction with the NCWM Annual Meeting) of individuals interested in the issue of pricing requirements for retail motor-fuel dispensers. Participants in the meeting included weights and measures officials, gasoline pump manufacturers, and other interested parties. The purpose of the meeting was to establish an informal WG to review the issue of price posting and computing capability for retail motor-fuel dispensers. The WG will focus on the development of proposed changes to NIST Handbook 44 necessary to provide flexibility to marketers while ensuring that the buyer and seller have adequate information about all aspects of the transaction with respect to the pricing and method of payment. The CWMA had suggested the formation of this small WG to study this issue with the idea that the issue could be more thoroughly developed than could be done in the limited time available during the NCWM Interim and Annual Meetings. Note that this work does not replace the discussion of this issue at the NCWM Interim and Annual Meetings, but rather is intended to supplement the work and provide the S&T Committee with some proposals to consider.

Participants at that meeting were asked to indicate their interest in the work as either “work group participants” (expected to regularly participate and contribute to the work) or “observers” (will be kept abreast of WG activities, including meeting agendas and summaries). Because there is no budget to support the cost of regular face-to-face meetings, the WG will attempt to accomplish its objectives through e-mail and other electronic communication. Anyone interested in the details of this work should contact Tina Butcher (NIST WMD) by e-mail at tbutcher@nist.gov or by telephone at (301) 975-2196.

During the open hearings at its 2008 Annual Technical Conference, the WWMA received comments that the Committee wait until a national WG is established to develop this item further. The WWMA agreed that the item should be “Informational.”

During its 2008 Interim Meeting, the CWMA heard the following comments during discussions of this item:

- Lighten the rules of dispensing so consumer can see the actual sale – transparency in the marketplace
- Not enough room on marquee or on pump for posting all prices
- What will appear on customer receipt or final receipt

The CWMA agrees that the item should be Informational until more information is obtained from the national WG.

At its 2008 Interim Meeting, NEWMA supported work on this item and looks forward to information from the WG.

At its 2008 Annual Meeting, the SWMA acknowledged the need to review and revise the requirements in the Liquid-Measuring Devices Code regarding price posting and computing capability. However, the SWMA does not support the proposed language as written. The SWMA heard comments in opposition to the proposed changes to the LMD Code. The SWMA S&T Committee noted that it is important for consumers to have full information about the purchase price of the product before they dispense the fuel and to be able to follow all aspects of the transaction. Also, the Committee is concerned that the proposed language does not provide for this.

The SWMA heard from Tina Butcher, NIST, that a WG has been established to study this issue. The group met in conjunction with the NCWM Annual Meeting in July, and anyone interested in participating in the work should contact Tina. The SWMA supports the continued efforts of the WG and encourages interested parties to provide comments to the WG. Because of the ongoing efforts to develop this item, the SWMA agrees that this item should remain an Informational item and encourages people to study the proposal that has been presented thus far.

At the 2009 NCWM Interim Meeting, the Committee heard from Tina Butcher, NIST WMD, who indicated that, due to staff shortages, she has not been able to devote time to work on this issue further. Several NCWM members offered help in continuing the work, including John Eichberger, National Association of Convenience Stores, who indicated he could coordinate assistance from some of the association's interested members.

The Committee also heard some specific comments on the proposed language from Will Wotthlie, Maryland Weights and Measures, who noted that, should the Committee proceed with its consideration of the proposed changes in the recommendation; the following issues should be addressed:

- Paragraphs S.1.6.4.1.(a); UR.3.2.(a)(1); UR.3.2.(b)(1) and (2) are already in the handbook and should not be underlined. (**Technical Advisor's Note:** These corrections have been made in the report.)

- Where did the printed receipt referenced in S.1.6.4.1.(b) and in UR.3.3.(c) originate?

- Could the references to "computing or money-operated devices" currently found in paragraph S.1.6.4.1. be carried over into paragraph UR.3.3. in the lead statement: "Any computing or money-operated device…"?

- In the proposed changes to UR.3.4., should the reference to "printed" in the phrase "or printed in clear hand script" be "written" instead?

- Does the note under UR.3.4. Printed Ticket infer that all computing devices will be required to have a printer?

The Committee believes that additional work is required on this proposal before it is ready to move forward for a Vote and the Committee supports continued work by the WG. The Committee agreed to maintain this item as an Informational item.

At the 2009 NCWM Annual Meeting, the Committee heard continued comments in support of continuing this work.

At its Fall 2009 Interim meeting, the CWMA recommended that this item remain Informational and urged resources be committed to its further development. CWMA members commented that price posting continues to be a problem, noting that the current language in NIST Handbook 44 does not reflect current market practices and the language needs to be either fixed or removed from the Handbook. The CWMA also requested that the NCWM sponsor a WG to address this issue.

At its 2009 Interim Meeting, NEWMA agreed that this is a priority item and wants to encourage the formation of a WG as soon as possible. NEWMA further noted comments heard during its meeting:

- As long as terms and conditions are made clear prior to sale, the transaction should be allowed.

- Businesses should purchase the correct equipment (according to HB 44) for their marketing strategy.

- This items needs to move forward as a priority.

- We need to find some remedy for businesses that have older equipment.

- It is very difficult to take a hard line (follow HB 44 exactly) on this item.

- We must enforce equally and provide a level playing field.

- HB 44 is antiquated and should be revised.

At its 2009 Annual Meeting, the SWMA recommended that NIST WMD resume working on this proposal as soon as resources are available. NIST should include John Eichberger, National Association of Convenience Stores, and other sectors that are interested in the work and that will be impacted by proposals to modify the LMD code relative to price posting and computing for RMFDs.

At its 2009 Annual Meeting, the WWMA recommended that the item remain Informational and, hearing that NIST plans to hire an additional staff member soon, urged NIST to allocate the necessary resources to the project. The WWMA feels that the suggested working group needs to be activated. The WWMA further commented that in reviewing the proposed language currently being considered, their members had some concerns that the customer may not be given adequate information until after the transaction is completed.

331 VEHICLE-TANK METERS

331-1 T.2.1. Automatic Temperature-Compensating Systems

Source: 2009 Carryover Item 331-1. This item originated from the Western Weights and Measures Association (WWMA) and first appeared on the Committee's 2008 agenda.

Purpose: To reduce tolerances applicable to comparisons of test results for compensated and non-compensated test runs to better reflect the performance of these systems.

Item Under Consideration: Amend paragraph T.2.1. as follows:

> **T.2.1. Automatic Temperature-Compensating Systems.** – The difference between the meter error (expressed as a percentage) for results determined with and without the automatic temperature-compensating system activated shall not exceed:
>
> (a) **~~0.4~~0.2 %** for mechanical automatic temperature-compensating systems; and
>
> (b) **~~0.2~~0.1 %** for electronic automatic temperature-compensating systems.
>
> The delivered quantities for each test shall be approximately the same size. The results of each test shall be within the applicable acceptance or maintenance tolerance.
> **(Amended 201X)**

Background/Discussion: For more than 13 years, Alaska has been testing mechanical and electronic temperature-compensating vehicle-tank meters with flow rates ranging from 100 gal/min to 300 gal/min. They have applied the tolerances of 0.2 % for mechanical and 0.1 % for electronic wholesale meters as specified in the LMD Code, and have found that the devices are fully capable of meeting these tolerances. When devices are found out of tolerance, it is usually because of a broken cable at the probe for the mechanical devices, an electrical fault at the probe on electronic devices, or an incorrect API setting. By keeping the current tolerances that are double the equivalent tolerances in the LMD Code, there is a risk these problems will be missed.

To illustrate how the current tolerances may mask problems, such as broken temperature probes or incorrect settings, consider the following example:

> 1000 gal prover
> Diesel #2
> API 34.5
> Temperature 60 °F
> Mechanical compensated VTM

- A net test draw is run and the result is + 2.0 gal or + 0.2 %. This meets the maintenance tolerance of 0.3 % or 3.0 gal.
- A gross draw is run and the result is – 2.0 gal or – 0.2 %. This still meets the tolerance and the difference between the two runs is 0.4 %.

- With the temperature of the fuel at 60 °F, both of these runs should have been equal.

- If an inspector used the system indication of temperature rather than using a certified thermometer in the meter temperature well, calculations show that the current tolerance of 0.4 % for a mechanical automatic temperature-compensating system could allow a system malfunction that provided a temperature error of up to 9 °F difference from the actual temperature taken in the prover and not be recognized as being caused by a faulty system.

At its 2007 Annual Meeting, the WWMA recommended that the item move forward for a Vote. The WWMA was presented with a letter from a meter manufacturer in support of the proposal based on a request from Alaska Weights and Measures for input from manufacturers of the mechanical and electronic compensators. The letter states that the proposed changes will align the VTM tolerances for the difference between meter error for results determined with and without the automatic temperature-compensating system activated with the LMD Code. Current NIST HB 44 language will require this manufacturer to produce different stationary and vehicle-mounted meters; the proposed change will align the United States with Canada and OIML, who currently do not have different standards for these meters.

In 2008 and 2009, the Committee heard mixed comments on this item. The MMA, some individual meter manufacturers, and some weights and measures officials opposed the proposal. While being comfortable with a tighter tolerance for type evaluation applications, they were generally uncomfortable with applying the tighter tolerances applied to routine field examinations, citing greater uncertainties in field testing and expressing concern over the consistency and adequacy of test equipment used in some field tests. The Committee heard similar concerns at the 2009 Interim and Annual Meetings. Several regional associations expressed the opinion that additional data is needed in order to better evaluate the proposal, with the CWMA and the WWMA noting that if no more information is received by the 2009 Interim Meeting, the item should move forward for a vote in 2009. NIST WMD supported the collection of additional data and suggested that the Committee re-examine and compare the tolerances for stationary and vehicle-mounted meters to ensure consistency across codes for the same meter type as part of this effort. NIST also highlighted comments made by some manufacturers and weights and measures officials regarding the importance of using NIST Handbook 105-compliant and traceable standards, such as thermometers and following appropriate test procedures for assessing compliance with ATC tolerances.

The Committee has repeatedly requested additional data in support of the proposal, as well as data from those who oppose the proposal indicating why the proposed change is inappropriate. The Committee maintained the item as an Informational item to allow for the submission of additional data. The Committee appreciates the data provided by Alaska and emphasizes that this position should not be taken to imply that the Committee questions the validity of the data or procedures used in collecting it. However, the Committee is reluctant to propose a change as significant as that of changing a tolerance based upon data from a single source. The NIST Technical Advisor contacted multiple states (including the majority of those along the northern U.S. border) for possible input, but found that many jurisdictions are not finding equipment with activated ATC systems in use on VTMs.

During the 2009 NCWM Annual Meeting, the Committee reported receiving additional VTM test data from the State of Maine. This data supports the proposed change to the tolerances; Maine noted the change would not impact the compliance rate for the devices included in these tests. The Committee pointed out that to date it has received only data in support of the proposed change.

The Committee reiterates its request for jurisdictions to supply test data in support or opposition of the proposal to assist the Committee in making a decision on the item. The Committee also encourages input of data from equipment manufacturers.

At its 2009 Annual meeting, the CWMA requested more data to support the item, noting that if none was received the CWMA would recommend the item move to a Voting item. Hearing no further comments at its 2009 Interim Meeting, the CWMA recommended that this proposal move forward as a Voting item.

At its 2009 Interim Meeting, NEMA recommended that this item remain "Informational," noting that New York has offered to provide alternative proposed tolerances and offering the following additional comments:

- Tolerances should be based on the expansion coefficient of the product being tested.
- The higher the expansion coefficient,t the more accurate the thermometer must be.
- The tolerance should be based on temperature (e.g., ± 2 ºF) of the given products expansion coefficient.

At its 2009 Annual Meeting, the WWMA reiterated its 2008 position, the item should be moved forward for a vote. The WWMA heard from the Alaska representative that there has been no additional data submitted that would contradict the proposed tolerance change. The WWMA noted that the NCWM S&T Committee has repeatedly requested data from industry and state jurisdictions to support or refute the proposed tolerances and to date has received only supporting data.

The WWMA received written comments from Andrea Martincic, Executive Director of the Arizona Petroleum Marketers Association, as follows:

> Petroleum tankers and tank wagons do not have VTMs equipped with ATC—why is there a tolerance change being proposed for VTMs? Again seems to be a problem for 2 states. What products are being delivered by VTMs ATC? Is this to address an issue with heating oil?

The SWMA received no input on this item at its 2009 Annual Meeting and, therefore, took no position, recommending that the item remain "Informational."

331-2 UR.2.5.2.1. Automatic Temperature Compensation for Refined Petroleum Products

Source: 2009 Carryover Item 331-3. This item originated as a companion proposal to 2009 Interim agenda Item 331-2.

Purpose: Add a user requirement to address continual use of a compensator and consistent use of automatic temperature compensation equipment for all fuel products in a single business location.

Item Under Consideration: Add the following subparagraphs to the Vehicle-Tank Meters Code:

> **UR.2.5.1.3. Condition of Use. – At a business location which offers fuel products for sale on the basis of a temperature-compensated volume, all vehicle-tank meters shall have active automatic temperature compensation and all fuel products offered for sale shall be dispensed on the basis of temperature-compensated volume.**

Discussion: Currently, there are no published guidelines for how a company has to use or operate their VTM with or without temperature compensation. They could choose to operate only part of their fleet with ATC or use ATC only part of the year when it is to their benefit. They may choose to use ATC only on certain products, such as home heating oil, and not use ATC with diesel, kerosene, or gasoline.

The Committee was originally asked by the SWMA to consider adding two paragraphs intended to help (1) to eliminate the potential for facilitation of fraud with ATC; and (2) to eliminate consumer confusion regarding why certain products are currently sold using ATC and others are not. The Committee was able reach agreement on a proposal to address the "Period of Use" and put forward a proposal as outlined in Item 331-2 in the Committee's 2009 Final Report. Under that item, the NCWM ultimately adopted the following changes at the 2009 Annual Meeting: (1) Proposed changes to UR.2.5.1.1. to require continual use of an automatic temperature compensator; and (2) the addition of a new UR.2.5.1.2. to require year-round use of temperature compensation unless otherwise agreed to in writing by the buyer and the seller.

In discussing the larger issue of ATC use on VTMs in January 2009, the Committee was not able to reach agreement on the "Conditions of Use" for ATC systems; that is, criteria for stipulating how ATC is used to sell similar products within a single company. Consequently, the Committee created this item at the 2009 Interim Meeting as a companion to 2008 Item 331-2 to enable further review and discussion of the proposed criteria.

In reaching this decision, the Committee considered the following comments received during the 2008 Interim and Annual Meetings, as well as comments from the regional associations regarding "condition of use."

The Committee considered several iterations of the original proposal based on the following points raised in open hearings and regional associations in 2008. Details can be found in the Committee's 2008 Final Report (see Item 331-2).

- The proposal should only apply to fuel products.
- A number of people voiced concern over the possibility of consumers (who generally are not educated regarding the import of compensated versus uncompensated deliveries) unwittingly signing contracts agreeing to gross or net deliveries that may put them at a disadvantage.
- Questions were raised over uniformity between buyer and seller agreements at the retail level.
- The numbering of the proposals is not consistent with current code format.
- Would the language inappropriately allow a seller to include a shorter time period than 12 months facilitating use of the system when it is of most advantage to the business?

During the 2008 CWMA Interim Meeting, one jurisdiction stated they would not support this item with UR.2.5.2.2. Condition of Use. This jurisdiction believes that all VTMs at a location should *not* be made to be temperature-compensate at a given facility. Other jurisdictions attending the meeting supported the item. For clarification purposes, the CWMA recommends the words "through a vehicle-tank meter" (see italics type below for illustrative purposes) be inserted after the words "offered for sale…" in UR.2.5.2.2. Condition of Use.

In addition to proposed changes specifying the "period of use," the CWMA supported recommending the following proposed paragraph to address "condition of use" for a vote:

> **UR.2.5.2.2. Condition of Use. – At a business location, which offers fuel products for sale on the basis of a temperature-compensated volume, all vehicle-tank meters shall have active automatic temperature compensation and all fuel products offered for sale *through a vehicle-tank* meter shall be dispensed on the basis of temperature-compensated volume.**

At its 2008 Interim Meeting, NEWMA heard discussion that allowing uncompensated sales when agreed to by both parties could result in consumers getting sales contracts that contained this language, and consumers may not understand fully what this means. When the phrase "unless otherwise agreed to by both the buyer and seller in writing" language is removed, it appears that UR.2.5.1. already addresses this issue.

Consequently, NEWMA recommended the following changes and suggested the item remain "Informational":

> ~~UR.2.5.2.1. Period of Use. – When fuel is bought or sold on an automatic temperature compensation basis, it shall be bought or sold using this basis over at least a consecutive 12-month period unless otherwise agreed to by both the buyer and seller in writing.~~

> **UR.2.5.2.~~2~~1. Condition of Use. – At a business location which offers fuel products for sale on the basis of a temperature-compensated volume, all vehicle-tank meters shall have active automatic temperature compensation and all fuel products offered for sale shall be dispensed on the basis of temperature-compensated volume.**

At its 2008 Annual Meeting, the SWMA raised the following concerns and questions about the proposal:

- The SWMA questioned the need for the new proposed paragraph UR.2.5.1. since the VTM Code currently includes a paragraph (also numbered UR.2.5.1.) that appears to cover similar criteria.

- The SWMA heard a suggestion to eliminate the phrase "unless otherwise agreed to by both the buyer and the seller" from the proposed UR.2.5.1. The Committee noted that the same language is already included in the Liquid-Measuring Devices Code; however, the references in that code are to wholesale meters and the buyer and seller are fully educated and understand the ramification of a temperature-compensated versus non-temperature-compensated sale.

- The SWMA questioned how the proposed paragraph UR.2.5.2.2. is intended to apply to metering devices at a single location. Does the reference to "all fuel products" in this paragraph refer to all vehicle-tank meters? Or does it refer to vehicle-tank meters, as well as RMFDs at a single location?

- The SWMA questions the proposed numbering of the paragraphs and whether or not the proposed paragraphs should be included under the section of "invoices" or in another section.

The SWMA also considered a suggestion to split the item into two parts in order to facilitate addressing these and other concerns. While the SWMA is amenable to this approach, it believes the above concerns and questions should be addressed prior to taking additional action and recommended the item remain "Informational."

At the 2009 NCWM Interim Meeting, concerns were expressed that the language in the recommendation may not allow a business that has a VTM dedicated to serving a single customer to have the option of providing the sale on an uncompensated basis. Comments in support of the language indicate that this will prevent business owners from selectively using a VTM without ATC to serve retail customers (who are not generally well educated with respect to the distinction between compensated and non-compensated deliveries) when a non-compensated sale would be disadvantageous to the customer. The CWMA has proposed alternative language, as shown in Item 331-2, to emphasize that the paragraph applies only to sales from a VTM by a business, not all of the business' fuel sales (for example, fuel sales made through loading-rack meters also operated by the business).

The Committee invited additional comments and suggestions on how to modify the proposed language to address the concerns raised. The Committee is also interested in comments on how the issue of a meter that can be programmed with multiple products should be addressed; specifically, whether such a meter should be permitted to be programmed to offer compensated and non-compensated sales through the same meter and, if so, what language is needed to address its use. The Committee agreed to keep this proposal on its agenda as an Informational item.

See Item 331-2 in the Committee's 2009 Interim and Final Reports for additional background information.

At their 2009 Annual Meetings, the CWMA, NEWMA, and SWMA heard no comments on the item; these regions not take a position on the item and recommended it remain "Informational." At its 2009 Interim Meeting, the CWMA heard comment from one jurisdiction in opposition of the item, but no other comments. At its 2009 Interim Meeting, NEWMA offered the following additional comments:

- A problem exists where businesses deliver gross/net from the same vehicle (e.g., different states with different requirements).
- This item is device focused but should be customer focused.

At its 2009 Annual Meeting, the WWMA also recommended the item remain "Informational," commenting that use of an ATC device should be linked to the customer, not the business location, because it appears that the way the section is currently written, all customers would be required to receive compensated deliveries where ATC is not required or desired.

The WWMA also received written comments from Andrea Martincic, Executive Director of the Arizona Petroleum Marketers Association. At the request of Ms. Martincic, these comments were entered directly into the WWMA final report as submitted:

> "Still presents a problem for jobbers/distributors operating in multiple states. Could S&T somehow tie it to the customer—so there must be consistency of ATC usage for those customers sold product ATC through VTMs?"

The WWMA heard comments reiterating concerns about how the current proposed language in UR.2.5.2.1. would apply in instances where a single VTM is used to make retail and wholesale deliveries both in jurisdictions permitting ATC and in jurisdictions prohibiting it.

The WWMA believes this language is not yet ready for adoption and encourages further refinement to address the concerns noted above.

336 WATER METERS

336-1 N.3. Test Drafts and N.4. Testing Procedures

Source: 2009 Carryover Item 336-3. This item originated from the Southern and Western Weights and Measures Associations (SWMA and WWMA).

Purpose: To increase the test draft size for water meters to reduce the impact of uncertainties contributed by the test process.

Item Under Consideration: The Committee is studying following recommendation and encourages input from interested parties.

Amend requirements in paragraphs N.3. Test Drafts and N.4. Testing Procedures Section 3.36. Water Meters as follows by changing the test draft quantities of Tables N.4.1. and N.4.2. of HB 44 as follows:

N.3. Test Drafts. – ~~**The normal test of a meter shall be made at the maximum discharge rate developed by the installation. Meters with maximum gallon per minute ratings higher than the values specified in Table N.4.1. Flow Rate and Draft Size for Water Meters Normal Tests may be tested up to the meter rating, with meter indications no less than those shown.**~~

~~**(Amended 1990, 2002, and 2003)**~~

(a) **Non Utility-Type Water Meters. – Test drafts should be equal to at least the amount delivered by the device in 2 minutes and in no case less than the amount delivered by the device in 1 minute at the actual maximum flow rate developed by the installation. The test draft sizes shown in Table N.4.1. Flow Rate and Draft Size for Non Utility-Type Water Meters Normal Tests, and in Table N.4.2. Flow Rate and Draft Size for Non Utility-Type Water Meters Special Tests, shall be followed as closely as possible.**

(b) **Utility-Type Water Meters. – The test draft sizes shown in Table N.4.X. and N.4.Y. shall be followed as closely as possible. Testing shall be done in like volumes (meters with gallon registration tested in gallon volumes, meters with cubic feet registration tested in cubic feet volumes).**

Table N.4.1. Flow Rate and Draft Size for Non Utility-Type Water Meters
Normal Tests

Meter Size (inches)	Rate of Flow (gal/min)	Maximum Rate Meter Indication/Test Draft	
		gal	**ft³**
Less than ⁵⁄₈	8	50	5
⁵⁄₈	15	50	5
¾	25	50	5
1	40	100	10
1½	80	300	40
2	120	500	40
3	250	500	50
4	350	1000	100
6	700	1000	100

(Table Added 2003) **(Amended 201X)**

Table N.4.X. Flow Rate and Draft Size for Utility-Type Water Meters Normal Tests			
Meter Size (inches)	**Rate of Flow (gal/min)**	**Maximum Rate**	
		Meter Indication/Test Draft	
		gal	**ft³**
Less than ⅝	**8**	**100**	**10**
⅝	**15**	**100**	**10**
⅝ x ¾	**15**	**100**	**10**
¾	**25**	**100**	**10**
1	**40**	**100**	**10**
1½	**50**	**300**	**40**
2	**100**	**500**	**40**

(Table Added 201X)

Table N.4.2. Flow Rate and Draft Size for Non Utility-Type Water Meters Special Tests						
Meter Size (inches)	**Intermediate Rate**			**Minimum Rate**		
	Rate of Flow (gal/min)	**Meter Indication/Test Draft**		**Rate of Flow (gal/min)**	**Meter Indication/Test Draft**	
		gal	**ft³**		**gal**	**ft³**
Less than or equal to ⅝	2	10	1	1/4	5	1
¾	3	10	1	1/2	5	1
1	4	10	1	3/4	5	1
1½	8	50	5	1½	10	1
2	15	50	5	2	10	1
3	20	50	5	4	10	1
4	40	100	10	7	50	5
6	60	100	10	12	50	5

(Table Added 2003) **(Amended 201X)**

Table N.4.Y. Flow Rate and Draft Size for Utility-Type Water Meters Special Tests						
Meter Size (inches)	**Intermediate Rate**			**Minimum Rate**		
	Rate of Flow (gal/min)	**Meter Indication/Test Draft**		**Rate of Flow (gal/min)**	**Meter Indication/Test Draft**	
		gal	**ft³**		**gal**	**ft³**
Less than ⅝	**2**	**10**	**1**	**¼**	**10**	**1**
⅝	**2**	**10**	**1**	**¼**	**10**	**1**
⅝ x ¾	**2**	**10**	**1**	**¼**	**10**	**1**
¾	**3**	**10**	**1**	**½**	**10**	**1**
1	**4**	**10**	**1**	**¾**	**10**	**1**
1½	**8**	**100**	**10**	**1½**	**100**	**10**
2	**15**	**100**	**10**	**2**	**100**	**10**

(Table Added 201X)

Background/Discussion: At its 2007 Annual Meeting, the SWMA received a proposal from a meter manufacturer with two options for modifying Section 3.36. The proposals were intended to address concerns regarding the impact of uncertainties contributed by the test process during repeatability testing by increasing the test draft size specified in the code.

At the 2009 NCWM Interim Meeting, the Committee heard comments from meter manufacturers regarding the urgency for moving this item forward for a vote. The Committee also heard comments from regulators questioning whether or not the proposed changes would address the problems being found during meter testing.

Because the other regional associations have essentially deferred to the WWMA's position and the WWMA's support in the event of a vote was questionable based on comments received from the region, the Committee did not feel it was appropriate to advance this item to a Voting status. However, given the possibility of additional data prior to the 2009 Annual Meeting, the Committee did agree that the item could be elevated to an Informational status; this would allow a higher degree of visibility for an issue which is of evident concern to the manufacturers without compromising the due process for issue development.

During the 2009 NCWM Annual Meeting, Tina Butcher, NIST Technical Advisor, reported that the Committee received additional information on this item. These items as well as copies of previously submitted data are available from the Committee upon request.

At the 2009 NCWM Annual Meeting, the Committee heard a report from Kristin Macey, California Division of Measurement Standards (DMS), on an intercomparison conducted by DMS since the 2009 NCWM Interim Meeting involving 18 California counties.

The Committee heard comments from George DeJarlais, Badger Meter, and Andre Noel, Neptune, who both expressed continued concern about the lack of progress on this issue and impact of the requirements on their ability to market meters. Both manufacturers who were present reported disappointment that Item 336-2 was withdrawn and noted that they are still studying the data from CA, which they received during the Committee's agenda review session.

Jeff Humphreys, LA County, acknowledged problems with testing at the lower flow rates. He went on to express concern about the quality of multi-jet meters they are encountering. The positive displacement meters that they are testing appear to meet the needs of the marketplace with a good compliance rate. Jeff also provided additional data to the Committee that was collected by LA County over the period of January to June 2009; this information will be included in the Committee's final report.

Ed Williams, CA DMS, indicated that in its review of the data collected, CA has observed some validity to the manufacturers' concerns over the requirements for repeatability tests. Both Jeff and Ed encouraged the Committee to do a thorough review of the full range of test requirements for these meters, including not only basic accuracy tests, but also repeatability test requirements.

During the Committee's 2009 Annual Meeting work session, Kristin Macey (representing CA DMS) and the water meter manufacturers present agreed to work to further review requirements for water meter testing with the goal of identifying changes or modifications to the scope of this item (336-1) in time for review by one or more of the fall 2009 regional weights and measures associations.

See the 2007, 2008, and 2009 S&T Committee reports for additional details and background information on this issue.

At its 2009 Annual Meeting, the WWMA heard comments from Ed Williams, Director, California Division of Measurement Standards, regarding water meter compliance in California and referencing testing that has been conducted at the State and county level. Ed provided a written copy of these comments to the WWMA; that document is included in Appendix A to this agenda.

The WWMA heard from George DeJarlais on behalf of five water meter manufacturers including Badger Meter, Neptune Technology Group, Master Meter, Elster-AMCO, and Sensus Metering Systems that there is an inadequate draft size in HB 44 for 1 ½ and 2 inch size meters and there is inequity in test draft sizes in Table N.4.2. between the five-gallon and corresponding one cubic foot drafts. Since the 2008 WWMA meeting, significant data has been submitted by the device manufacturers and CA DMS. In light of this data, George stated that eight new proposals were submitted to the WWMA that represent alternatives to 336-1, several of which would incorporate the changes proposed in this item. George also stated that the type evaluation compliance rate was somewhat misleading because it involves only four meter product lines that have passed type evaluation since 2002. In the meantime, some manufacturers have deferred submitting meters for evaluation until some of the HB 44 issues are resolved.

The WWMA S&T Committee was advised by George that the eight new proposals were submitted as multiple alternatives for solving the three concerns identified by the water meter manufacturers: accuracy test drafts for 1 ½ and 2 inch meters, gallon test drafts for meters ≤ 1 inch size, and accuracy test drafts with respect to repeatability requirements. After reviewing these proposals and considering the original proposal in 336-1, the WWMA recommended that this item be withdrawn and forwarded two new proposals (as outlined Item 336-2 and 336-3 of this agenda) to the NCWM S&T Committee for consideration.

At its 2009 Interim Meeting, the CWMA requested comments on this item; however, hearing none, the CWMA recommended that the item remain an Informational item.

At its 2009 Interim Meeting, NEWMA recommended withdrawing this item until a solid proposal can be made.

At its 2009 Annual Meeting, the SWMA recommended withdrawing this proposal in favor of supporting two alternate related proposals, developed by the September 2009 WWMA (as outlined in Items 336-2 and336-3 in this agenda).

336-2 N.4.2 Special Tests.

Source: WWMA

Purpose: To increase the test draft size for special tests of Utility Type Water meters to reduce the impact of uncertainties contributed by the test process.

Item Under Consideration: Modify paragraph N.4.2. Special Tests and Table N.4.2. and add a new table as follows:

N.4.2. Special Tests. – Special tests to develop the operating characteristics of meters may be made according to the rates and quantities shown in Table N.4.2. Flow Rate and Draft Size for Water Meters Special Tests.
(Amended 2003)

Table N.4.2.
Flow Rate and Draft Size for Batching Water Meters Special Tests

Meter Size (inches)	Intermediate Rate			Minimum Rate		
	Rate of Flow (gal/min)	Meter Indication/Test Draft		Rate of Flow (gal/min)	Meter Indication/Test Draft	
		gal	ft^3		gal	ft^3
Less than or equal to $^5/_8$	2	10	1	¼	5	1
¾	3	10	1	½	5	1
1	4	10	1	¾	5	1
1 ½	8	50	5	1 ½	10	1
2	15	50	5	2	10	1
3	20	50	5	4	10	1
4	40	100	10	7	50	5
6	60	100	10	12	50	5

(Table ~~Added 2003~~ Amended 2011)

Table N.4.X.
Flow Rate and Draft Size for Utility Type Water Meters Special Tests

Meter Size (inches)	Intermediate Rate			Minimum Rate		
	Rate of Flow (gal/min)	Meter Indication/Test Draft		Rate of Flow (gal/min)	Meter Indication/Test Draft	
		gal	ft^3		gal	ft^3
Less than 5/8	2	10	1	¼	5	1
5/8	2	10	1	¼	5	1
5/8 x ¾	2	10	1	¼	5	1
¾	3	10	1	½	5	1
1	4	10	1	¾	5	1
1 ½	8	100	10	1 ½	100	10
2	15	100	10	2	100	10

(Table Added 2011)

Background/Discussion: The WWMA heard from Andre Noel, Neptune Technology Group, representing five water meter manufacturers. The meter manufacturers state that meters 1 ½ and 2 inch size are guaranteed to fail type evaluation because of inadequate test draft sizes. The test draft size only represents ten graduations on the proving indicator, only one-tenth the revolutions of the proving indicator. This results in larger meter uncertainties.

The WWMA heard that field testing of 1 ½ and 2 inch meters seldom occurs in California, but these meters are type evaluated by the California Type Evaluation Program laboratory on a more frequent basis. The WWMA recognizes that the current draft sizes are inadequate to obtain valid test results. Increasing the test draft size in this case would not create undue hardship during field testing, since field tests are not being conducted on a routine basis.

The WWMA also received a comment regarding the consistent use of words describing non-utility, batch-type, and batching type meters. The WWMA suggests that the term "batching meters" be used throughout this code. The WWMA also recognizes the need for including of the 5/8 x ¾ size meter, which is commonly found in commercial sub-metering applications.

At its 2009 Interim Meeting, the CWMA heard no comments on this item and recommended it be maintained as an Informational item.

At its 2009 Annual Meeting, the SWMA supported the WWMA in its proposed modifications to Table N.4.2. to address the flow rates and test draft sizes for special tests of batching meters. The SWMA also supports the WWMA's including a new Table N.4.X. to address the flow rates and test draft sizes for special tests of utility type water meters. The SWMA acknowledges the change in flow rates and test drafts for special tests of utility type water meters are needed to address the operating characteristics of these meters. Since tests are conducted on an infrequent basis, the increase in the test draft sizes as proposed in new Table N.4.X. would not create undue hardship for a jurisdiction. The SWMA also recognizes the proposed new Table N.4.X. now addresses meter sizes in actual use that were not previously addressed in the code. The SWMA relies on WWMA experience and expertise in the regulation this technology. Consequently, the SWMA recommends this proposal be included as a Voting item on the NCWM S&T's 2010 agenda.

336-3 T.1.1. Repeatability.

Source: WWMA

Purpose: To return the tolerances for repeatability tests of water meters to the values specified prior to 2003 for water meters (and many other measuring devices) in the General Code in an effort to reduce the impact of uncertainties contributed by the test process.

Item Under Consideration: Modify paragraph T.1.1. Repeatability as follows:

T.1.1. Repeatability. - When multiple tests are conducted at approximately the same flow rate, ~~the range of the test results shall not exceed 0.6 % for tests performed at the normal and intermediate flow rates, and 1.3 % for tests performed at the minimum flow rate, and~~ each test shall be within the applicable tolerance<u>s and the range of test results shall not exceed the following values:</u>

	Batching Meters	Utility-Type Meters
Normal Flow Rates	**0.6 %**	**0.6 %**
Intermediate Flow Rates	**0.6 %**	**2 %**
Minimum Flow Rate	**1.3 %**	**4 %**

(Added 2002) <u>(Amended 2011)</u>

Background/Discussion: The WWMA heard from George DeJarlais, with Badger Meter, representing a group of five water meter manufacturers. One of the primary concerns of the manufacturers is the inability of meters to pass repeatability requirements during type evaluation testing. Based upon the data collected by the State of California and multiple California counties, the WWMA noted that three separate ranges of repeatability are appropriate for the maximum, intermediate, and minimum flow rates when current HB 44 test draft sizes are used. The WWMA also noted that an increase to the range of the test results performed at the intermediate and minimum flow was warranted, notwithstanding the requirement for each test to be within the applicable tolerance.

At its 2009 Interim Meeting, the CWMA heard no comments on this item and recommended it be maintained as an Informational item.

At its 2009 Annual Meeting, the SWMA heard from Andre Noel (Neptune Technology) about the primary concerns of the manufacturers over the inability of meters to pass repeatability requirements during type evaluation testing. Mr. Noel indicated that the data collected by the State of California and multiple California counties support the proposed new ranges of repeatability tolerances for the maximum, intermediate, and minimum flow rates when current HB 44 test draft sizes are used. The SWMA relies on WWMA experience and expertise in the regulation this technology. Consequently, the SWMA recommended this proposal be included as a Voting item on the NCWM S&T's 2010 agenda.

360 OTHER ITEMS

360-1 Tentative Code for Hydrogen Gas-Measuring Devices.

Source: WWMA and SWMA

Purpose: To provide the U.S. Weights and Measures community (manufacturers, users, and weights and measures officials) with legal metrology requirements to address gaseous hydrogen refueling dispensers already in operation in 24 states.

Item Under Consideration: Adopt the proposed Section 3.39. Hydrogen Gas-Measuring Devices Code outlined in **Appendix B** as a tentative code in NIST Handbook 44.

Background/Discussion: The U.S. National Work Group (USNWG) for the Development of Commercial Hydrogen Measurement Standards recommends changing the status of the NCWM S&T Committee Developing Item proposing development of a new hydrogen code from Developing to "Voting." The latest Draft 5.0 of the proposed new NIST HB 44 Section 3.39. Hydrogen Gas-Measuring Devices Code was distributed to the four regional weights and measures associations in September 2009 for consideration. Note that a corresponding recommendation that proposes including hydrogen fuel quality and method of sale requirements in NIST HB 130 "Uniform Laws and Regulations in the Areas of Legal Metrology and Engine Fuel Quality"(HB 130) was also submitted to the four regional weights and measures association Laws and Regulations (L&R) Committees.

The USNWG makes this recommendation for an upgrade in the proposal's status as a result of 22 months of work to ready the draft code language for national approval and adoption. The USNWG will be collecting additional data in the coming months to confirm that the proposed tolerances are adequate and fair given today's hydrogen technology and the test equipment available. These tolerances are derived from performance requirements in use for similar compressed gas applications in HB 44 and OIML R 139 "Compressed gaseous fuel measuring systems for vehicles." The USNWG will update the weights and measures community on its findings in the event that the proposed tolerances for these systems require further refinement.

As additional justification, the USNWG notes that the proposed new hydrogen code provides the U.S. Weights and Measures community with legal metrology requirements to address gaseous hydrogen refueling dispensers already in operation in twenty-four states. Thirty additional stationary/mobile refueling systems are in the planning stages. Existing requirements for other compressed gas refueling applications, primarily compressed natural gas (CNG), were the starting point for many hydrogen standards. CNG requirements are not entirely suitable for some of the unique features of hydrogen gas dispensers (e.g., product density). While some jurisdictions feel it is premature for hydrogen requirements because there are limited refueling stations, the USNWG feels that this is the ideal time to set the stage for weights and measures requirements. The hydrogen community is looking to the weights and measures community for their expertise, and this is the opportunity to be involved in the early stages of the development of commercial measurement standards that was not possible with CNG.

The United States has the largest number of hydrogen refueling dispensers worldwide. By taking the lead in developing appropriate requirements for this growing alternative fuel technology, the United States can fill a critical gap in the hydrogen infrastructure and can move closer to its goal for a clean fuel source and independence from imported energy.

The USNWG members represent: (1) federal and state government, (2) dispenser, meter, and related component manufacturers, (3) fuel providers, (4) fuel partnerships, (5) fuel quality administrators, (6) related standards organizations, and (7) type evaluation and research and development laboratories. The USNWG is recommending design, performance, installation, and user requirements for hydrogen dispensers based on its experience with compressed gas delivery systems and hydrogen's properties and measurement technology. The draft code is the first phase of a five-year project, which starts with a tentative code. The tentative code is necessary for providing guidelines to device manufacturers and, once finalized, will be the basis for test procedures, type evaluation criteria, and eventual training of industry and field officials.

The ongoing work to develop the hydrogen code has been documented and is under review through posting on the websites:

1. http://www.fuelcellstandards.com/ tracks over 200 hydrogen and fuel cell standards,

2. http://ts.nist.gov/WeightsAndMeasures/Developing-Commercial-Hydrogen-Measurement-Standards.cfm a NIST WMD outreach project providing the latest updates on work to develop legal metrology requirements for hydrogen measurement,

3. http://www.hydrogenandfuelcellsafety.info/ lists updates on the latest USNWG work reported to the National Hydrogen Fuel Cell Codes and Standards Coordinating Committee (NHFCCSCC). The committee is sponsored by U. S. Department of Energy (DOE), U.S. Fuel Cell Council, and National Hydrogen Association and is chartered with coordinating the development of hydrogen codes and standards to harmonize national and international codes. The NHFCCSCC fosters this collaborative effort between industry and government to encourage sharing of information, avoiding duplication, and to ensure all essential elements are in place for a safe, cost effective, and viable commercial program.

The USNWG work on these requirements has been reported in detail in multiple outreach projects such as the:

1. Weights and Measures Quarterly news article series on "Hydrogen, What's Next?" a NIST WMD technical news publication distributed to the weights and measures community,

2. Open hearings of the 2008 and 2009 meetings of the National Conference on Weights and Measures, S&T and L&R Committees, and Meter Manufacturers Association meetings,

3. Three U.S. Weights and Measures Administrators' Workshops on Commercial Hydrogen Measurement, and

4. Two Regional Weights and Measures Association Technical Training Seminars on Commercial Hydrogen Measurement, which like the workshop were sponsored in part by the DOE and NIST to familiarize weights and measures officials with the latest developments in the operation, performance, and safety of hydrogen refueling technology

The work to fully develop the new hydrogen infrastructure included representation and input from affected sectors, including weights and measures officials and equipment manufacturers and operators. This is an opportunity to influence the direction of the work prior to commercialization of this application. The work represents a unique and collaborative effort.

The USNWG initially focused its efforts on the development of requirements for retail refueling dispensers. As discussions and work progressed, the USNWG discussed at what point to address wholesale applications acknowledged. The USNWG is aware that other measuring device codes address wholesale applications, but does not agree as some have suggested that the code should wait until wholesale applications are addressed. The update of codes is an ongoing process. The USNWG agreed that retail dispensers have the more immediate need for marketplace standards. The USNWG has begun to consider code language to addresses both retail and wholesale devices.

The USNWG is working to provide guidance documents and training that are necessary for the start-up and implementation of a hydrogen device inspection and test program. The USNWG is examining the resources necessary to test hydrogen refueling equipment and has, with the assistance of California's Division of Measurement Standards, created an equipment list with an estimated average cost for a test standard of $111,000.

Jurisdictions may rely on the provisions of HB 44 General Code paragraph G-UR.4.4. Assistance in Testing Operations to ensure suitable test equipment is available. The USNWG is also considering the incorporation of User Requirements which would provide more specific equipment and assistance requirements that apply to the official test, such as those specified in paragraph UR.3.8. Return of Product to Storage, Retail Compressed Natural Gas Dispensers in the Mass Flow Meters Code. It should be noted that the USNWG and CSA/HGV 4.3 Temperature Compensation Devices for Hydrogen Gas Dispensing Systems Work Group are exploring the advantages of cost sharing a single test standard for use to test for over pressurization and over-heating as well as for the accuracy of the delivery system.

The USNWG anticipates input from both the weights and measures and hydrogen communities in support of the proposed code during the regional fall meetings.

At its 2009 Interim Meeting, the CWMA recommended changing the status of the Developing Item on the S&T Committee's 2009 agenda to a Voting item as a tentative code in NIST Handbook 44 to address gaseous hydrogen refueling applications.

At its 2009 Interim Meeting, NEWMA stated that, if an EPO has been developed and all safety considerations have been addressed then NEWMA supports as "Voting." Otherwise, NEWMA supports the proposal as "Informational." NEWMA offered the following additional points and questions to address in considering this proposal:

- Is there an urgency to move this from developing to "Voting?" Why not move to Informational first?

- An EPO should be developed before this goes for a vote.

- What equipment will be necessary for testing?
- Are there any safety considerations?
- This is very new for Weights & Measures inspectors.
- Should a hydrogen specification chart be included as part of the code or in the EPO?

At its 2009 Annual Meeting, the WWMA heard from Ms. Kristin Macey, California, Chair of the USNWG on Hydrogen Device Standards Subcommittee, about the necessity for a tentative hydrogen gas-measuring device code to further the development of a retail infrastructure for commercial hydrogen as a motor fuel. There are eighteen states where hydrogen stations are under current operations. Ms. Macey urged state directors at the WWMA meeting to visit and learn more about these sites and provide written and/or oral support at upcoming NCWM meetings. The WWMA recommends this as a "Voting" item and also encourages the collection of data in the coming months to validate the proposed tolerances and test notes.

At its 2009 Annual meeting, the SWMA supported the USNWG's proposal for a new Section 3.39 Hydrogen Gas-Measuring Devices Code and recommends the proposal move forward for adoption as a tentative code. The SWMA S&T Committee recommends the USNWG consider the comments made during its open hearing session and all other comments made at the fall 2009 regional weights and measures association meetings as it prepares the final draft of the hydrogen code for consideration at the January 2010 NCWM.

The USNWG is scheduled meet December 15, 2009, and January 13, 2010, to review and develop a position on the comments it received on the draft code. The USNWG responses to those comments and any updates to the draft code will be posted on the website http://ts.nist.gov/WeightsAndMeasures/Developing-Commercial-Hydrogen-Measurement-Standards.cfm and made available to all interested parties. The USNWG notes that the WG agreed in October 2007 to simultaneously develop a device code and corresponding test procedures. Currently, the USNWG has a draft examination procedure outline (EPO 29) under review for the gravimetric test method to include safety guidelines.

360-2 International Organization of Legal Metrology (OIML) Report

Many issues before the OIML, the Asian-Pacific Legal Metrology Forum (APLMF), and other international groups are within the purview of the Committee. Additional information on OIML activities will appear in the Board of Directors agenda and Interim and Final Reports and on the OIML website at http://www.oiml.org. NIST WMD staff will provide the latest updates on OIML activities during the open hearing sessions at NCWM meetings. For more information on specific OIML-related device activities, contact the WMD staff listed in the table below. The OIML projects listed below represent only currently active projects. For additional information on other OIML device activities that involve WMD staff, please contact WMD using the information listed below:

NIST Weights and Measures Division (WMD) Contact List for International Activities	
Contact Information	**Responsibilities**
Postal Mail and Fax for all Contacts:	NIST WMD 100 Bureau Drive MS 2600 Gaithersburg, MD 20899-2600 Tel: (301) 975-4004 Fax: (301) 975-8091
Mr. John Barton (LMDG) (301) 975-4002 john.barton@nist.gov	• R 21 "Taximeters" • R 50 "Continuous Totalizing Automatic Weighing Instruments (Belt Weighers)" • R 60 "Metrological Regulations for Load Cells" (jointly with Ken Butcher) • R 106 "Automatic Rail-weighbridges"

NIST Weights and Measures Division (WMD) Contact List for International Activities	
Contact Information	**Responsibilities**
Mr. Kenneth Butcher (LMG) (301) 975-4859 kenneth.butcher@nist.gov	• D 1 “Elements for a Law on Metrology” • TC 3 “Metrological Control” • TC 3/SC 1 “Pattern Approval and Verification” • TC 3/SC 2 “Metrological Supervision” • TC 6 “Prepackaged Products” • R 60 “Metrological Regulations for Load Cells” (jointly with John Barton)
Mr. Steven Cook (LMDG) (301) 975-4003 steven.cook@nist.gov	• R 76 “Non-automatic Weighing Instruments”
Dr. Charles Ehrlich (ILMG) (301) 975-4834 charles.ehrlich@nist.gov	• CIML Member • B 3 “OIML Certificate System for Measuring Instruments” • B 6 “OIML Directives for the Technical Work” • B 10 “Framework for a Mutual Acceptance Arrangement (MAA) on OIML Type Evaluations” • TC 3/SC 5 “Expression of Uncertainty in Measurement in Legal Metrology Applications,” “Guidelines for the Application of ISO/IEC 17025 to the Assessment of Laboratories Performing Type Evaluation Tests” • TC 3 “Metrological Control”
Mr. Richard Harshman (LMDG) (301) 975-8107 richard.harshman@nist.gov	• R 51 “Automatic Catchweighing Instruments” • R 61 “Automatic Gravimetric Filling Instruments” • R 107 “Discontinuous Totalizing Automatic Weighing Instruments” (totalizing hopper weighers) • R 134 “Automatic Instruments for Weighing Road Vehicles In-Motion and Measuring Axle Loads”
Ms. Diane Lee (LMDG) (301) 975-4405 diane.lee@nist.gov	• R 59 “Moisture Meters for Cereal Grains and Oilseeds” • R 92 “Wood Moisture Meters – Verification Methods and Equipment” • R 121 “The Scale of Relative Humidity of Air Certified Against Saturated Salt Solution” • TC 17/SC 8 “Measuring Instruments for Protein Determination in Grains”
Mr. Ralph Richter (ILMG) (301) 975-3997 ralph.richter@nist.gov	• R 35 “Material Measures of Length for General Use” • R 49 “Water Meters” (Cold Potable Water & Hot Water Meters) • R 71 “Fixed Storage Tanks” • R 80 “Road and Rail Tankers” • R 85 “Automatic Level Gauges for Measuring the Level of Liquid in Fixed Storage Tanks” • R 105 & R 117 “Measuring Systems for Liquids Other Than Water” (all measuring technologies) • R 118 “Testing Procedures and Test Report Format for Pattern Examination of Fuel Dispensers for Motor Vehicles” • TC 3/SC 4 “Verification Period of Utility Meters Using Sampling Inspections” • R 137 “Gas Meters” (Diaphragm, Rotary Piston, & Turbine Gas Meters) • R 140 “Measuring Systems for Gaseous Fuel” (i.e., large pipelines)

NIST Weights and Measures Division (WMD) Contact List for International Activities	
Contact Information	**Responsibilities**
Dr. Ambler Thompson (ILMG) (301) 975-2333 ambler@nist.gov	• D 11 “General Requirements for Electronic Measuring Instruments” • D 16 “Principles of Assurance of Metrological Control” • D 19 “Pattern Evaluation and Pattern Approval” • D 20 “Initial and Subsequent Verification of Measuring Instruments and Processes” • D 27 “Initial Verification of Measuring Instruments Using the Manufacturer’s Quality Management System” • R 34 “Accuracy Classes of Measuring Instruments” • R 46 “Active Electrical Energy Meters for Direct Connection of Class 2” • TC 5/SC 2 “General Requirements for Software Controlled Measuring Instruments”
Ms. Juana Williams (LMDG) (301) 975-3989 juana.williams@nist.gov	• R 81 “Dynamic Measuring Devices and Systems for Cryogenic Liquids” • R 139 “Compressed Gaseous Fuel Measuring Systems for Vehicles”

LIST OF ACRONYMS			
B	Basic Publication	LMDG	Legal Metrology Devices Group
CIML	International Committee of Legal Metrology	P	Project
D	Document	R	Recommendation
ILMG	International Legal Metrology Group	SC	Subcommittee
LMG	Laws and Metrics Group	TC	Technical Committee

The WWMA and the SWMA support these issues and the related device activities as an Informational item.

360-3 Developing Items

The NCWM established a category of items called Developing items as a mechanism to share information about emerging issues which have merit and are of national interest, but have not received sufficient review by all parties affected by the proposal or that may be insufficiently developed to warrant review by the Committee. The Developing items are currently under review by at least one regional association, technical committee, or organization.

Developing items are listed in Appendix C according to the specific HB 44 code section under which they fall. Periodically, proposals will be removed from the Developing item agenda without further action because the submitter recommends it be withdrawn. Any remaining proposals will be renumbered accordingly.

The Committee encourages interested parties to examine the proposals included in Appendix C and send their comments to the contact listed in each item. The Committee asks that the regional associations and NTETC sectors continue their work to develop each proposal fully. Should an association or sector decide to discontinue work on an item, the Committee asks that it be notified.

Mr. Brett Saum, San Luis Obispo County, California, Chairman

Mr. Carol Fulmer, South Carolina
Mr. Steve Giguere, Maine
Mr. Kenneth Ramsburg, Maryland
Mr. Paul Moyer, Nebraska

Mr. Ted Kingsbury, Measurement Canada, Technical Advisor
Mr. Steven Cook, NIST, Technical Advisor
Ms. Tina Butcher, NIST, Technical Advisor

Specifications and Tolerances Committee

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Appendix A

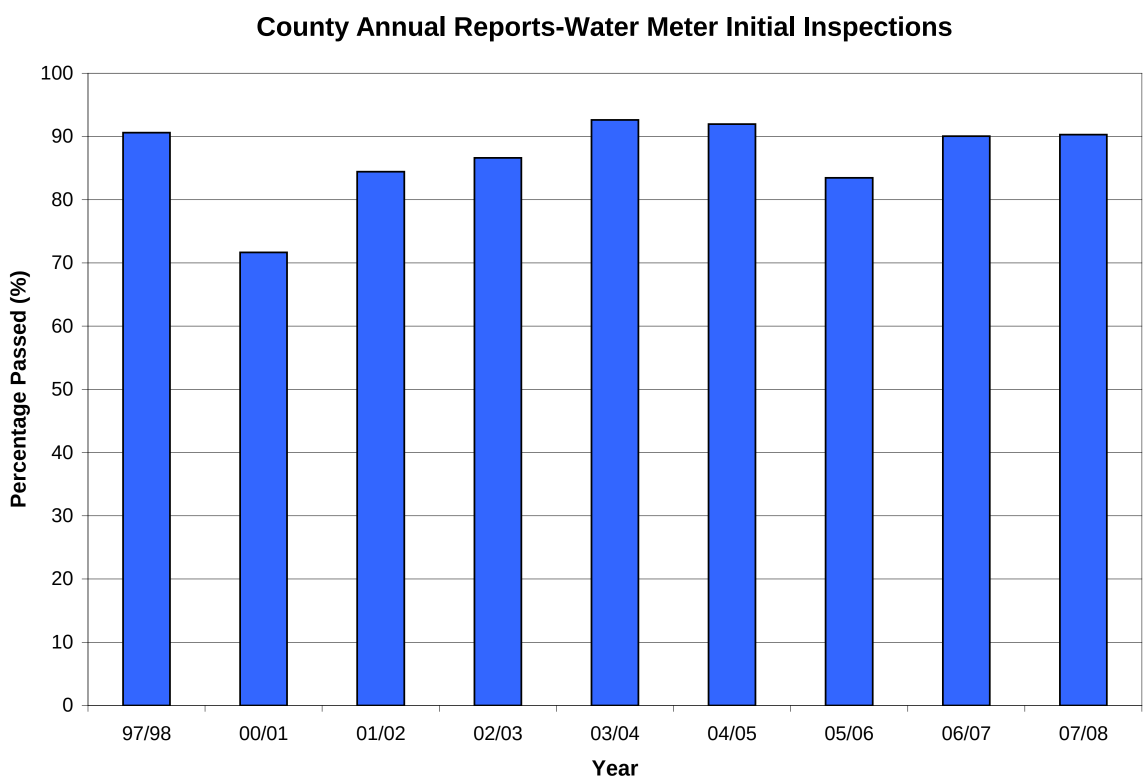
Letter from Ed Williams, California Department of Agriculture Division of Measurement Standards submitted to the 2009 WWMA Annual Meeting (see NCWM Interim Agenda Item 336-1).

Water Meter Compliance in California - 1998 to 2008

The compliance rate of water meters submitted for **type evaluation** has risen in the last ten years. Before the repeatability requirements were added to Handbook 44 in 2003 the percentage of devices passing evaluation was 60%. After this date the percentage rose to 66%, with only one failure for repeatability alone. Of the five meter manufacturers submitting proposals and claiming high failure rates, two have not submitted meters for testing since the introduction of the repeatability requirements

Compliance of water meters submitted to **county** officials has been comparatively high. In 1997/98 the compliance rate was 90% however in 2000/2001 this dropped to the low 70% presumably because one meter manufacturer was not submitting complete meters; registers only were submitted and county officials installed these into a preexisting body. After the manufacturer was instructed to submit only complete meters compliance gradually improved.

Compliance has been above 90% for five of the last ten years



Type Approval

Before Repeatability Requirements

10 applications, 6 certificates issued — Compliance **60 %**

After Repeatability Requirements

9 applications, 6 certificates issued — Compliance **66 %**

This does not support the meter manufacturers' claim that they experienced a high failure rate. After the introduction of repeatability requirements compliance actually increased; only one failure was for repeatability alone, the others failed tolerance.

Two of the five meter manufacturers did not submit a meter for testing; they could not have experienced any failure.

County Testing

Five years; 98, 04, 05, 07, and 08 compliance was above **90%**
Three years; 02, 03, and 06 compliance was above **80%**
Only in 01 was compliance in the low **70%**
This does not support the claim of a high rejection rate by county officials

Appendix B

Item 360-1: New NIST Handbook 44 Section 3.39
Hydrogen Gas-Measuring Devices Code
Draft 5.0

360-1 Tentative Code for Hydrogen Gas-Measuring Devices

Sec. 3.39. Hydrogen Gas-Measuring Devices

This tentative code has only a trial or experimental status and is not intended to be enforced. The requirements are designed for study prior to the development and adoption of a final code. Requirements that apply to wholesale applications are under study and development by the U.S. National Work Group for the Development of Commercial Hydrogen Measurement Standards. Officials wanting to conduct an official examination of a device or system are advised to see paragraph G-A.3. Special and Unclassified Equipment.

A.1. This code applies to devices that are used for the measurement of hydrogen gas in the vapor state used as a vehicle fuel.

A.2. This code does not apply to:

(a) devices used solely for dispensing a product in connection with operations in which the amount dispensed does not affect customer charges.

(b) the wholesale delivery of hydrogen gas

A.3. In addition to the requirements of this code, hydrogen gas-measuring devices shall meet the requirements of Section 1.10 General Code.

S. Specifications

S.1. Indicating and Recording Elements.

S.1.1. Indicating Elements. – A measuring assembly shall include an indicating element that continuously displays measurement results relative to quantity and total price. Indications shall be clear, definite, accurate, and easily read under normal conditions of operation of the device.

S.1.2. Vehicle Fuel Dispensers. – A hydrogen gas dispenser used to fuel vehicles shall be of the computing type and shall indicate the mass, the unit price, and the total price of each delivery.

S.1.3. Units. -

S.1.3.1. Units of Measurement. - Deliveries shall be indicated and recorded in kilograms and decimal subdivisions thereof.

S.1.3.2. Numerical Value of Quantity-Value Divisions. - The value of a scale interval shall be equal to:

(a) 1, 2, or 5, or

(b) a decimal multiple or submultiple of 1, 2, or 5.

Examples: quantity-value divisions may be 10, 20, 50, 100; or 0.01, 0.02, 0.05; or 0.1, 0.2, or 0.5 etc.

S.1.3.3. Maximum Value of Quantity-Value Divisions. - The maximum value of the quantity-value division shall be not greater than 0.5 % of the minimum measured quantity.

S.1.3.4. Values Defined. - Indicated values shall be adequately defined by a sufficient number of figures, words, symbols, or combinations thereof. A display of "zero" shall be a zero digit for all displayed digits to the right of the decimal mark and at least one to the left.

S.1.4. 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) 0.001 kg on devices with a maximum rated flow rate of 30 kg/min or less

(b) 0.01 kg on devices with a maximum rated flow of more that 30 kg/min

S.2. Operating Requirements.

S.2.1. Return to Zero.

(a) The primary indicating and the primary recording elements, if the device is equipped to record, shall be provided with a means for readily returning the indication to zero either automatically or manually.

(b) **It shall not be possible to return primary indicating elements, or primary recording elements, beyond the correct zero position.**

S.2.2. Indicator Reset Mechanism. - The reset mechanism for the indicating element shall not be operable during a delivery. Once the zeroing operation has begun, it shall not be possible to indicate a value other than the latest measurement, or "zeros" when the zeroing operation has been completed.

S.2.3. Nonresettable Indicator. - A device may also be equipped with a nonresettable indicator if the indicated values cannot be construed to be the indicated values of the resettable indicator for a delivered quantity.

S.2.4. Provisions for Power Loss.

S.2.4.1. Transaction Information. - In the event of a power loss, the information needed to complete any transaction in progress at the time of the power loss (such as the quantity and unit price, or sales price) shall be determinable for at least 15 minutes at the dispenser or at the console if the console is accessible to the customer.

S.2.4.2. User Information. - The device memory shall retain information on the quantity of fuel dispensed and the sales price totals during power loss.

S.2.5. Display of Unit Price and Product Identity.

S.2.5.1. Unit Price. - A computing or money-operated device shall be able to display on each face the unit price at which the device is set to compute or to dispense.

S.2.5.2. Product Identity. - A device shall be able to conspicuously display on each side the identity of the product being dispensed.

S.2.5.3. Selection of Unit Price. - When a product is offered for sale at more than one unit price through a computing device, the selection of the unit price shall be made prior to delivery using

controls on the device or other customer-activated controls. A system shall not permit a change to the unit price during delivery of a product.

S.2.5.4. Agreement Between Indications. – All quantity, unit price, and total price indications within a measuring system shall agree for each transaction.

S.2.6. Money-Value Computations. - A computing device shall compute the total sales price at any single-purchase unit price for which the product being measured is offered for sale at any delivery possible within either the measurement range of the device or the range of the computing elements, whichever is less.

S.2.6.1. Auxiliary Elements. - If a system is equipped with auxiliary indications, all indicated money value and quantity divisions of the auxiliary element shall be identical with those of the primary element.

S.2.6.2. Display of Quantity and Total Price. - 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 user-activated controls.

S.2.7. Recorded Representations, Point of Sale Systems. A printed receipt shall be available through a built-in or separate recording element for transactions conducted with point-or-sale systems or devices activated by debit cards, credit cards, and/or cash. The printed receipt shall contain the following information for products delivered by the dispenser:

(a) the total mass of the delivery,

(b) the unit price,

(c) the total computed price, and

(d) the product identity by name, symbol, abbreviation, or code number.

S.2.8. Indication of Delivery. - The device shall automatically show on its face the initial zero condition and the quantity delivered (up to the nominal capacity).

S.3. Design of Measuring Elements and Measuring Systems.

S.3.1. Maximum and Minimum Flow-Rates. - The ratio of the maximum to minimum flow-rates specified by the manufacturer for devices measuring gases shall be 10:1 or greater.

S.3.2. Adjustment Means. – An assembly shall be provided with means to change the ratio between the indicated quantity and the quantity of gas measured by the assembly. A bypass on the measuring assembly shall not be used for these means.

S.3.2.1. Discontinuous Adjusting Means. - When the adjusting means changes ratio between the indicated quantity and the quantity of measured gas in a discontinuous manner, the consecutive values of the ratio shall not differ by more than 0.1 %.

S.3.3. Provision for Sealing. - Adequate provision shall be made for an approved means of security (e.g., data change audit trail) or physically applying security seals in such a manner that no adjustment may be made of:

(a) each individual measurement element,

(b) any adjustable element for controlling delivery rate when such rate tends to affect the accuracy of deliveries

(c) the zero adjustment mechanism, and

(d) any metrological parameter that detrimentally affects the metrological integrity of the device or system.

When applicable, the adjusting mechanism shall be readily accessible for purposes of affixing a security seal. Audit trails shall use the format set forth in Table S.3.3.

Table S.3.3.
Categories of Device and Methods of Sealing

Categories of Device	**Method of Sealing**
Category 1: No remote configuration capability.	**Seal by physical seal or two event counters: one for calibration parameters and one for configuration parameters.**
Category 2: Remote configuration capability, but access is controlled by physical hardware. The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.	**The hardware enabling access for remote communication must be on-site. The hardware must be sealed using a physical seal or an event counter for calibration parameters and an event counter for configuration parameters. The event counters may be located either at the individual measuring device or at the system controller; however, an adequate number of counters must be provided to monitor the calibration and configuration parameters of the individual devices at a location. If the counters are located in 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.**
Category 3: Remote configuration capability access may be unlimited or controlled through a software switch (e.g., password). **The device shall clearly indicate that it is in the remote configuration mode and record such message if capable of printing in this mode or shall not operate while in this mode.**	**An event logger is required in the device; it must include an event counter (000 to 999), the parameter ID, the date and time of the change, and the new value of the parameter. A printed copy of the information must be available through the device or through another on-site device. The event logger shall have a capacity to retain records equal to ten times the number of sealable parameters in the device, but not more than 1000 records are required. (Note: Does not require 1000 changes to be stored for each parameter.)**

~~***S.3.4. Automatic Density Correction. - An automatic means to determine and correct for changes in product density shall be incorporated in any hydrogen gas-measuring system where measurements are affected by changes in the density of the product being measured.***~~

S.3.5. Pressurizing the Discharge Hose. - The discharge hose for hydrogen gas shall automatically pressurize to a pressure equal to or greater than the receiving vessel prior to the device beginning to register the delivery. Neither initial hose pressurization or purging/bleeding of the discharge hose shall advance the indications.

S.3.6. Zero-Set-Back Interlock, Retail Vehicle Fuel Devices. - A device shall be constructed so that:

(a) when the device is shut-off at the end of a delivery an automatic interlock prevents a subsequent delivery until the indicating elements, and recording elements if the device is equipped and activated to record, have been returned to their zero positions;

(b) it shall not be possible to return the discharge nozzle to its start position unless the zero set-back interlock is engaged or becomes engaged

(c) in a system with more than one dispenser supplied by a single measuring element, an effective automatic control valve in each dispenser prevents product from being delivered until the indicating elements on that dispenser are in a correct zero position.

(d) in a system with more than one hose supplied by a single measuring element, effective automatic means must be provided to prevent product from being delivered until the indicating element(s) corresponding to each hose are in a correct zero position.

S.4. Discharge Lines and Valves.

~~S.4.1. Diversion of Measured Product. - No means shall be provided by which any measured product can be diverted from the measuring device.~~

S.4.2. Directional Flow Valves. - If a reversal of flow could result in errors that exceed the tolerance for the minimum measured quantity, a valve or valves or other effective means, automatic in operation (and equipped with a pressure limiting device, if necessary) to prevent the reversal of flow shall be properly installed in the system. (See N.1.)

S.4.3. Other Valves. - Check valves and closing mechanisms that are not used to define the measured quantity shall have relief valves (if necessary) to dissipate any abnormally high pressure that may arise in the measuring assembly.

S.5. Markings. - A measuring system shall be conspicuously, legibly, and indelibly marked with the following information:

(a) pattern approval mark (i.e., type approval number);

(b) name and address of the manufacturer or his trademark and, if required by the weights and measures authority, the manufacturer's identification mark in addition to the trademark;

(c) model designation or product name selected by the manufacturer;

(d) nonrepetitive serial number;

(e) the accuracy class of the device as specified by the manufacturer consistent with Table T.2.;

(f) maximum and minimum flow rates in kilograms per unit of time;

(g) maximum working pressure;

(h) applicable range of ambient temperature if other than - 10 °C to + 50 °C;

(i) minimum measured quantity; and

(j) product limitations (such as fuel quality), if applicable.

S.5.1. Location of Marking Information; Hydrogen-Fuel Dispensers. – The marking information required in General Code, paragraph G-S.1. Identification shall appear as follows:

(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 accessible for inspection 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 hydrogen-measuring devices.

S.6. Printer. – When an assembly is equipped with means for printing the measured quantity, the printed information must agree with the indications on the dispenser for the transaction and the printed values shall be clearly defined.

S.6.1. Printed Receipt. - Any delivered, printed quantity shall include an identification number, the time and date, and the name of the seller. This information may be printed by the device or pre-printed on the ticket.

S.7. Totalizers for Vehicle Fuel Dispensers. - Vehicle fuel dispensers shall be equipped with a nonresettable totalizer for the quantity delivered through each separate measuring device.

S.8. Minimum Measured Quantity. – The minimum measured quantity shall satisfy the conditions of use of the measuring system as follows:

(a) Measuring systems having a maximum flow rate less than or equal to 4 kg/min shall have a minimum measured quantity not exceeding 0.5 kg.

(b) Measuring systems having a maximum flow rate greater than 4 kg/min but not greater than 12 kg/min shall have a minimum measured quantity not exceeding 1.0 kg.

N. Notes

N.1. Minimum Measured Quantity. - The minimum measured quantity shall be specified by the manufacturer.

N.2. Test Medium. - The device shall be tested with the product commercially measured except that, in a type evaluation examination, hydrogen gas as specified in NIST Handbook 130 shall be used.

N.3. Test Drafts. - The minimum test shall be one test draft at the declared minimum measured quantity and one test draft at approximately ten times the minimum measured quantity or 1 kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed. (See T.3.)

The test draft shall be made at flows representative of that during normal delivery. The pressure drop between the dispenser and the proving system shall not be greater than that for normal deliveries. The control of the flow (e.g., pipework or valve(s) size, etc.) shall be such that the flow of the measuring system is maintained within the range specified by the manufacturer.

NOTE: Corresponding SAE requirements are under development and this paragraph will be revisited.

N.4. Tests.

N.4.1. Master Meter (Transfer) Standard Test. - When comparing a measuring system with a calibrated transfer standard, the minimum test shall be one test draft at the declared minimum measured quantity and one test draft at approximately ten times the minimum measured quantity or 1 kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed.

N.4.1.1. Verification of Master Metering Systems. – A master metering system used to verify a hydrogen gas-measuring device shall be verified before and after the verification process. A master metering system used to calibrate a hydrogen gas-measuring device, shall be verified before starting the calibration and after the calibration process.

N.4.2. Gravimetric Test. – The weight of the test drafts shall be equal to at least the amount delivered by the device at the declared minimum measured quantity and one test draft at approximately ten times the minimum measured quantity or 1 kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed.

~~N.4.3. PVT Pressure Volume Temperature Test. – The minimum test with a calibrated volumetric standard shall be one test draft the declared minimum measured quantity and one test draft at approximately ten times the minimum measured quantity or 1 kg, whichever is greater. More tests may be performed over the range of normal quantities dispensed.~~

N.5. Minimum Measured Quantity. - The device shall be tested for a delivery equal to the declared minimum measured quantity when the device is likely to be used to make deliveries on the order of the declared minimum measured quantity.

N.6. Testing Procedures.

N.6.1. General. - The device or system shall be tested under normal operating conditions of the dispenser.

The test draft shall be made at flows representative of that during normal delivery. The pressure drop between the dispenser and the proving system shall not be greater than that for normal deliveries. The control of the flow (e.g., pipework or valve(s) size, etc.) shall be such that the flow of the measuring system is maintained within the range specified by the manufacturer.

N.6.1.1. Repeatability Tests. - Tests for repeatability should include a minimum of three consecutive test drafts of approximately the same size and be conducted under controlled conditions where variations in factors are reduced to minimize the effect on the results obtained.

N.7. Density. – Temperature and pressure of hydrogen gas shall be measured during the test for the determination of density or volume correction factors when applicable. For the thermophysical properties of hydrogen the following publications shall apply: for density calculations at temperatures above 255 K and pressures up to 120 MPa, a simple relationship may be used that is given in the publication of Lemmon et al., J. Res. NIST, 2008. Calculations for a wider range of conditions and additional thermophysical properties of hydrogen are available free of charge online at the "NIST Chemistry WebBook" http://webbook.nist.gov/chemistry, or available for purchase from NIST as the computer program NIST Standard Reference Database 23 "NIST Reference Fluid Thermodynamic and Transport Properties Database (REFPROP): Version 8.0" http://www.nist.gov/srd/nist23.htm. These calculations are based on the reference Leachman, J.W., Jacobsen, R.T, Lemmon, E.W., and Penoncello, S.G. "Fundamental Equations of State for Parahydrogen, Normal Hydrogen, and Orthohydrogen" to be published in the Journal of Physical and Chemical Reference Data. More information maybe obtained from NIST online at http://www.boulder.nist.gov/div838/Hydrogen/Index.htm.

T. Tolerances

T.1. Tolerances, General.

(a) **The tolerances apply equally to errors of underregistration and errors of overregistration.**

(b) **The tolerances apply to all products at all temperatures measured at any flow rate within the rated measuring range of the device.**

T.2. Tolerances. - The tolerances for hydrogen gas measuring devices are listed in Table T.2. (Proposed tolerance values are based on previous work with compressed gas products and will be confirmed based on performance data evaluated by the U.S. National Work Group.)

Table T.2. Accuracy Classes and Tolerances for Hydrogen Gas-Measuring Devices

Accuracy Class	Application or Commodity Being Measured	Acceptance Tolerance	Maintenance Tolerance
2.0	Hydrogen gas as a vehicle fuel	1.5 %	2.0 %

T.3. Repeatability. - When multiple tests are conducted at approximately the same flow rate and draft size, the range of the test results for the flow rate shall not exceed 40 % of the absolute value of the maintenance tolerance and the results of each test shall be within the applicable tolerance. See also N.6.1.1.

T.4. Tolerance Application.

T.4.1. Type Evaluation Examinations for Devices. - For type evaluation examinations, the tolerance values shall apply under the following conditions:

(a) **at any temperature and pressure within the operating range of the device, and**

(b) **for all quantities greater than the minimum measured quantity**.

T.4.2 Transfer Standard Test Method. - To the basic tolerance values that would otherwise be applied, there shall be added an amount equal to two times the standard deviation of the applicable transfer standard when compared to a basic reference standard.

UR. User Requirements

UR.1. Selection Requirements.

UR.1.1. Computing-Type Device; Retail Dispensers. – A hydrogen gas dispenser used to refuel vehicles shall be of the computing type and shall indicate the mass, the unit price, and the total price of each delivery.

UR.1.2. Discharge Hose-Length. – The length of the discharge hose on a retail fuel dispenser:

(a) **shall not exceed 4.6 m (15 ft) unless it can be demonstrated that a longer hose is essential to permit deliveries to be made to receiving vehicles or vessels;**

(b) **shall be measured from its housing or outlet of the discharge line to the inlet of the discharge nozzle; and**

(c) shall be measured with the hose fully extended if it is coiled or otherwise retained or connected inside a housing.

An unnecessarily remote location of a device shall not be accepted as justification for an abnormally long hose.

UR.1.3. Minimum Measured Quantity.

(a) The minimum measured quantity shall be specified by the manufacturer.

(b) The minimum measured quantity appropriate for a transaction may be specified by the weights and measures authority. A device may have a declared minimum measured quantity smaller than that specified by the weights and measures authority; however, the device must perform within the performance requirements for the declared or specified minimum measured quantity up to deliveries at the maximum measurement range.

(c) The minimum measured quantity shall satisfy the conditions of use of the measuring system as follows:

(1) Measuring systems having a maximum flow rate less than or equal to 4 kg/min shall have a minimum measured quantity not exceeding 0.5 kg

(2) Measuring systems having a maximum flow rate greater than 4 kg/min but not greater than 12 kg/min shall have a minimum measured quantity not exceeding 1.0 kg

UR.2. Installation Requirements.

UR.2.1. Manufacturer's Instructions. – A device shall be installed in accordance with the manufacturer's instructions, and the installation shall be sufficiently secure and rigid to maintain this condition.

UR.2.2. Discharge Rate. – A device shall be installed so that after initial equalization the actual maximum discharge rate will not exceed the rated maximum discharge rate. Automatic means of flow regulation shall be incorporated in the installation if necessary.

UR.2.3. Low-Flow Cut-Off Value. – If a measuring system is equipped with a programmable or adjustable "low-flow cut-off" feature:

(a) the low-flow cut-off value shall not be set at flow rates lower than the minimum operating flow rate specified by the manufacturer on the measuring device; and

(b) the system shall be equipped with flow control valves, which prevent the flow of product and stop the indicator from registering product flow whenever the product flow rate is less than the low-flow cut-off value.

UR.3. Use of Device.

UR.3.1. Unit Price and Product Identity for Retail Dispensers. – The unit price at which the dispenser is set to compute shall be conspicuously displayed or posted on the face of a retail dispenser used in direct sale.

UR.3.2. Ticket Printer; Customer Ticket. – Vehicle-mounted measuring systems shall be equipped with a ticket printer, which shall be used for all sales where product is delivered through the device. A copy of the ticket issued by the device shall be left with the customer at the time of delivery or as otherwise specified by the customer.

UR.3.3. Printed Ticket. – The total price, the total quantity of the delivery, and the price per unit shall be printed on any ticket issued by a device of the computing type and containing any one of these values.

UR.3.4. Ticket in Printing Device, Vehicle-Mounted Measuring Systems. – A ticket shall not be inserted into a device equipped with a ticket printer until immediately before a delivery is begun, and in no case shall a ticket be in the device when the vehicle is in motion while on a public street, highway, or thoroughfare.

UR.3.5. Steps After Dispensing. – After delivery to a customer from a retail dispenser:

(a) the device shall be shut-off at the end of a delivery, through an automatic interlock that prevents a subsequent delivery until the indicating elements and recording elements, if the device is equipped and activated to record, have been returned to their zero positions; and

(b) the discharge nozzle shall not be returned to its start position unless the zero set-back interlock is engaged or becomes engaged by the act of disconnecting the nozzle or the act of returning the discharge nozzle.

UR.3.6. Return of Indicating and Recording Elements to Zero. – The primary indicating elements (visual), and the primary recording elements shall be returned to zero immediately before each delivery.

UR.3.7. Return of Product to Storage, Retail Hydrogen Gas Dispensers. – Provisions at the site shall be made for returning product to storage or disposing of the product in a safe and timely manner during or following testing operations. Such provisions may include return lines or cylinders adequate in size and number to permit this procedure.

UR.3.8. Conversion Factors. – Established correction values (see references in N.7.) shall be used whenever measured hydrogen gas is billed. All sales shall be based on kilograms.

NOTE: Current NIST Handbook 44 definitions that will need to be modified to correspond with the proposed new code for hydrogen gas measuring devices.

Appendix D

Definitions

The specific code to which the definition applies is shown in [brackets] at the end of the definition. Definitions for the General Code [1.10] apply to all codes in Handbook 44.

A

audit trail. An electronic count and/or information record of the changes to the values of the calibration or configuration parameters of a device. [1.10, 2.20, 2.21, 2.24, 3.30, 3.37, **3.39**, 5.56(a)]

automatic temperature or density compensation. The use of integrated or ancillary equipment to obtain from the output of a volumetric meter an equivalent mass, or an equivalent liquid volume at the assigned reference temperature below and a pressure of 14.696 lb/in^2 absolute.

Cryogenic liquids, – 21 °C (70 °F) [3.34,]
Hydrocarbon gas vapor – 15 °C (60 °F) [3.33]
Hydrogen gas – 21 °C (70 °F) [3.39]
Liquid carbon dioxide – 21 °C (70 °F) [3.38]
Liquefied petroleum gas (LPG) and Anhydrous ammonia – 15 °C (60 °F) [3.32]
Petroleum liquid fuels and lubricants – 15 °C (60 °F) [3.30]

C

calibration parameter. Any adjustable parameter that can affect measurement or performance accuracy and, due to its nature, needs to be updated on an ongoing basis to maintain device accuracy, e.g., span adjustments, linearization factors, and coarse zero adjustments.[2.20, 2.21, 2.24, 3.30, 3.37, **3.39**, 5.56(a)]

D

discharge hose. A flexible hose connected to the discharge outlet of a measuring device or its discharge line.[3.30, 3.31, 3.32, 3.34, 3.37, 3.38, **3.39**]

discharge line. A rigid pipe connected to the outlet of a measuring device.[3.30, 3.31, 3.32, 3.34, 3.37, **3.39**]

E

event counter. A nonresettable counter that increments once each time the mode that permits changes to sealable parameters is entered and one or more changes are made to sealable calibration or configuration parameters of a device. [2.20, 2.21, 3.30, 3.37, **3.39**, 5.54, 5.56(a), 5.56(b), 5.57]

event logger. A form of audit trail containing a series of records where each record contains the number from the event counter corresponding to the change to a sealable parameter, the identification of the parameter that was changed, the time and date when the parameter was changed, and the new value of the parameter.[2.20, 2.21, 3.30, 3.37, **3.39**, 5.54, 5.56(a), 5.56(b), 5.57]

I

indicating element. An element incorporated in a weighing or measuring device by means of which its performance relative to quantity or money value is "read" from the device itself as, for example, an index-and-graduated-scale combination, a weighbeam-and-poise combination, a digital indicator, and the like. (Also see "primary indicating or recording element.")[1.10]

M

minimum measured quantity (MMQ). The smallest quantity delivered for which the measurement is to within the applicable tolerances for that system . . . 3.37, 3.39]

N

nonresettable totalizer. An element interfaced with the measuring or weighing element that indicates the cumulative registration of the measured quantity with no means to return to zero.[3.30, 3.37, 3.39]

P

point-of-sale system. An assembly of elements including a weighing or measuring element, an indicating element, and a recording element (and may also be equipped with a "scanner") used to complete a direct sales transaction.[2.20, 3.30, 3.32, 3.37, **3.39**]

R

remote configuration capability. The ability to adjust a weighing or measuring device or change its sealable parameters from or through some other device that is not itself necessary to the operation of the weighing or measuring device or is not a permanent part of that device. [2.20, 2.21, 2.24, 3.30, 3.37, **3.39**, 5.56(a)]

retail device. A measuring device primarily used to measure product for the purpose of sale to the end user. [3.30, 3.32, 3.37, **3.39**]

W

wet hose. A discharge hose intended to be full of product at all times. (See "wet-hose type.")[3.30, 3.31, 3.38, **3.39**]

wet-hose type. A type of device designed to be operated with the discharge hose full of product at all times. (See "wet hose.")[3.30, 3.32, 3.34, 3.37, 3.38, **3.39**]

Appendix C

Item 360-3: Developing Items

Part 3, Item 1 Vehicle-Tank Meters: T.4. Product Depletion Test

Source: Northeast Weights and Measures Association (NEWMA)

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

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

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

[**Note:** The result of the product depletion test may fall outside of the applicable test tolerance as specified in Table 1.]

Table T.4. Tolerances for Typical Vehicle-Tank Meters on Product Depletion Tests, Except Milk Meters **Refer to T.4. for meters with maximum flow rates not listed.**	
Meter ~~Size~~ Maximum Flow Rate	**Maintenance and Acceptance Tolerances**
~~Up to, but not including, 50 mm (2 in)~~ **114 LPM (30 GPM)**	~~1.70 L (104 in³)¹~~ **0.57 L (0.15 gal) (34.6 in³)¹**
~~From 50 mm (2 in) up to, but not including, 75 mm (3 in)~~ **225 LPM (60 GPM)**	~~2.25 L (137 in³)¹~~ **1.1 L (0.30 gal) (69.3 in³)¹**
~~75 mm (3 in) or larger~~ **378 LPM (100 GPM)**	~~3.75 L (229 in³)¹~~ **1.9 L (0.5 gal) (115 in³)¹**
758 LPM (200 GPM)	**3.8 L (1.0 gal) (231 in³)¹**
[1] Based on a test volume of at least the amount specified in N.3.	

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

Alternative language for T.4. with larger tolerance for smaller meters.

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

[**Note:** The result of the product depletion test may fall outside of the applicable test tolerance as specified in Table 1.]

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

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

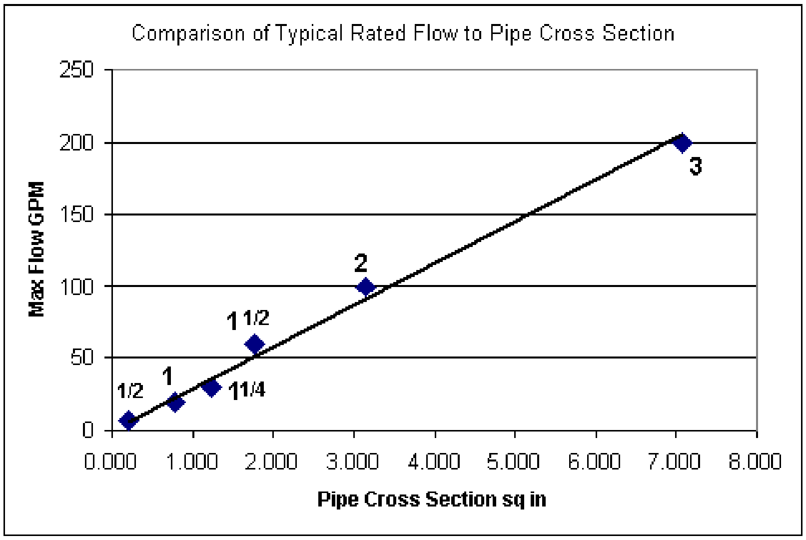
Background/Discussion: This item was submitted to NEWMA at its 2008 Interim Meeting as an alternative to Item 331-1 (S.5.7. Meter Size) in 2008 Publication 16. It would base the tolerances for the product depletion test on a percentage of the maximum flow rate rather than meter size. Justification provided to NEWMA by the submitter is as follows:

> The NCWM S&T Committee received a proposal in 2008 to add new marking requirements to provide inspectors with a basis on which to assess tolerances since the meter size in inches is not currently marked on meters used in VTM systems. This solution would add a new marking requirement non-retroactively, which will not solve the problem until the entire fleet of meters presently in use are replaced with new meters. This could take a very long time since VTMs can see many years of service. In addition, the compromise made when this item originally passed did not address the possibility that smaller meters, (e.g. down to ¼ in could be mounted on a vehicle and thus subject to these tolerances). Allowing the smallest current tolerance (104 in^3) on a ¼-in meter delivering 2 GPM would be 22.5 % relative error for one minute of flow due to air passing through the meter. Even at 20 GPM for a 1-in meter, the relative error only drops to 2.25 %. That seems unconscionable. New York recommends going back to the 0.5 % of 1 minute of flow at the maximum rated flow rate for the meter that was part of the original proposal. The max flow rate must be marked on every meter under current HB 44 requirements and thus the inspector will have the information necessary to correctly apply the tolerance. It is further recommend that the table provide tolerances for the common meter sizes which will handle most cases encountered in the field (i.e., 1¼-, 1½-, 2- and 3-inch meters with 30, 60, 100 and 200 GPM respectively).
>
> There may be concern that users will move to larger meter sizes to take advantage of the larger tolerances. It is not thought that this will happen since these systems cannot deliver much over 100 GPM without damaging storage tanks. In fact, most systems we have seen delivering heating oil are actually delivering at less than 80 GPM. If they move to a 200 GPM, 3-inch meter, rated at 40 to 200 GPM, they will then have to meet acceptance tolerances all the way down to 60 GPM which it is not believed that they can do on a consistent basis. We believe the typical 2-inch system will remain the mainstay of the industry.
>
> Graphs of the relationship of typical meter ratings to pipe cross section area show that PD flow rates are clearly a function of pipe size. Any tolerance that does not reflect that relationship is fundamentally flawed in our view. For comparison, we have included a graphic comparison of the proposed tolerances.

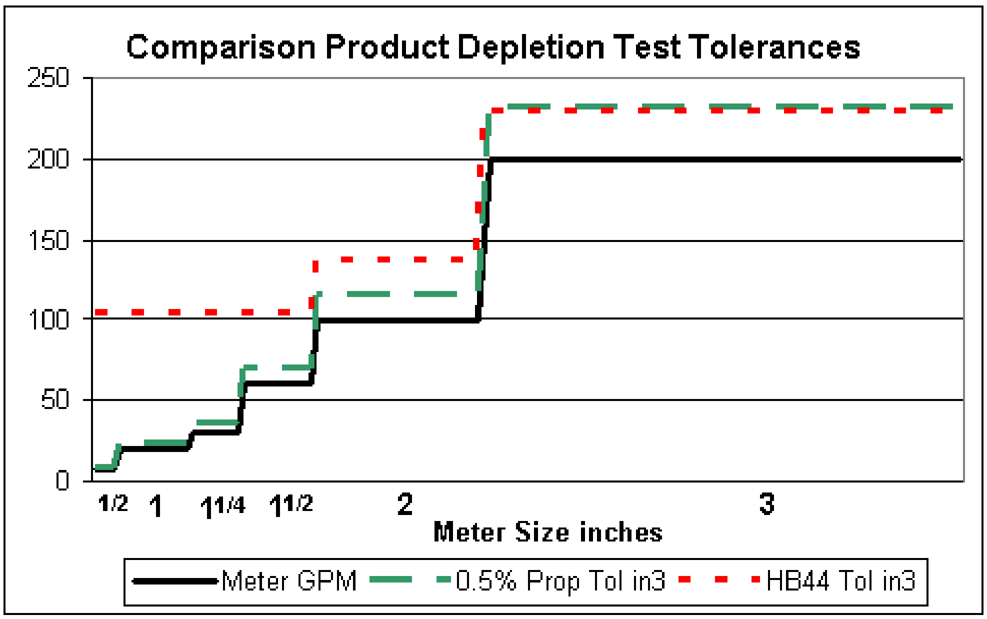
The submitter also noted the following:

> We recognize that the tolerances proposed will reduce the tolerances for meter sizes 2 inch and under. We could support some compromise to recognize diminishing returns on smaller meters and thus allow a slightly larger tolerance (e.g., 0.6 %) at or below 100 gpm rated flow rate. At 0.6 for a 2 inch (100 gpm) meter the tolerance would be 139 in^3, virtually identical to the existing tolerance.

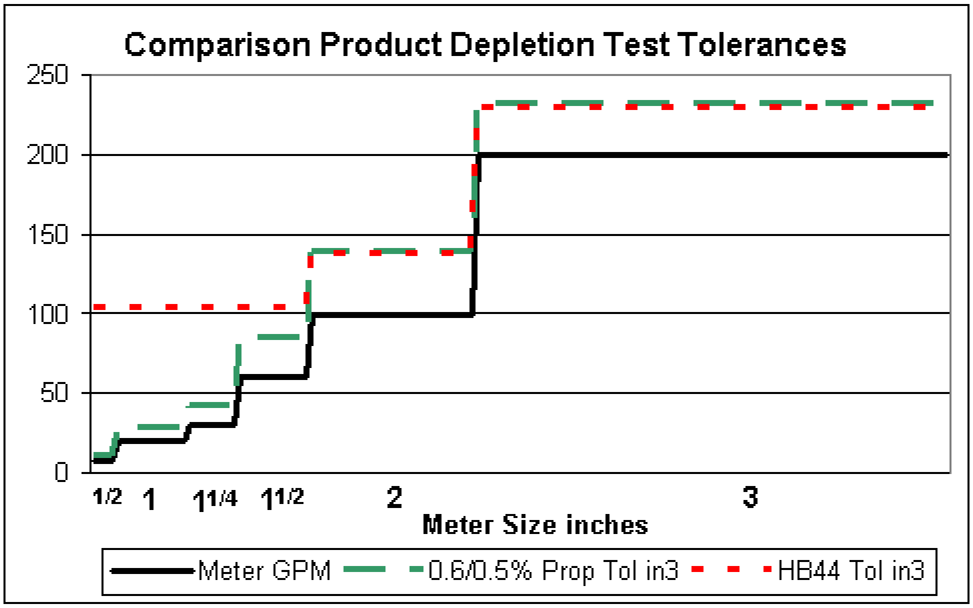
The submitter also provided the following supporting graphics:



Option 1 – 0.5 % across the board:



Option 2 – 0.6 % up to and including 100 gpm and 0.5 % thereafter:



In reviewing this item at its 2008 Interim Meeting, some NEWMA members felt that what is currently in HB 44 is sufficient and did not feel there was a problem determining meter size. Until NEWMA hears further about problems determining meter size from other states, it recommends this item be made "Informational."

Part 4, Item 1 Farm Milk Tanks: N.5.1. Verification of Master Metering Systems

Source: Central Weights and Measures Association (CWMA)

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

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

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

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

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

The use of a mass flow meter has eliminated the variations seen in other types of meters used to calibrate or check farm bulk milk tanks. The reverification of the meter at every quarter of tank capacity adds time and potentially introduces errors by requiring the hose or valves to be moved before the tank is totally filled. This proposal originated by Tom MacNish from the Cleveland Market Administrator and was presented to the CWMA in September [2008]. Mass flow meters have been used extensively in their market with excellent results.

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

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

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Report of the
Professional Development Committee (PDC)

Ross Andersen, Chairman
New York Weights and Measures
Albany, New York

Reference
Key Number

400 INTRODUCTION

The Professional Development Committee (Committee) will address the following items at the National Conference on Weights and Measures (NCWM) January 2010 Interim Meeting.

Table A identifies the agenda items in the Report by Reference Key Number, Item Title, and Page Number. An item marked with an **"I"** after the reference key number is an Informational item. An item marked with a **"D"** after the reference key number is a Developing item. The developing designation indicates an item has merit; however, the item was returned to the submitter for further development before any action can be taken at the national level. Table B lists the appendices to the agenda.

In some cases, background information will be provided for an item. The fact that an item appears on the agenda does not mean that the item will be presented to the Conference for a vote. The Committee will review its agenda at the Interim Meeting and may withdraw some items, present some items for information meant for additional study, issue interpretations, or make specific recommendations that will be presented for a vote at the Annual Meeting.

The recommendations are statements of proposals and are not necessarily those of the Committee.

Table A
Index to Reference Key Items

Table B
Appendices

Details of All Items
(In Order by Reference Key Number)

401 EDUCATION

401-1 I National Certification Program (NCP)

Source: Carryover Item 401-1. (This item originated from the Committee and first appeared on its agenda in 2003.)

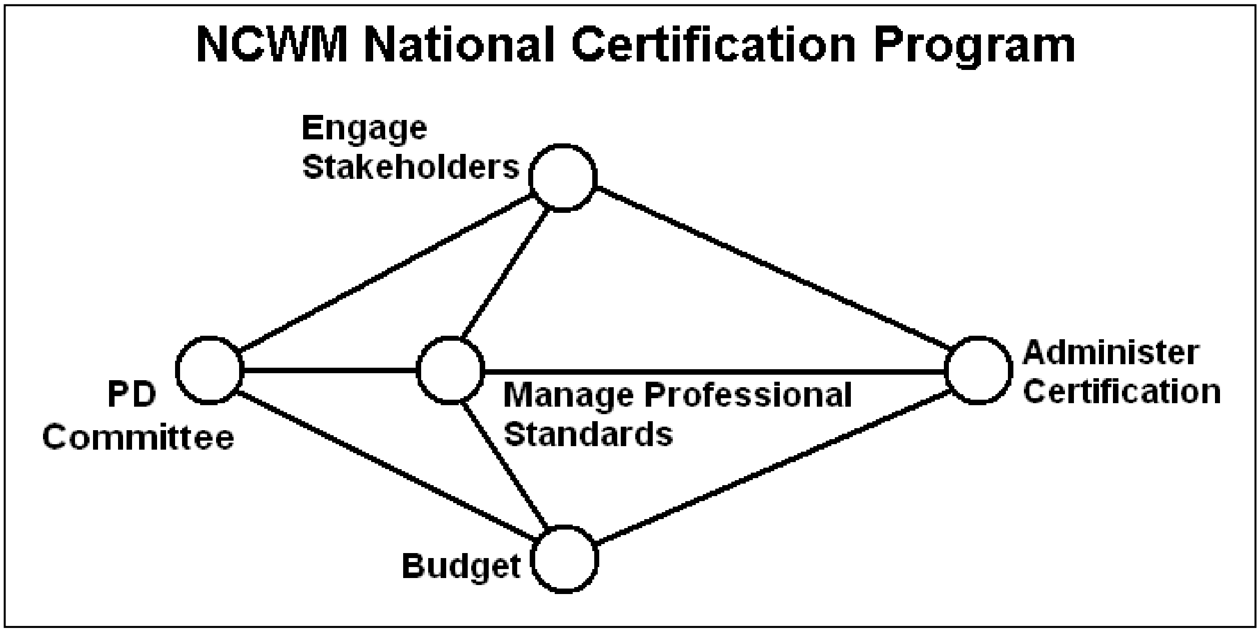
Background/Discussion: For complete background information, see the PDC page of the NCWM website, www.ncwm.net.

The PDC encourages each regional association to dedicate a portion of their Annual Meeting to the National Certification Program (NCP).

During the 2008 Interim Meeting, the Committee discussed the Western Weights and Measures Association's (WWMA) suggestion to establish an action plan and timeline. The Committee has developed an NCP, Critical Component Analysis, and an action plan of the components of the NCP. The Committee presents a draft of this document below.

National Conference on Weights and Measures
National Certification Program
Critical Component Analysis
DRAFT, February 21, 2008

> The Committee has begun a comprehensive effort to identify critical resources and tasks necessary for the project, and the logical sequence in which those tasks must be performed, including the possible use of parallel activities.
>
> Critical path analysis techniques were developed to manage complex projects just like the National Certification Program. The Committee is planning to use those techniques to the extent possible to plan future activities in working toward a certification program.

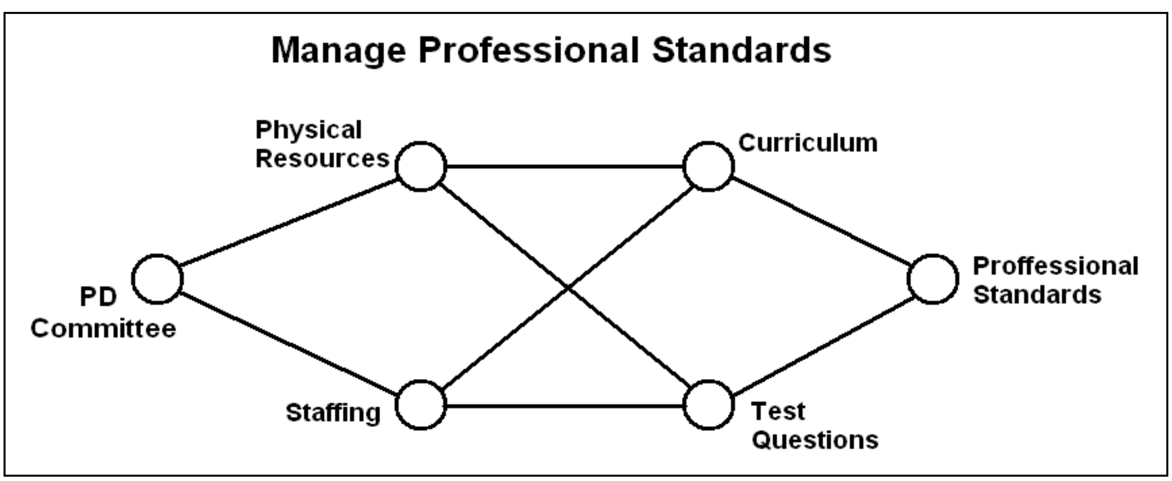


The Committee sees its task as one of managing four critical elements that come together as a certification program (as depicted above). Each bubble in the figure represents a milestone that must be reached in order to complete the objective. Those four main elements are:

Budget – involves tasks to secure necessary funding from the Board and other sources to undertake and complete all the other tasks.

Engage Stakeholders – involves tasks necessary to identify stakeholders and the resources they can bring to the project, encourage them to participate at all levels, and particularly to incorporate the professional standards in their training programs and to eventually take part in the certification program. The stakeholders, not the NCWM, will conduct the training. The NCWM will only be coordinating the professional standards and administering the certifications.

Manage Professional Standards – involves tasks necessary to create and manage a set of standards for the profession. The Committee has identified the creation of professional standards (i.e., the Curriculum) as the first task in the process. The completion of the curriculum plan, the curriculum template, the guide to preparing curriculum segments, and the guide to preparing test questions are some of those important steps toward that goal. The work groups are now finalizing the first seven curriculum segments and corresponding test questions. This is a great start and there still is a significant amount of additional work necessary in this area.



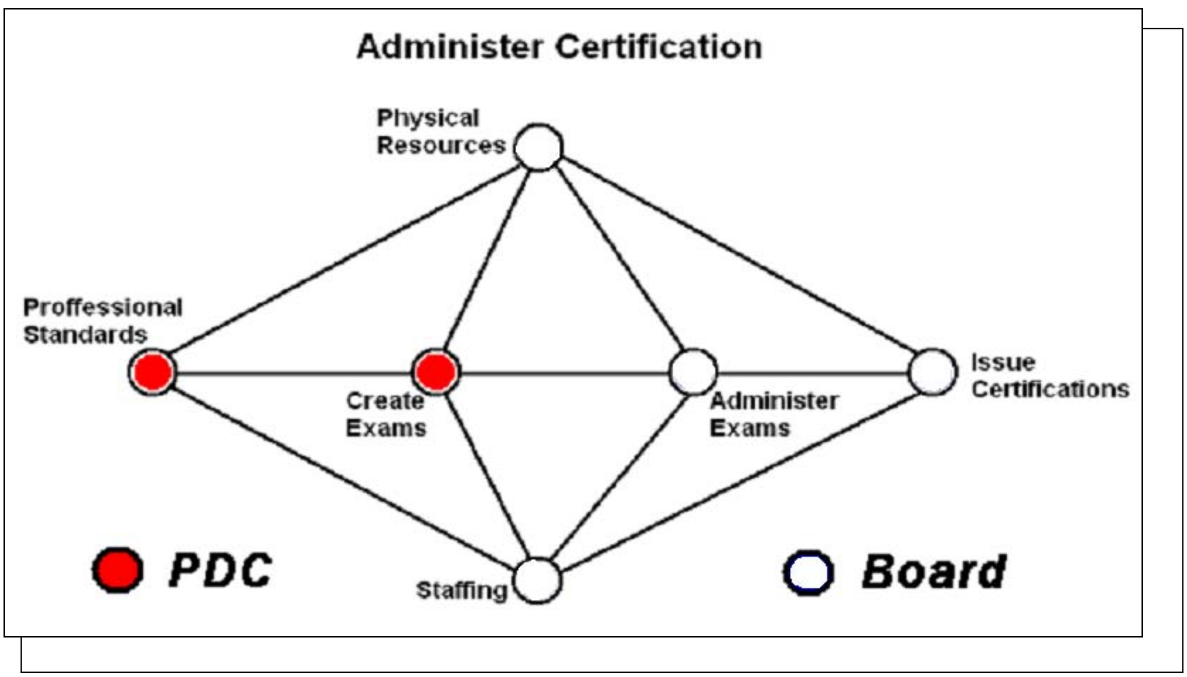
Administer Certification – involves tasks necessary to create certification exams, administer those exams, and issue certifications to those who qualify. The Committee will manage staffing, both paid and volunteer, and physical resources to secure the exams and record and issue the certificates.

As the necessary curriculum segments are completed and test questions prepared, we may begin to embark on some of the steps toward certification. Over the coming months, the Committee will continue to elaborate on the details in this project and keep refining it as we move forward.

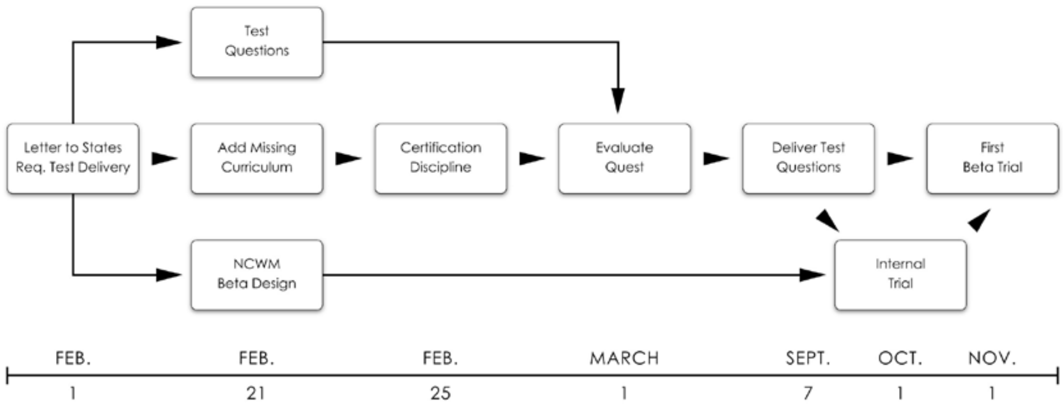
The Central Weights and Measures Association (CWMA) PDC Committee at their 2008 fall meeting proposed changing the name of the program to the National Certification Program. They further made recommendations regarding the creation of a standard like HB 130 or HB 44 that might be the mechanism to document the work on the curriculum and the certification program. (Also, see Item 402-2 for more on PDC publications.)

The PDC had learned that the Associate Membership Committee might be interested in funding the work on the curriculum and the certification package. The Committee will consider suitable projects that might make good use of that funding.

At the 2009 NCWM Interim Meeting, the PDC developed an action plan based upon the critical path analysis already completed. In this plan, responsibilities will be divided between the NCWM Board of Directors and the PDC. The PDC will develop and maintain the curricula and test questions. The Board will provide physical resources and staffing to compile the exams, issue certificates, and maintain records.



A goal was set to have all the elements in place to begin beta testing a certification examination in one competency area by November 2009, and in three more competency areas by 2010. The initial plans are to target retail motor fuel devices (RMFDs), small capacity Class III scales, package checking, and VTMs. (See Item 401-4 for details of the proposed certification program.) The plan below shows action items and target dates for the first certification area (tentatively RMFDs).



Discussion: The Committee received compliments on its work thus far and a suggestion that the CWMA might be willing to share the exams member states use for testing service agents. The Committee was asked to share its work with the regions in order to receive feedback on whether the PDC is on the right track. California indicated it has certification experience and extensive testing materials already developed for review. California also has curriculum material available on Investigative Techniques.

At the 2009 Annual Meeting, the Committee formally changed the name of the program to the National Certification Program (NCP) to reflect that the program offers certification and not training.

The steps outlined in the timeline developed at the 2009 Interim Meeting are being implemented. The Board of Directors has contracted with an online testing company. The format of the test and the details of test-result reporting are being worked out. Development of test questions is slightly behind schedule. The guide to writing test questions required revision to accommodate the format needed for an online test. The anticipated beta testing for the RMFD curriculum will be ready for evaluation in November 2009.

Action for 2010 Interim Meeting: The Committee will review progress and revise the plan as necessary to accommodate other planned beta exams.

401-2 I Create a Curriculum Plan

Source: Carryover Item 401-2 (This item originated from the Committee and first appeared on its agenda in 2003.)

Background/Discussion: For complete background information, see the PDC page of the NCWM website www.ncwm.net.

Prior to the 2007 Annual Meeting, the Committee reviewed the curriculum segments submitted thus far. At the 2007 Annual Meeting, the Committee decided, based on comments from several of the regions and its own assessment, it was essential to have a standardized format to ensure uniformity. Based on a collective review of curriculum plans received, the Committee created a sample template and example for regions to use in developing other curricula. The Committee updated its curriculum (Curriculum Package) to include the NCWM Core Competency Model, which provides a model for improving the quality of education in a select discipline. The Committee included this information as a general guideline for the regions to use as they develop other curriculum topics. In addition, the Committee revisited the original "National Training Curriculum Outline" from its 2004 NCWM Annual Report (Final Report). The Committee prepared an accompanying "NCWM Curriculum Work Plan," which is intended to assist in the management of curriculum development. The Committee also revised the original curriculum outline to match the Work Plan see Appendix A. (This was Appendix H from the 2008 Final Report.)

The Committee updated the Curriculum Package as shown below, which is accessible from the NCWM website members' page at www.ncwm.net.

- Cover Memorandum (guide to curriculum development),
- NCWM Core Competency Model,
- NCWM Curriculum Template (curriculum guideline),
- NCWM Sample Curriculum (examples of desired format),
- Guide for Writing Test Questions (including examples),
- National Training Curriculum Outline, and
- NCWM Curriculum Work Plan.

The Committee has received the following curriculum drafts (region responsible):

- 4.2 NIST Handbook 44 – Introduction to Device Control, (NEWMA);
- 4.3.1 Static Electronic Weighing Systems, General, (NEWMA);
- 4.3.5 Small Capacity Weighing Systems, Class III, (NEWMA);
- 4.3.7 Vehicle Class III or III L, (SWMA);
- 4.4.1 Retail Motor Fuel Dispensers, (WWMA); and
- 5.3.1 Commodities, General, (CWMA).

The Committee will return the curriculum drafts received, along with the newly revised curriculum package to the development team in each region to make revisions based on the Committee's recommendations and continue work on preparing test questions related to each segment.

The Committee will also be requesting that each region set aside time for a presentation of the new curriculum package at their upcoming Annual or Interim Meeting. In addition, the Committee is requesting volunteers develop additional segments. The Committee acknowledges that the CWMA volunteered to sponsor the first training session on the use of the completed curriculum.

Mike Cleary, California, contacted the PDC in October concerning training on Investigative Techniques. California has developed a course and expressed willingness to share that with the Committee.

The CWMA PDC Committee at its 2008 fall meeting asked to get feedback on the segment they prepared. They also expressed interest in seeing what the other work groups had done on their segments and associated test questions.

At the Interim Meetings, the Committee will review progress on the curriculum including the feedback to the regional work groups. It will then establish priorities for preparing the next segments and search for volunteers to begin the work.

At the 2009 Interim Meeting, the PDC reaffirmed its commitment to completing all the curriculum items, but recognized the need to prioritize the completion of those curriculum items necessary for the four competency areas, which are to be beta tested by the end of 2010. (See PERT Diagram in Item 401-1 for timeline on completion.)

At the 2009 Annual Meeting, the Committee reported it considers the curriculum segments to be the critical element of the certification program. They set the standards to which the candidate will be tested. The National Training Curriculum Outline is already available online on the NCWM website. The actual curricula for Segment 4.2 *Introduction to Device Control*, Segment 4.4 *Dynamic Liquid Measuring Systems – General*, and Segment 4.4.1 *Retail Motor Fuel Dispensers (RMFD)* will be posted as soon as possible. Using these three documents plus the table below (copied from page PDC–8 of Publication 16, 2009), jurisdictions would be able to prepare their staff to take the RMFD test and/or evaluate the strengths and weakness of their training programs based upon those curricula. In addition, the Committee will be developing the segments for Small Capacity Class III Scales, package checking, and vehicle-tank meters. These segments will be posted online as they are developed.

Curriculum Discipline for Retail Motor Fuel Devices (RMFD) Certificate		
Curriculum Areas (RMFD Certificate)	**# Quest/50 Quest Exam**	**Approx %**
1.0 Fundamentals of Weights and Measures	7	14
4.2 NIST Handbook 44 – Introduction to Device Control	8	16
4.4 Dynamic Measuring Systems - General		
4.4(1) Technology and Terminology	3	6
4.4(2) Device Operations & Functionality	3	6
4.4(3) Technical Requirements	3	6
4.4(4) User Requirements	3	6
4.4(5) Test Methods	3	6
4.4.1 Retail Motor Fuel Dispensers		
4.4.1(1) Technology and Terminology	4	8
4.4.1(2) Device Operations and Functionality	4	8
4.4.1(3) Technical Requirements	4	8
4.4.1(4) User Requirements	4	8
4.4.1(5) Test Methods	4	8

Action for 2010 Interim Meeting: The Committee expects to have posted the beta exam for retail-motor fuel devices prior to the Interim Meeting. Those test questions were based on three curriculum segments and a certification discipline that should be posted on the PDC pages of the NCWM website (www.ncwm.net). The certification discipline is included in Appendix B. At the 2010 Interim Meeting, the Committee hopes to be able to evaluate test scores from those who have taken the beta examination. The Committee will review progress and continue work on the RMFD exam to move to an active version. Work will also continue on the curriculum segments necessary to support the planned beta exams for small capacity scales, package checking and vehicle tank meters.

401-3 D Instructor Improvement

Source: Carryover Item 401-3 (This item originated from the Committee and first appeared on its agenda in 2003.)

Background/Discussion: The Committee is charged with the coordination of activities to improve the competence of instructors and the uniformity of delivery of the curriculum. For complete background information, see the PDC pages of the NCWM website www.ncwm.net. After logging in under the members' area, look under the PDC Legacy Documents for the PDC Formal Scope.

Industry has continued to support and sponsor training on their new technology for weighing and measuring devices. NIST has assured the Committee work will continue work towards providing technical training for the trainers. The Committee supports the recommendation from the WWMA to encourage jurisdictions to participate in the NIST, WMD Instructor Training program as those classes become available.

At the NCWM 2009 Interim Meeting, a work group from the NCWM BOD provided information to the Committee on initiatives it was considering to use the NCWM website to provide training materials and other trainer aids, such as presentations, videos, etc. The Committee applauds these efforts by the Board and will support the NCWM efforts. However, the Committee will continue to maintain this item as low priority until other parts of the certification program are completed.

At the 2009 Annual Meeting, the Committee reported that no action is being taken on this item while the Committee concentrates on curriculum development and the establishment of the certification program.

401-4 D Certification

Source: Carryover Item 401-4. (This item originated from the Committee and first appeared on its agenda in 2003.)

Background/Discussion: For complete background information, please see the PDC page of the NCWM website (www.ncwm.net).

Subsequent to the 2006 NCWM Annual Meeting, all states not previously contacted received a letter requesting the name of their State Certification Coordinator (SCC). The state director becomes the default SCC in the absence of a designated contact. The SCC contact list is available on the PDC page of the NCWM website (www.ncwm.net).

The Committee continues to hear support from the regions concerning the establishment of a certification program.

The Committee has contacted the SCC of each state to gather information on its current training and certification programs. The Committee will be reviewing the Model Professional Development Training and Certification Standards Statute for Inspectors and Sealers of Weights and Measures that was submitted by NEWMA. The Committee will study the sample with the possibility that it might ultimately be used to establish model criteria for a certification program.

The Committee has created a Guide for Developing Test Questions in the curriculum package referenced in Item 401-2. At the 2008 Interim Meeting, the Committee brought forth two options for building the bank of questions for certification. The first option was to build one large bank of questions developed for use in training and during the certification exam. The second option would be to develop two banks of questions using one bank of questions for training and the second bank of protected questions used for certification.

Recommendations heard during the open hearing included having jurisdictions take the lead on developing the questions, administering the examination, and grading. The NCWM would issue certificates based on the jurisdictions' reported results.

Pursuant to the recommendations from the WWMA and the CWMA, the Committee is in the process of developing a model for the infrastructure of the program. The Committee believes that a model is necessary to determine what the program will look like and what the roles of the states and the NCWM should be.

CWMA PDC Committee at their 2008 fall meeting proposed changing the name of the program to the National Certification Program. They further made recommendations regarding the creation of a standard like HB 130 or HB 44 that might be the mechanism to document the work on the curriculum and the certification program. (Also, see Item 402-2 for more on PDC publications.)

At the 2009 Interim Meeting, the PDC set a goal of being ready to start beta testing a component of a certification program for at least one competency area by November 2009, with the intention of having four areas completed by the end of 2010. The basic elements of the proposed program are:

- The PDC will develop curricula, which will be published in second section of the NCWM National Certification Guide (see also Item 402-2). Until that Guide is created, completed curriculum sections will be posted on the NCWM website (PDC files section under Members Only Section).

- The PDC will develop Certification Disciplines that outline which curriculum segments and objectives will be covered under each certificate, and how they will be weighted on the exam. Those Certification Disciplines will be published in the third section of the NCWM National Certification Guide (see also Item 402-2). Until that Guide is created, completed Certification Disciplines will be posted on the NCWM website.

- The PDC will provide the NCWM BOD with a pool of test questions for each curriculum segment and objective. Pool size will be proportional to the assigned weight of each curriculum item.

- It will be the BOD responsibility to develop and administer a testing program. NCWM staff will compile the exam from the questions pools, issue certificates, and maintain records.

The first draft of a Certification Discipline for RMFD's is presented below. The Discipline outlines which curriculum segments and objectives must be mastered, what percentage of the test will be devoted to each item, and how many questions will be included from each area on a typical exam. The Committee is considering a fifty-question test format with a two hour test time limit in the beta test phase. Refer to the Curriculum Outline that is published on the NCWM website or the Curriculum Workplan in Appendix A for an overview of curriculum areas. The Committee is interested in feedback on the percentage weighting of the various curriculum areas.

Curriculum Discipline for Retail Motor Fuel Devices (RMFD) Certificate		
Curriculum Areas (RMFD Certificate)	**# Quest/50 Quest Exam**	**Approx %**
1.0 Fundamentals of Weights and Measures	7	14
4.2 NIST Handbook 44 – Introduction to Device Control	8	16
4.4 Dynamic Measuring Systems - General		
4.4(1) Technology and Terminology	3	6
4.4(2) Device Operations and Functionality	3	6
4.4(3) Technical Requirements	3	6
4.4(4) User Requirements	3	6
4.4(5) Test Methods	3	6
4.4.1 Retail Motor Fuel Dispensers		
4.4.1(1) Technology and Terminology	4	8
4.4.1(2) Device Operations and Functionality	4	8
4.4.1(3) Technical Requirements	4	8
4.4.1(4) User Requirements	4	8
4.4.1(5) Test Methods	4	8

At the 2009 Interim Meetings, the AMC offered financial assistance to support development of the certification program. The AMC will consider effective ways to utilize such support in the coming months. The Committee recognizes that certification will initially be developed for regulatory inspectors, but they would like to quickly extend the program to the private sector as well.

At the 2009 Annual Meeting, the Committee identified three pieces critical to the Certification Program:

- Standards as defined by the curriculum
- Certification Discipline - weighting of the curriculum segments (see example on PDC-9)
- Evaluation of competence - the test

The first two steps are completed for the RMFDs test, and the Committee is busy developing the actual test. The Committee asked state directors for test questions and would like to thank California, New Hampshire, Massachusetts, New York, and the CWMA for their assistance in providing questions. The questions must now be evaluated, assigned to the relevant curriculum segments, and formatted according to the requirements of the online testing company.

The first test on RMFDs will be a beta test. The purpose of the beta test is to introduce online testing procedures, to troubleshoot any possible difficulties, and to help the Committee evaluate test questions in terms of weighting them for difficulty and curriculum coverage. The initial plan is to require a passing score of 85 % on a two hour, 50-question test. In answer to the question from the floor on whether there would be a time-out function, the answer is "no." The test taker must commit two hours to taking the test in one session. However, the results will be informational, and no certificates will be issued based upon the results of the beta test.

There was a question from the floor on whether it would be better to concentrate on core competencies rather than developing difficulty levels. The Committee responded that the overall objective is to develop an exam that challenges the test taker with reasonable and fair questions so that a passing score is truly indicative of competence in the respective discipline. The goal is not to have overly difficult questions, but to have questions that cover the breadth of issues included in the curricula.

The look and feel of the first test was demonstrated at the open hearing by presenting attendees with samples of test questions. Typical questions will be a multiple choice, fill-in-the-blank, and situational questions where the answer is either "Yes" (if the device is in compliance as described) or a citation of the section of the handbook being violated (if the device is not in compliance in the situation described).

A question regarding test fees disclosed that there would be no fee for the beta test. The Board will make the decision regarding the cost of testing, and whether the fees will vary for members versus non-members and service people versus regulatory personnel when the certification program is operational.

The Committee is working with the test company to develop a report that can be provided to both the test taker and a designated other, such as the state certification coordinator or state director. The report would detail the score for each segment of the test, as well as the over-all test score. The report will not identify specific questions missed within any given segment nor the correct answers to those questions.

The integrity of the test questions is going to be protected by blocking screen prints and copy functions during the administration of the test. A recommendation was made to have at least three versions of the test available to allow for retests. Randomizing the selection of test questions will ensure that no one takes the same test twice and eliminate the need for creating multiple versions of the same test.

Jurisdictions and service companies will be encouraged to participate in the beta test within the limits of participation set by the Board. The Committee will make an announcement when the Committee is ready to accept volunteers for the beta test.

Although no certificates will be issued based upon the test results, the Committee feels that participating jurisdictions will benefit by being able to evaluate the success of their training programs, and by having the opportunity to familiarize their staff with the experience of online testing. The Committee will benefit by using the evaluation programs of the testing service to evaluate the difficulty and appropriateness of each test question, as well as the overall effectiveness of the test and the testing process.

Interest was expressed from the floor in having state-specific testing. The Committee feels that questions on State Program Scope and Overview will necessarily be state-specific. However, that is a refinement that needs to be addressed later by the Committee and the Board.

A comment was received from the floor that if the PDC Committee still needs additional questions, a request could be put out on the various NIST and NCWM list serves.

Finally, the Committee appreciates the many positive comments received on the progress of the Certification Program.

Action for 2010 Interim Meeting: The Committee expects to have posted the beta exam for RMFDs prior to the Interim Meeting. Those test questions were based on three curriculum segments and a certification discipline that should be posted on the PDC pages of the NCWM website (www.ncwm.net). The certification discipline is included in Appendix B. At the 2010 Interim Meeting, the Committee hopes to evaluate test scores from those who have taken the beta examination. The Committee will review progress and continue work on the RMFD exam to move to an active version. At the 2010 Interim Meeting, the Committee will review progress and continue work on the certification disciplines necessary to support the planned beta exams for small capacity scales, package checking, and vehicle tank meters.

401-5 D Recommended Topics for Conference Training

Source: Carryover Item 401-5 (This item originated from the Committee and first appeared on its agenda in 2003.)

Background/Discussion: The Board has charged the Committee with responsibility for selecting appropriate topics for the technical sessions at future Annual Meetings. The Board asked that the Committee review and prioritize possible presentations and submit those to the Chairman. The Chairman would then work with NCWM staff to make the arrangements and schedule the sessions.

The Committee continues to carry the following list and recommends these topics for possible training seminars, roundtables, or symposia for presentation at the NCWM meetings:

(a) Risk-based Inspections (Robert Williams, Tennessee, volunteered to present his state's RMFD testing program);
(b) Marketplace Surveys;
(c) Auditing the Performance of Field Staff (Will Wotthlie, Maryland, volunteered to lead the session);
(d) Alternative Fuels (including motor-fuel trends and technology updates);
(e) Device Inspections Using a Sampling Model;
(f) Emerging Issues;
(g) Proper Lifting Techniques (recommended by Ken Deitzer, Pennsylvania);
(h) Overview of OIML and its Relationship to Standards Development (recommended by Julie Quinn, Minnesota);
(i) Back and Stress Techniques (recommended by Don Onwiler);
(j) Public Relations, specifically dealing with aggressive/angry people (recommended by the SWMA);
(k) Inspector Investigative Procedures (recommended by the SWMA);
(l) General Safety Issues (recommended by the WWMA);
(m) Defensive Driving (recommended by the WWMA);
(n) Administrative Civil Penalty Process (recommended by the WWMA);
(o) Price Verification (recommended by the WWMA);
(p) Customer Service (recommended by the WWMA);
(q) Ethics (recommended by the CWMA);
(r) Automatic Temperature Compensation (ATC) testing for field inspectors;
(s) Hydrogen Measuring Systems; and
(t) OSHA Safety.

For the 2008 NCWM Annual Meeting Technical Education Sessions, the Committee recommended ATC testing for field inspectors and OSHA Safety. The Board accepted these topics and presentations on both were made during the 2008 Annual Meeting.

For the 2009 NCWM Annual Meeting Technical Education Sessions, the Committee recommended seven possible topics for consideration of the NCWM Chairman:

1. Investigative Techniques (offered by Michael Cleary);
2. Handbook 44 Scale Code Tare Changes;
3. Wet Tare/U.S. Department of Agriculture (USDA) Issues;
4. ATC;
5. Moisture Loss;
6. Fuel Volatility Issues and Ethanol Blending; and
7. Ergonomic Lifting Techniques.

At the 2009 NCWM Annual Meeting, technical sessions were presented on Investigative Techniques, Fuel Volatility, and on an emerging issue, Diesel Emission Fluid (DEF).

The Committee believes that the training sessions at the NCWM could be taped and the video materials made available on the website to start building a library. The Committee plans to approach the AMC for funding for video equipment expressly for this purpose. Just prior to the 2009 Annual Meeting, the Committee sent a letter asking the

Associate Membership Committee (AMC) for video equipment funding to record future technical presentations. The intention is to provide an online library. The AMC announced from the floor that they had approved the request for funding at their meeting. The Committee has been informed that NCWM staff purchased video equipment under that grant from the AMC, and it will be used in future training sessions.

Action for 2010 Interim Meeting: The Committee will continue to solicit suggestions for future presentations and make recommendations to the NCWM Chair for the next Annual Meeting.

402 PROGRAM MANAGEMENT

402-1 I Safety Awareness

Source: Carryover Item 402-1 (This item originated from the Committee and first appeared on its agenda in 2003.)

Background/Discussion: In the past, the Committee's responsibility extended to the identification of safety issues in the weights and measures field and included efforts to increase safety awareness. Jurisdictions are encouraged to send their safety reports and issues to their regional safety liaison, who in turn will forward them to the Charles Gardner, the NCWM Safety Coordinator. Below is a list of the Regional Safety Liaisons.

SWMA	Steve Hadder, Florida Department of Agriculture and Consumer Services
WWMA	Dennis Ehrhart, Arizona Department of Weights and Measures
CWMA	Julie Quinn, Minnesota Department of Commerce
NEWMA	Michael Sikula, New York Bureau of Weights and Measures

The Committee will also continue to ask the regions to prepare articles for the NCWM newsletter and will be extending the schedule to cover the next year. The Committee revised the schedule as follows for future issues. The Committee plans to notify the Regional Safety Coordinators as their assignment date approaches.

Association	Issue	Publication Date	Article Deadline
NEWMA	2009, Issue 2	June	April 15, 2009
SWMA	2009, Issue 3	September	July 15, 2009
WWMA	2010, Issue 1	February	January 15, 2010
CWMA	2010, Issue 2	June	April 15, 2010

All articles should be e-mailed to the NCWM headquarters at info@ncwm.net.

Action for 2010 Interim Meeting: The Committee will review any safety issues submitted to the Regional Safety Liaisons and expand the publication schedule for future NCWM Newsletters.

402-2 D PDC Publication

Background/Discussion: This item originally served to record the development of various documents prepared in pursuit of our training and certification programs. These are available on the members section of the NCWM website at www.ncwm.net. At the 2008 Annual Meeting, the Committee indicated its desire to eliminate this item from the agenda. However, in the report from the CWMA PDC Committee, the Committee received a proposal to create a standard like HB 130, *Uniform Laws and Regulations in the Areas of Legal Metrology and Engine Fuel Quality,* or HB 44, *Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices,* to serve as the work product of the Committee. This standard could be reviewed, amended, and adopted by the NCWM to make it a living document. The Committee considered this proposal during discussions held at the 2009 Interim Meetings.

Based on feedback at the 2009 NCWM Interim Meeting, the PDC decided to move forward on the new publication to be titled NCWM Publication XX National Certification Program Guide. This publication will serve to document the details of the Certification Program.

The guide will remain under control of the PDC Committee but will not require formal NCWM vote to add new sections or revise existing sections. The Committee will add and modify sections continuously to meet its priority objectives with a concerted effort to respond to feedback from program users and the NCWM membership. The three main sections of the Guide would include:

1. Program Administration – combines historical documentation (curriculum outline and work plan, etc.) with administrative procedures on administering exams and records of certifications,

2. Competency Standards – includes the curriculum segments that describe the objectives and measurable competencies that will be used in certification, and

3. Certification Disciplines – includes one document per certification area delineating the standards from the curricula that will be covered in the exam and the weighting of the competencies.

All segments of the PDC publication will be posted online as they are developed. New pages within the NCWM website will be created for the curriculum disciplines and segments so that interested parties can easily find and utilize this material.

Guidelines for operation of the Certification Program still need developing and posted online when they are completed.

Action for 2010 Interim Meeting: Members are encouraged to review the documents on the NCWM website relating to the RMFD certification. This includes the three curriculum segments and the certification discipline also provided in Appendix B. The Committee will be reviewing them as well and will be working on additions for the new certification areas as described in Item 401-4. The Committee will also be reviewing all of the documents relating to the certification program on the PDC pages of the NCWM site to ensure they are current and relevant.

Ross Andersen, Chair, New York

Stacy Carlsen, Marin County, California
Julie Quinn, Minnesota
Dale Saunders, Virginia
John Sullivan, Mississippi
Steven Grabski, Walmart
Tina Butcher, NIST, Weights and Measures Division

Professional Development Committee

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Appendix A

National Conference on Weight and Measures
National Certification Program

NCWM CURRICULUM WORK PLAN
Revised January 2009

Segment/Subject

Level 1/Level 2/Level 3

1. **Fundamentals of Weights and Measures**
   - 1.1. Introduction to Weights and Measures Programs
   - 1.2. W&M Laws and Regulations
   - 1.3. Field Standards and Test Equipment
   - 1.4. State Program Scope and Overview
   - 1.5. Enforcement Powers

2. **W&M Administration**
   - 2.1. Fundamentals of W&M Administration (Commercial System, Powers and Duties, etc.)
   - 2.2. Administration Functions (Personnel, Management, Budget, Safety, etc.)
   - 2.3. Legislation and Regulations (Legal Considerations, Interaction with Legislature, Stakeholders, Industry, etc.)
   - 2.4. Regulatory Control (Device Inspection, Commodities, Complaints)
   - 2.5. Laboratory Metrology Administration (Purpose of Laboratory, Responsibilities of Metrologist, NIST Expectations for Recognition of Laboratory, Quality System, Training Requirements, etc.)
   - 2.6. Public Relations and Communications (Publicity, Public Relations, Communications)

3. **Laboratory Metrology**
   - 3.1. NIST Basic Metrology
   - 3.2. NIST Intermediate Metrology
   - 3.3. NIST Advanced Metrology

4. **Device Control Program**
   - 4.1. Safety Considerations
   - 4.2. NIST Handbook 44 – Introduction to Device Control
   - 4.3. Weighing Systems, General
     - 4.3.1. Precision Weighing Systems Class I and II
     - 4.3.2. Small Capacity Weighing Systems Class III
     - 4.3.3. Medium Capacity Weighing Systems Class III
     - 4.3.4. Vehicle Scale Class III or III L
     - 4.3.5. Vehicle Scale Class III or III L – Advanced
     - 4.3.6. Railroad Track Scales
     - 4.3.7. In-Motion Railroad Track Scales
     - 4.3.8. Hopper Scale Systems
     - 4.3.9. Automatic Bulk Weighing Systems
     - 4.3.10. Automatic Weighing Systems
     - 4.3.11. Belt Conveyor Weighing Systems

- 4.3.12. In-Motion Monorail Scales
- 4.3.13. Point-of-Sale Scale Systems
- 4.3.14. Other Specialty Weighing Systems

4.4. Dynamic Measuring Systems – General
- 4.4.1. Retail Motor Fuel Dispensers
- 4.4.2. Loading Rack and Other Stationary Metering Systems
- 4.4.3. Loading Rack and Other Stationary Metering Systems – Advanced
- 4.4.4. Vehicle-Tank Meter Systems
- 4.4.5. Vehicle-Tank Meter Systems – Advanced
- 4.4.6. Milk Metering Systems
- 4.4.7. Water Meters
- 4.4.8. LPG/Anhydrous Ammonia Liquid Metering Systems
- 4.4.9. LPG/Anhydrous Ammonia Liquid Metering Systems – Advanced
- 4.4.10. LPG Vapor Meter Systems
- 4.4.11. Mass Flow Metering Systems
- 4.4.12. Other Metering Systems (Cryogenics, Carbon Dioxide, etc.)

4.5. Static Volume Measuring Systems – General
- 4.5.1. Liquid Measures
- 4.5.2. Farm Milk Tanks
- 4.5.3. Dry Measures

4.6. Other Measuring Systems
- 4.6.1. Taximeters and Odometers
- 4.6.2. Wire and Cordage Measuring Systems
- 4.6.3. Linear Measures
- 4.6.4. Timing Devices
- 4.6.5. Weights
- 4.6.6. Multiple Dimension Measuring Systems

4.7. Quality Measuring Systems
- 4.7.1. Grain Moisture Meters
- 4.7.2. NIR Grain Analyzers
- 4.7.3. Carcass Evaluation Systems

5. Market Practices, Laws and Regulations (NIST HB 130) and Commodities (NIST HB 133)

5.1. Safety Considerations – Market Practices, NIST Handbook 130, NIST Handbook 133

5.2. NIST Handbook 130 – Laws and Regulations
- 5.2.1. NIST Handbook 130 – General Provisions
- 5.2.2. Packaging and Labeling Regulations
- 5.2.3. Method of Sale Regulations
- 5.2.4. Quality of Automotive Fuels and Lubricants
- 5.2.5. Price Verification

5.3. NIST Handbook 133 – Package Net Contents Control
- 5.3.1. Commodities – General
- 5.3.2. Packages Labeled by Weight, Standard and Random
- 5.3.3. Packages Labeled by Weight, Special Commodities
- 5.3.4. Packages Labeled by Volume (Volumetric and Gravimetric Testing)
- 5.3.5. Packages Labeled by Volume, Special
- 5.3.6. Packages Labeled by Length/Area/Thickness
- 5.3.7. Packages Labeled by Count
- 5.3.8. Other Package Types

5.4. Test Purchases

5.5. E-Commerce

Note: Initial Verification has been intentionally been left off this listing and will be addressed later.

Appendix B

National Conference on Weights and Measures
National Training Program
CERTIFICATION DISCIPLINE
for

Retail Motor Fuel Devices (RMFD)
Beta Exam - November 2009

Prepared by the NCWM Professional Development Committee

The NCWM is offering a (beta) certification examination on the subject above. The examination will be taken online via the NCWM website. You must register with the NCWM and be granted a user authorization to access the test site. For registration information, call NCWM at 402-434-4880 or email info@ncwm.net. Be sure to include "RMFD exam" in the subject line.

Format and Duration:

The examination will be in three sections. There will be a total of 50 questions with a two hour time limit to complete all three parts. The test will be given in one session and you may not log off and then attempt to return to that exam. You must complete each section before moving to the next section.

The exam is OPEN BOOK, and you may make use of any reference materials, training documents, procedural guides at your disposal. You are expected to take the examination alone and may not receive assistance from any other person. You will be asked to affirm that at the conclusion of the examination.

Instructions on how to take the test will be provided online. Since the test is electronically graded, the answer must be marked or answer typed correctly. The test questions will be either multiple choice, fill in the blank, or compliance/citation. For multiple choice questions, you will be asked to pick the best answer from four options. For fill in the blank questions, you must enter the specific answer, typed correctly. For compliance/citation questions, you will be given information describing a situation and asked to assess compliance. Answer "yes" if the situation complies based on the information provided, otherwise provide the specific citation if the device does not comply. The form of the citation will typically be something like S.X.X. for a specification, T.X.X. for a tolerance or UR.X.X. for a user requirement. You will typically be directed to a specific Handbook code, so reference to the numerical code designation, such as 1.10. for the General Code, will usually not be necessary. If the potential answers span many codes, you will be specifically directed to include the numerical code reference.

Subject of Examination:

1. Segment 4.2. Introduction to Device Control – 15 questions
These questions test for knowledge, understanding, and ability to apply the basic requirements applicable to all weighing and measuring devices. This may include questions on the legal basis of NIST Handbook 44, the selection, care and use of standards, the organization of that Handbook, understanding of Fundamental Considerations, knowledge of systems of measurement bunits, understanding and application of General Code requirements, and understanding of the NTEP program and Certificates of Conformance.

2. Segment 4.1. Dynamic Measuring Systems – General – 15 questions
These questions test for knowledge and understanding of the basic technologies used in liquid measuring devices, ability to operate liquid measuring devices and associated controls and interpret indications, understanding and ability to apply code requirements from NIST Handbook 44 Liquid Measuring Device Code, and understanding and ability to conduct basic tests of liquid measuring devices.

3. Segment 4.2. Retail Motor Fuel Dispensers – 20 questions
These questions test for knowledge and understanding of the basic technologies used in RMFDs, understanding and ability to apply code requirements from NIST Handbook 44 Liquid Measuring Device Code for RMFDs, and understanding and ability to conduct basic tests of RMFDs.

Passing Score and Grading:

Weights and Measures regulatory officials	85 % (43 or more correct answers)
Service agents	75 % (38 or more correct answers)

You will be given a score for each section and total score immediately after completing the exam (or upon reaching the two hour time limit). To protect the integrity of the test questions, you will not be advised of the specific questions answered incorrectly. The PDC Committee will be reviewing incorrect answers in periodic reviews and will make adjustment to scores in select cases. If your score is affected, you will be notified.

If you wish to challenge any of the questions, there will be a section at the end where you can offer comments. You may also contact the NCWM PDC Committee through the NCWM staff at the same email address used for registration.

National Type Evaluation Program (NTEP) Committee
Interim Agenda

Judy Cardin, Chairman
Chief
Wisconsin, Weights and Measures

Reference
Key Number

500 INTRODUCTION

The N TEP C ommittee will a ddress th e f ollowing ite ms a t its 2 010 Interim M eeting. E xcept when p osted, a ll meetings are open to the membership. The members will be invited to dialogue with the NTEP Committee on issues on its agenda. The NTEP Committee is currently working on the following issues:

Table A
Index to Reference Key Items

Table B
Appendices

*Sector summaries can be viewed online at NCWM (www.ncwm.net) under Meetings, or at NIST Weights and Measures Division (http://ts.nist.gov/WeightsAndMeasures/Publications/pub15-10.cfm) under Publication 15 Interim Meeting Agenda for 2010.

Table D
Glossary of Acronyms*

BIML	Bureau of International Legal Metrology	IR	International Recommendation
CD	Committee Draft[1]	MAA	Mutual Acceptance Arrangement
CIML	International Committee of Legal Metrology	OIML	International Organization of Legal Metrology
CPR	Committee on Participation Review	MC	Measurement Canada
DD	Draft Document[2]	R	Recommendation
DR	Draft Recommendation[2]	SC	Subcommittee
DV	Draft Vocabulary[2]	TC	Technical Committee
DoMC	Declarations of Mutual Confidence	UT	Utilizing Participant
IP	Issuing Participant	WD	Working Document[3]

[1] CD: a draft at the stage of development within a technical committee or subcommittee; in this document, successive drafts are numbered 1 CD, 2 CD, etc.

[2] DD, DR, DV: draft documents approved at the level of the technical committee or subcommittee concerned and sent to BIML for approval by CIML.

[3] WD: precedes the development of a CD; in this document, successive drafts are number 1 WD, 2 WD, etc.

* Explanation of acronyms provided by OIML.

Details of All Items
(In Order by Reference Key Number)

500-1 I Mutual Recognition Arrangement (MRA)

Background/Discussion: Both Measurement Canada (MC) and the NTEP labs continue striving to improve the data exchange under the Mutual Recognition Arrangement (MRA). During the 2009 NTEP labs meeting, MC supplied the U.S. NTEP labs with an updated version of an Excel spreadsheet program to standardize the test report forms for weighing devices that fall under the MRA. This updated version of the spreadsheet is now in use for evaluations conducted by the labs. NTEP will continue to review progress and work on improvements during the NTEP lab meetings.

The NTEP Committee was asked to consider expanding the MRA to higher capacity scales. The NTEP weighing labs agreed that expanding the MRA should be considered and MC expressed willingness to consider a proposal from NCWM.

Current Comment: The NTEP Administrator opened communication with MC with a recommendation to expand the MRA to include electronic platform scales up to 14 000 kg (30 000 lb). The current limit is 1000 kg. If the limit was expanded to just platform scales (i.e., not including hoppers, OBWS, IIIL, etc.), it appeared the only addition to what is required during an evaluation would be the field permanence test criteria (Pub 14, DES Sections 62.22, 63.7., 64.3., & 64.4.). Upon discussion with MC type evaluation personnel, other issues surfaced: a) MC tests some weighing elements up to 10 000 kg in the lab, applying influence factor requirements (power, temperature, EMI, etc). There is a size limit of 1.6 m x 1.6 m. NTEP has a lab test limit of 1000 kg and some of the chambers will not accommodate the larger weighing elements, and b) MC does not apply the minimum 20 day use limit for field permanence tests for "cost factor" reasons (i.e., they want to avoid a second visit to the site). MC initially had a 20 day use requirement, then did away with the time requirement, now only requiring 300 weighments, and may not want to reinstitute the time requirement for NTEP.

Based upon this information, taking the current workload of the weighing labs and current economic conditions into consideration, NTEP does not plan to move forward with the expansion of the MRA at this time.

500-2 I Mutual Acceptance Arrangement (MAA)

Background/Discussion: Information regarding the OIML MAA can be found at www.oiml.org/maa. NCWM has signed the OIML MAA Declaration of Mutual Confidence (DoMC) for R 60 Load Cells as a utilizing participant.

OIML technical subcommittee for TC 3 /SC 5 "Conformity assessment" is revising the following OIML B documents that are classified as Basic Publications:

- OIML B 3, "OIML Certificate System for Measuring Instruments;" and
- A combined revision of OIML B 10-1, "Framework for a Mutual Acceptance Arrangement on OIML Type Evaluations," and OIML B 10-2, "Checklists for Issuing Authorities and Testing Laboratories carrying out OIML Type Evaluations."

A 2 CD of B 3 and a 1 CD of the combined B 10 revision were distributed to TC 3/SC 5 "Conformity assessment" in December 2009.

A meeting of the MAA Committee on Participation Review (CPR) was held in June 2009 in Berne, Switzerland. The NCWM was represented at the CPR meeting by Mr. Jim Truex. Dr. Charles Ehrlich and Mr. John Barton of NIST also attended the meeting as Secretariats of OIML TC 3 /SC 5 "Conformity assessment" and TC 9 "Instruments for measuring mass," respectively.

A major discussion topic at the CPR meeting was whether to allow data from manufacturers' test laboratories (obtained under 'unsupervised' conditions) as part of the MAA process. While this issue was not resolved at the CPR meeting, a way of possibly moving forward was developed. The CPR members have been queried to better understand the minimum requirements they would have for assessing the impartiality of manufacturers' test labs (MTLs), as well as the minimum requirements that an MTL must meet so that those MTLs that were excluded would not have a basis for complaint. CPR members have also been queried on their view of a possible compromise, where a minimum requirement on 'frequency of supervision' of an MTL could be established.

Another discussion topic at the CPR meeting was whether to accept laboratories in three countries into the MAA program for OIML R 76 (non-automatic weighing instruments) and OIML R 60 (load cells). These three countries were approved, and this is anticipated to soon lead to a significant increase in the number of OIML MAA Certificates that are issued for these instruments.

An update of related OIML activities will be given to the Committee during the Interim Meeting.

500-3 I NTEP Participating Laboratories and Evaluations Reports

Background: During the 2009 NCWM Annual Meeting, Mr. Jim Truex, NTEP Administrator, updated the Committee on NTEP laboratory and administrative activities.

The NTEP weighing and measuring laboratories held a joint meeting March 31 - April 2, 2009, in Reynoldsburg, Ohio. The NTEP weighing laboratories also met in August 2009, prior to the meeting of the Weighing Sector in Columbus, Ohio. The NTEP measuring laboratories met again in October 2009, prior to the Measuring Sector meeting in Clearwater Beach, Florida.

Current Comment: NTEP Administrator, Mr. Truex, reported that incoming applications remain strong and all labs are busy. He reported there is no backlog concern for measuring devices, but three of the brick and mortar weighing labs still report about a three-month backlog.

2010 NTEP Meetings:

• NTETC Belt-Conveyor Sector	February 24 - 25, 2010	St. Louis, Missouri (if needed)
• NTETC Software Sector Meeting	March 2 - 3, 2010	Sacramento, California
• NTEP Laboratory Meeting	March 22 - 26, 2010	Sacramento, California
• NTETC Grain Analyzer Sector	August 25 - 26, 2010	Kansas City, Missouri
• NTETC Weighing Sector	August 31 - September 2, 2010	Columbus, Ohio
• NTETC Measuring Sector	Date and Location TBD (in conjunction with the SWMA mtg)	

500-4 I NTETC Sector Reports

Background/Discussion:

The NTEP Committee is working to correct the sector report process to ensure the reports are posted for members on the NCWM website prior to the Interim Meeting.

Grain Moisture Meter and NIR Protein Analyzer Sectors: The NTETC Grain Moisture Meter and NIR Protein Analyzer Sectors held a joint meeting in Kansas City, Missouri, August 19 - 20, 2009. A draft of the final summary was provided to the Committee prior to the 2010 NCWM Interim Meeting for review and approval.

The next meeting of the Grain Moisture Meter and NIR Protein Analyzer Sectors is scheduled for August 25 - 26, 2010, in Kansas City, Missouri. For questions on the current status of sector work or to propose items for a future meeting, please contact the sector technical advisors:

Ms. Diane Lee
NIST WMD
100 Bureau Drive, Stop 2600
Gaithersburg, MD 20899-2600
Phone: (301) 975-4405
Fax: (301) 975-8091
e-mail: diane.lee@nist.gov

Mr. Jack Barber
J.B. Associates
10349 Old Indian Trail
Glenarm, IL 62536
Phone: (217) 483-4232
e-mail: barber.jw@comcast.net

Measuring Sector: The NTETC Measuring Sector met October 2 - 3, 2009, in Clearwater Beach, Florida. A draft of the final summary was provided to the NTEP Committee prior to the 2010 NCWM Interim Meeting for review and approval.

The next meeting of the Measuring Sector for 2010 has not been scheduled, but will be in conjunction with the Southern Weights and Measures Association's 2010 Annual Meeting. For questions on the current status of sector work or to propose items for a future meeting, please contact the sector technical advisor:

Ms. Tina Butcher
NIST WMD
100 Bureau Drive, Stop 2600
Gaithersburg, MD 20899-2600
Phone: (301) 975-2196
Fax: (301) 975-8091
e-mail: tbutcher@nist.gov

Software Sector: The NTETC Software Sector met March 11 - 12, 2009, in Reynoldsburg, Ohio. A final draft of the meeting summary was provided to the Committee prior to the 2010 NCWM Interim Meeting for review and approval.

The next meeting of the Software Sector is scheduled for March 2 - 3, 2010, in Sacramento, California. For questions on the current status of sector work or to propose items for a future meeting, please contact the sector chairs and NTEP Administrator:

Mr. Jim Pettinato	Mr. Norm Ingram	Mr. Jim Truex
Sector Chair	Sector Chair	NTEP Administrator
FMC Technologies	CA Div. of Measurement Standards	NCWM
1602 Wagner Avenue	6790 Florin Perkins Road, Suite 100	1135 M Street, Suite 110
Erie, PA 16510	Sacramento, CA 95828	Lincoln, NE 68508
Phone: (814) 898-5250	Phone: (916) 229-3016	Phone: (740) 919-4350
Fax: (814) 899-3414	Fax: (916) 229-3026	Fax: (740) 919-4348
e-mail: jim.pettinato@fmcti.com	e-mail: ningram@cdfa.ca.gov	e-mail: jim.truex@ncwm.net

Weighing Sector: The NTETC Weighing Sector met August 25 - 27, 2009, in Columbus, Ohio. A final draft of the meeting summary was provided to the Committee prior to the 2010 NCWM Interim Meeting for review and approval.

The next Weighing Sector meeting is scheduled for August 31 - September 2, 2010, in Columbus, Ohio. For questions on the current status of sector work or to propose items for a future meeting, please contact the sector technical advisor:

Mr. Steven Cook	Phone: (301) 975-4003
NIST WMD	Fax: (301) 975-8091
100 Bureau Drive, Stop 2600	e-mail: steven.cook@nist.gov
Gaithersburg, MD 20899-2600	

Belt-Conveyor Scale Sector: The NTETC Belt-Conveyor Scale Sector met February 25 - 26, 2009, in St. Louis, Missouri. A final draft of the meeting summary was provided to the Committee prior to the 2010 NCWM Interim Meeting for review and approval.

The next Belt-Conveyor Scale Sector meeting is scheduled for February 24 - 25, 2010, in St. Louis, Missouri. For questions on the current status of sector work or to propose items for a future meeting, please contact the sector technical advisor:

Mr. John Barton	Phone: (301) 975-4002
NIST WMD	Fax: (301) 975-8091
100 Bureau Drive, Stop 2600	e-mail: john.barton@nist.gov
Gaithersburg, MD 20899-2600	

500-5 I Conformity Assessment Program

Background/Discussion: The Conformity Assessment Program was established to ensure devices produced after the device has been type evaluated and certified by NTEP continue to meet the same requirements. This program has three major elements: (1) Certificate Review (administrative); (2) Initial Verification (inspection and performance testing); and (3) Verified Conformity Assessment (influence factors). This item is included on the Committee's agenda to provide an update on these elements.

Certificate Review: The question addresses how this would be accomplished given the limited resources of NCWM. It was suggested this item may need to continue on a "back burner" until resources can be clearly identified to proceed with the project in an efficient, thorough, and accurate manner.

During the 92nd NCWM (2007), it was reported that this item continues on the "back burner" until funding can be identified for this project. The NTEP Committee considered the fact that continuing improvement is occurring on Certificates of Conformance (CC) and the improvements are making it easier for inspectors to verify. Therefore, for the time being, the NTEP Committee plans to discontinue reporting on this portion of Conformity Assessment in future NTEP reports.

Initial Verification (IV): Work group (WG) chair, Lou Straub, reported that Initial Verification checklists have been developed for small scales, vehicle scales, and retail motor-fuel dispensers. Data has been received from several states on small-capacity price computing scales, and the pilot of Initial Verification for small-capacity scales has been completed. All data has been forwarded to NCWM staff for safekeeping.

The WG asked for direction from the NTEP Committee on how to proceed to the next step. Mr. Straub clarified that not all states or jurisdictions need to participate in submitting information to NCWM on Initial Verification. A subset of states would be sufficient. The NTEP Committee instructed the WG to proceed with development of additional checklists, but there was a sense that the WG was reluctant until they know how states will react and use the developed checklists. The NTEP Committee also noted the need to decide how to process the data generated from Initial Verification. The Committee acknowledges that Verification Conformity Assessment (VCAP) is the priority and thinks IV is a very important element of conformity assessment but may need to rest until the states are ready to act.

Verified Conformity Assessment Program (VCAP): NCWM and NTEP have been concerned about production meeting type, protecting the integrity of the NTEP CC since the inception of NTEP. A WG was developed to assist the NCWM with this effort, which has provided feedback and recommendations to the conference. The NCWM Board of Directors thinks it has reached a point that the Verified Conformity Assessment Program can be launched. Load cells traceable to NTEP certificates have been selected for the initial effort. All holders of NTEP CCs for load cells have been notified.

The NTEP Committee has been asked to announce which device(s) will be next after load cells. The NTEP Committee wants some additional time to see what issues and concerns come to light with the load cell effort before making a decision.

The NTEP Committee decided to use the current process in Publication 14, Administrative Policy, Section T, "Appeal and Review Process" for all VCAP appeals. To make it clear, the NTEP Committee decided to add a bullet to Pub. 14, Section T to read: "A certificate holder may appeal a certificate made inactive due to non-compliance with VCAP. However, the decision of the Certification Body or VCAP auditor cannot be appealed to the NCWM."

During the 2009 Annual Meeting, a decision was made to keep the established timeline for load cell manufacturers with NTEP certificates but to delay the timeline by six months for "private label" load cell certificate holders. A new timeline was developed.

Current Comment: The NTEP Administrator updated the NTEP Committee and the NCWM Board regarding progress of Conformity Assessment issues. The VCAP/Load Cell Project is progressing. The NTEP Administrator attended the fall SMA meeting to explain and update details of the project.

The NCWM Board of Directors reconfirmed its belief that conformity assessment is vital to NTEP's continued success and will be implemented. The NCWM Board recently made decisions that affect Private Label NTEP Load Cell certificate holders and Manufacturers of NTEP Load Cell certificate holders. The Board extended the timeline by six months for both "Manufacturer" and "Private Label" NTEP load cell certificate holders. VCAP Audit Reports for manufacturers with load cell certificates are now due no later than June 30, 2010. VCAP Audit Reports for private label certificate holders are now due no later than November 30, 2010. These decisions finalize the load cell VCAP audit process and timeline. VCAP for load cells will occur according to the final timelines below.

NTEP VCAP Timeline – Load Cell Manufacturer Certificate Holders				
Jul 2008–ongoing	**Jan 2009–Jun 2010**	**Jan 2010-Sep 2010**	**Jul 2010-May 2011**	**May 2011**
Refine VCAP procedures	LC Manufacturers to put VCAP QM system in place	NTEP to evaluate incoming Certification Body audit reports	NTEP to contact manufacturers not meeting VCAP and encourage compliance	CCs declared inactive if CC holder fails to meet VCAP
Answer incoming questions	Conduct audit by Certified Body		Continue to evaluate incoming audit reports	
Refine/develop appeals process	Submit audit report to NCWM/NTEP			
Notify all CC holders of updated plan, Q&A, etc.				

NTEP VCAP Timeline – Load Cell Private Label Certificate Holders				
Jul 2008–ongoing	**Jan 2009–Nov 2010**	**Jun 2010-Mar 2011**	**Dec 2010-May 2011**	**Nov 2011**
Refine VCAP procedures	CC holders to put VCAP QM system in place	NTEP to evaluate incoming Certification Body audit reports	NTEP to contact manufacturers not meeting VCAP and encourage compliance	CCs declared inactive if CC holder fails to meet VCAP
Answer incoming questions	Insure audit by Certified Body		Continue to evaluate incoming audit reports	
Refine/develop appeals process	Submit audit report to NCWM/NTEP			
Notify all CC holders of updated plan, Q&A, etc.				

The NCWM decided to require a systems audit checklist that is to be completed by an outside auditor and submitted to the NCWM per section 2.5 of the VCAP requirements. A "VCAP Systems Audit Checklist for Manufacturers" and a "VCAP Systems Audit Checklist for Private Label Certificate Holders" have been developed and are available on the NCWM website at www.ncwm.net.

The NTEP Committee has also established a work group to modify VCAP frequently asked questions and other clarifications and a guideline document to assist manufacturers and auditors when completing the checklist and VCAP audit.

500-6 I NTEP Contingency - NCWM NTEP Laboratory

Source: NTEP Committee

Purpose: NTEP Contingency, to keep NTEP operating and ensure NTEP services are available at an adequate level. The NTEP Committee wants to ensure there is an appropriate number of laboratories and personnel (evaluators) to maintain viable support for NTEP services, including MRAs, MAAs and potentially to be an R76 Issuing Participant.

Item Under Consideration: The NTEP Committee discussed contingency planning for continuity of NTEP operations. With the state of today's economy, what if NTEP lost a lab? How will NTEP maintain workflow? Are there additional states interested in applying to become an NTEP field lab or an NTEP brick-and-mortar lab? The

NTEP Committee will continue to discuss the issues during a long-range planning session and welcomes comments from the membership.

Issues under consideration include should the NCWM:

1. Employ NTEP evaluators to conduct testing at manufacturer's facilities?
2. Have evaluators under contract to conduct testing at manufacturer's facilities?
3. Employ NTEP evaluators or have evaluators under contract to assist the state NTEP laboratories?
4. Have a brick and mortar NTEP laboratory and NTEP evaluators?
5. Use a private third party laboratory to conduct NTEP evaluations?

Ms. Judy Cardin, Wisconsin, NTEP Committee Chair

Mr. Randy Jennings, Tennessee, NCWM Chair
Mr. Tim Tyson, Kansas
Mr. Mike Sikula, New York
Mr. Kirk Robinson, Washington
NTEP Technical Advisor: Mr. Jim Truex, NTEP Administrator

National Type Evaluation Program Committee

Appendix A
National Type Evaluation Technical Committee (NTETC)
Grain Analyzer Sector

August 19 - 20, 2009, Kansas City, Missouri
Meeting Summary

Agenda Items

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1. Report on the 2009 NCWM Interim and Annual Meetings

The Interim Meeting of the 94th National Conference on Weights and Measures (NCWM) was held January 11 - 14, 2009, in Daytona Beach, Florida. At that meeting the National Type Evaluation Program (NTEP) Committee accepted the Sector's recommended amendments and changes to the 2008 Edition of NCWM Publication 14. These changes appear in the 2009 Edition of Publication 14. For additional background, refer to *Committee Reports for the* 94th *Annual Meeting,* NCWM Publication 16.

Changes to the Grain Moisture Meter and Near Infrared Grain Analyzers 2009 Edition of NCWM Publication 14			
Section Number	**Amendment/Change**	**Page**	**Source**
IV. Tolerances for Calibration Performance	Delete the portion of §IV specifying the categories of calibrations to be listed on a Certificate of Conformance (CC).	GMM-6 and GMM-7	08/08 GMM Sector Agenda Item 10
VII.B. Accuracy, Precision, and Reproducibility	Amend to address multi-class type evaluations for TW.	GMM-11 through GMM-15	08/08 GMM Sector Agenda Item 7
VII.C. Tolerances for Test Weight per Bushel Calibration Performance	Amend to limit the moisture content of samples used in evaluating TW performance and to add special considerations for multi-class calibrations.	GMM-15	08/08 GMM Sector Agenda Item 8
Appendix C	Amend to add additional data fields for TW data and to update instructions for submitting data to reflect current practice.	GMM-41	08/08 GMM Sector Agenda Item 9

No Grain Moisture Meter (GMM) or Near Infrared (NIR) Grain Analyzer items appeared in the Specifications and Tolerances (S&T) Committee Interim Report for consideration by the NCWM at the 2009 Annual Meeting held July 12 - 16, 2009, in San Antonio, Texas. Mr. Jim Truex, NTEP Administrator, reported that Annual Meeting attendance was down this year, but that 35 states were represented exceeding the quorum requirements of 27. Other General Code items of interest to the Sector were non-voting items related to software and provisions for sealing electronic adjustable components. [See Sector Agenda Items 4, 4a, 4b, 4c, 4.d, 4.e and 9.]

2. Report on NTEP Type Evaluations and OCP (Phase II) Testing

Ms. Cathy Brenner of the Grain Inspection, Packers and Stockyards Administration (GIPSA), the NTEP Participating Laboratory for Grain Analyzers, briefed the Sector on NTEP Type Evaluation activity. Evaluations are currently underway for three additional devices: one new grain moisture meter with test weight capability; one new grain moisture meter; and one test weight per bushel add-on to a currently approved grain moisture meter. Annual GMM calibration reviews were completed on schedule and updated Certificates of Conformance (CCs) were issued for six device types. She reported that the following five device types are enrolled in the OCP (Phase II) for the 2009 harvest:

[Note: Models listed on a single line are considered to be of the same “type.”]

Bruins Instruments	OmegAnalyzerG
DICKEY-john Corporation	GAC2000 NTEP, GAC2100, GAC2100a, GAC2100b
Foss North America	Infratec 1241
Perten Instruments	AM5100
The Steinlite Corporation	SL95

[Note: Foss Infratec 1227 & 1229 dropped out of Phase II – CC expires June 30, 2010.]

3. Review of Ongoing Calibration Program (Phase II) Performance Data

At the Sector’s August 2005 meeting, it was agreed that comparative OCP data identifying the Official Meter and listing the average bias for each NTEP meter type should be available for annual review by the Sector. Accordingly, Ms. Brenner, representing GIPSA, the NTEP Participating Laboratory for Grain Analyzers, presented data showing the performance of NTEP meters compared to the air oven. This data is based on the last three crop years, 2006 - 2008 using calibrations updated for use during the 2009 harvest season.

Four meter types were included in the comparison graphs: DICKEY-john's GAC2100; Foss's Infratec 1241; Foss's Infratec 1229; and Steinlite's SL95. Only the GAC2100 has been identified on the comparisons. It is identified as "Official Meter." The remaining three instruments were randomly assigned numbers 1, 2, and 3.

Ms. Brenner pointed out that data on Perten's AM5100 was not included in the comparisons because it has not been in the program for three full years. It will be included next year. Comparisons of GMMs with less than three years of data against GMMs with the full three years of data are not meaningful, as they may be unduly influenced by a single unusual crop year. Also, to preserve confidentiality, sunflower results were not included because only two meters were approved for sunflowers, one of which was the Official Meter. She noted that labels are missing on the moisture axis of the comparison graph for Hard White Wheat. The moisture intervals and number of samples for Hard White Wheat should be as follows:

8 % to 10 %	43 samples
10 % to 12 %	20 samples
12 % to 14 %	9 samples

[Note: The 2006 - 2008 GMM Phase II comparison graphs were distributed with the August 2009 Grain Analyzer Sector Agenda. They can also be downloaded from the NCWM website using the following link: http://www.ncwm.net/ntep/pdf/09_GMMBiases.pdf.]

Dr. Richard Pierce explained that GIPSA was considering changes in sample collection procedures, this year and in the future, to make moisture data somewhat more representative with respect to both geographical and moisture-range distribution. To illustrate the problem that present procedures have created, he offered an example involving soybean samples. Sample collection assignments are communicated to GIPSA field offices in the spring of each year through a sample collection notice. In the past, GIPSA has requested soybean samples in moisture ranges of 10 % to 13 % and 13 % to 16 %. Within these ranges, they typically receive large quantities of 12 % to 13 % and 13 % to 14 % samples, which results in a huge number of samples in the 12 % to 14 % range. To avoid this unintended consequence, GIPSA intends to request samples in moisture intervals matching those used in reporting Phase II data. They will also try to limit the number of samples that will be analyzed in each 2 % moisture interval.

Dr. Pierce noted that while having too many samples is not a problem for many of the moisture intervals, but GIPSA is trying to scale back so that they don't have more than 25 to 40 samples in a given 2 % interval per year. They will also be attempting to achieve better geographical balance that, as much as reasonably possible, is proportional to crops grown in an area. His message was, "We're not going to analyze every sample we receive."

4. Software Requirements That May Impact Grain Analyzers

Background: In October 2008 the International Committee of Legal Metrology (CIML) approved the new OIML document **D 31** ***General requirements for software-controlled measuring instruments*** that is intended to serve as guidance for software requirements in international recommendations under development by OIML technical committees. **Document D 31** can be downloaded free of charge from:

http://www.oiml.org/publications/D/D031-e08.pdf

In 2005 the NCWM Board of Directors established an NTETC Software Sector. One of the tasks assigned to the Sector was to develop a clear understanding of the use of software in today's weighing and measuring instruments. A good overview of the work of the Software Sector is contained in the Meeting Summary of the Sector's Annual Meeting held March 11 - 12, 2009, in Reynoldsburg, Ohio. The Summary can be downloaded from the NCWM web page:

http://www.ncwm.net/events/pdf/09_Software_Sector_Summary.pdf

Two NTETC Software Sector items have been accepted as Information items by the S&T Committee for inclusion in the Committee Reports for the NCWM 94th Annual Meeting in 2009. Information Items report on subjects and/or actions under consideration by the committee but not proposed for voting. The Committee Reports can be downloaded from the NIST Weights and Measures Division (WMD) web page:

http://ts.nist.gov/WeightsAndMeasures/Publications/upload/11-ST-09-Pub16-FINAL.doc

The two Information items, and several other Software Sector items, are summarized and discussed separately in Agenda Items 4.a, 4.b, 4.c, 4.d, and 4.e. (This information was included to facilitate discussion on the possible impact of these recommendations on GMMs, and ,NIR, Grain Analyzers.)

Discussion: Ms. Cassie Eigenmann, DICKEY-john, encouraged other meter manufacturers to get involved in the Software Sector and to attend their meetings, noting that what gets decided in those meetings can have a big effect on both existing meters and on the design of future meters.

Mr. Jim Truex, NTEP Administrator, explained that much of the work the Software Sector is doing will likely become General Code items that would affect every code in NIST Handbook 44 (HB 44). Fortunately, GMMs and NIR Grain Analyzers have their own specific codes which take precedent over the General Code when there are conflicts/differences. He urged the Sector to pay attention to what is happening so it can anticipate where changes or additions to the specific codes might be required.

4.a Item 310-2: Appendix D – Definition of Electronic Devices, Software-Based and Built-For-Purpose Device

Background: At the Software Sector's October 2007 meeting, it was initially suggested that the term "not-built-for-purpose" be removed from the wording in NIST HB 44 paragraph G-S.1.1., as there is no definition for a not-built-for-purpose device in HB 44. After a lengthy discussion related to the terms "built-for-purpose" and "not-built-for-purpose," the Software Sector agreed these terms were not clear and should be replaced with definitions based on the revision of *OIML R 76 Non-Automatic Weighing Instruments,* Subsections 5.5.1. (Type P) and 5.5.2. (Type U).

At the 2009 NCWM Interim Meeting, the S&T Committee received comments from the Scale Manufacturers Association (SMA) stating that it now opposes this item as there is no technological justification for making a distinction in software-based device types. Other comments were received taking issue with the SMA, position arguing that significant physical differences make the distinction necessary. The Software Sector recommended that this item remain Informational to allow further review. Following is the definition as it appeared the S&T Committee Report for the 94th Annual Meeting:

<u>Electronic devices, software-based. – Weighing and measuring devices or systems that use metrological software to facilitate compliance with Handbook 44. This includes:</u>

(a) <u>Embedded software devices (Type P), aka built-for-purpose. – A device or element with software used in a fixed hardware and software environment that cannot be modified or uploaded via any interface without breaking a security seal or other approved means for providing security, and will be called a "P," or</u>

(b) <u>Programmable or loadable metrological software devices (Type U), aka not-built-for-purpose. – A personal computer or other device and/or element with PC components with programmable or loadable metrological software, and will be called "U." A "U" is assumed if the conditions for embedded software devices are not met.</u>

<u>Software-based devices – See Electronic devices, software-based.</u>

At the Software Sector's March 2009 meeting, some discussion on the wording of the definitions resulted in the proposal of a slightly modified version (see below), but no consensus was reached on the language change shown below.

Electronic devices, software-based. Weighing and measuring devices or systems that use metrological software to facilitate compliance with Handbook 44. This includes:

(a) **Type 'P' (aka built-for-purpose) software-based electronic devices. – A device or element with software used in a fixed hardware and software environment that cannot be modified or uploaded via any interface without breaking a security seal or other approved means for providing security;**

(b) **Type 'U' (aka not-built-for-purpose) software-based electronic devices. – All metrological software-based devices not meeting the conditions of a Type 'P' device. Example: a personal computer or other device and/or element with PC components with programmable or loadable metrological software.**

Software-based devices – See Electronic devices, software-based.

Discussion: The differentiation between software embedded in a built-for-purpose measuring instrument (Type P) and software for measuring instruments using a universal computer (Type U) is well established in the European community. See **WELMEC *Software Guide (Measuring Instruments Directive 2004/22/EC)***. The designations Type P and Type U are also expected to be used in the General Code section of NIST Handbook 44 (HB 44).

Grain Analyzer Sector members were asked for comments on the definition proposed by the Software Sector at their March 2009 meeting. This prompted a lengthy discussion as Sector members tried to grasp the differences between P and U and to understand why it might be important to them. Some questioned, "Does the user care?" It was pointed out that there are security differences and field inspection differences.

When the Sector was asked to express a preference for the definition proposed by the Software Sector at their March 2009 meeting over the definition proposed as Item 310-2 in the S&T Committee Report for the 94th Annual Meeting, additional questions were raised. One member asked if there was anything in either of the two definitions that would cause problems for GMMs or NIR grain analyzers. The Co-Technical Advisor did not believe that there was anything in either of the two definitions themselves that would be troublesome for GMMs or NIR Grain Analyzers. He explained that the reason that this question of definitions had been placed on the Sector's agenda as the first software-related item was due to the following: software items require a thorough knowledge and understanding of what is meant by Type P and Type U. He strongly favored the definition proposed by the Software Sector in March of 2009 because of its clarity and sentence structure.

Mr. Andy Gell, Foss North America, was concerned about the definition for Type U devices (see part b of the definition above) possibly precluding any instrument that consists of a black box that requires a personal computer (PC) to be sitting next to it. In this case, the black box will not function without a PC being connected to it. Proprietary software loaded into a generic PC controls all the functions of the black box and calculates the results which can be displayed on the PC, stored on the PC, and printed on a generic printer attached to the PC. Because the PC was a generic PC capable of functioning as a regular PC, it appeared to the Sector that this would be a Type U device requiring the proprietary software to meet the general code requirements for Type U software. However, the system consisting of PC+software and black box would have to meet the requirements of the appropriate grain analyzer code. The Sector wondered if a single CC could be issued for this system. No decision was reached on this question.

Conclusion: The Sector reached a consensus that, at this point, the Software Sector's March 2009 definition was preferred over the definition that appeared as Item 310-2 in the S&T Committee Report for the 94th Annual Meeting.

Jim Truex, NTEP Administrator, recommended that the Sector's decision be forwarded to the Software Sector and to the S&T Committee.

4.b Item 310-3: G-S.1. Identification. – Software

Background: Beginning at the October 2007 meeting, the Software Sector discussed the value and merits of required markings for software. After several iterations, the Software Sector developed a table to reflect their positions. This table was submitted to NCWM S&T Committee and was assigned Developing status in 2008. However, the Software Sector did not include a recommendation on how to incorporate the proposal into existing G-S.1. and G-S.1.1. language. In particular, WMD was concerned about properly addressing the various existing requirements and multiple non-retroactive dates.

Prior to the NCWM 2009 Interim Meeting, NIST WMD commented on S&T Item 310-3, and presented an alternate proposal with significant modifications, which were included in the Interim Meeting Agenda background for the item (see 2009 Pub 15 for more details). The WMD proposal was subsequently accepted by the S&T Committee as Information Item 310-3 in the Committee Reports for the 94th Annual Meeting of the NCWM. The WMD proposal is reproduced below:

G-S.1. Identification. – **<u>For the purposes of identification, all equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect and manufactured on or after January 1, 201X, shall be clearly marked as specified in Table G-S.1. Identification and explained in the accompanying notes in Table G-S.1. Notes:</u>**

All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect **<u>and manufactured prior to January 1, 201X</u>**, 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* ***<u>Type U</u>*** ***(not-built-for-purpose) software-based*** *devices;*
[Nonretroactive as of January 1, 1968]
(Amended 2003 **<u>and 201X</u>**)

(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* ***<u>Type U</u>*** ***(not-built-for-purpose) software-based*** *devices;*
[Nonretroactive as of January 1, 2004]
(Added 2003) **<u>(Amended 201X)</u>**

(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)

(e) *an NTEP Certificate of Conformance (CC) number or a corresponding CC Addendum Number for devices that have a CC. 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 201X**)

G-S.1.1. Location of Marking Information for Type U (Not-Built-For-Purpose), Software-Based Devices. – *For* ***Type U*** ~~***not-built-for-purpose, software-based***~~ *devices* ***manufactured prior to January 1, 201X,*** *either:*

(a) *The required information in G-S.1. Identification. (a), (b), (d), and (e) shall be permanently marked or continuously displayed on the device; or*

(b) *The Certificate of Conformance (CC) Number shall be:*

(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."*

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.*

[Nonretroactive as of January 1, 2004]

(Added 2003) (Amended 2006 **and 201X**)

Table G-S.1. Identification for Devices Manufactured on or after January 1, 201X (For applicable notes, see Table G-S.1. Notes on Identification)			
Required Marking	**Full Mechanical Devices and Separable Mechanical Elements**	**Type P Electronic Devices and Separable Elements**	**Type U Electronic Devices and Separable Elements**
Name, initials, or trademark of the manufacturer or CC holder	**Hard-Marked**	**Hard-Marked or Continuously Displayed**	**Hard-Marked, Continuously Displayed, or Via Menu (display) or Print Option (8)**
Model identification information that positively identifies the pattern or design of the device (1)	**Hard-Marked**	**Hard-Marked or Continuously Displayed**	**Hard-Marked, Continuously Displayed, or Via Menu (display) or Print Option (8)**
Non-repetitive serial number (2)	**Hard-Marked**	**Hard-Marked or Continuously Displayed**	**Not Acceptable**
Software version or revision (3)	**Not Applicable**	**Hard Marked (5), Continuously Displayed, or by Command (operator action) (6)**	**Continuously Displayed or Via Menu (display) or Print Option (8)**
Certificate of Conformance number or corresponding CC Addendum (4)	**Hard-Marked**	**Hard-Marked or Continuously Displayed**	**Hard-Marked (7) or Continuously Displayed**
The r equired i nformation shall be so l ocated t hat i t i s r eadily ob servable w ithout t he n ecessity of the disassembly of a part requiring the use of any means separate from the device.			

(Added 201X)

Table G-S.1. Notes on Identification
For Devices Manufactured on or after January 1, 201X

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.**

2. **Except for equipment with no moving or electronic parts, the serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number.**
   - **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.).**

3. **Metrologically significant software shall be clearly identified with the software version. The identification may consist of more than one part but one part shall be dedicated to the metrologically significant portion.**
   - **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.**
   - **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.).**

4. **An NTEP Certificate of Conformance (CC) number or a corresponding CC Addendum Number for devices that have a CC. 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.).**

5. **If the manufacturer declares that the primary sensing element "software" is integral, has no end user interface and no print capability, the version/revision shall be hard-marked on the device. Example: Primary sensing element may be Positive Displacement (P.D.) meter with integral correction, digital load cell (only for reference, not limiting).**

6. **Information on how to obtain the Version/Revision shall be included on the NTEP CC.**

7. **Hard-marking of the CC Number is permitted if no means of displaying this information is available.**

8. **Information on how to obtain the name, initials, or trademark of the manufacturer or CC holder, model designation, and software version/revision information shall be included on the NTEP CC.**

(Added 201X)

At the Software Sector's March 2009 meeting, several members were of the opinion that the perceived scope of their original proposal had been extended by the modifications proposed by WMD and had actually made the Sector's intent less clear. The Sector Chairman proposed revisiting the current text of G-S.1. to determine exactly what changes would be required to reflect the Sector's position. It was also noted that there was some validity to the SMA argument that there is no justification for differentiation of marking requirements based on device type P or U. After additional lengthy discussions, the following modified versions of G-S.1./G-S.1.1 were drafted. Although the Sector believed that a table was now unnecessary, they also suggested what the table should look like if one was desired. They also pointed out that the second table of notes, as proposed by WMD, was now redundant as the notes were incorporated in their suggested table.

The Software Sector's March 2009 proposal is shown below:

G-S.1. Identification. – All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect **and manufactured after January 1, 201X**, 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 lower case.
[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 ***software that is not part of a Type P (built-for-purpose) device****;*
[Nonretroactive as of January 1, 1968]
(Amended 2003 **and 201X**)

(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 software-based ***electronic*** *devices;*
[Nonretroactive as of January 1, 2004]
(Added 2003)**(Amended 201X)**

(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)

(e) an NTEP Certificate of Conformance (CC) number or a corresponding CC Addendum Number for devices that have a CC. 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)

***G-S.1.1. Method of Marking Information for all Software-Based Devices**. – For devices **manufactured after January 1, 201X,** either:*

(a) The required information in G-S.1 Identification. shall be permanently marked or continuously displayed on the device; or

(b) The Certificate of Conformance (CC) Number shall be:

(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."

***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.*

[Nonretroactive as of January 1, 2004]

(Added 2003) (Amended 2006 **and 201X**)

Table G-S.1. Identification
for Devices Manufactured on or after January 1, 201X

Required Marking	**Full Mechanical Devices and Separable Mechanical Elements**	**Electronic Devices, Software Based**
Manufacturer or CC holder ID	**Hard-Marked**	**Hard-Marked, Continuously Displayed, Via Menu (display) or by command (operator action)**
Model identification	**Hard-Marked**	**Hard-Marked, Continuously Displayed, Via Menu (display) or by command (operator action)**
Serial number	**Hard-Marked**	**Hard-Marked, Continuously Displayed[1]**
Metrologically Significant Software version	**Not Applicable**	**Continuously Displayed, Via Menu (display) or by command (operator action)[2]**
Certificate of Conformance number	**Hard-Marked**	**Hard-Marked, Continuously Displayed, Via Menu (display) or by command (operator action)[3]**

[1]Type 'U' devices need not have a non-repetitive serial number.

[2]If the manufacturer declares that the primary sensing element "software" is integral, has no end user interface and no print capability, the version/revision shall be hard-marked on the device. Example: Primary sensing element may be Positive Displacement (P.D.) meter with integral correction, digital load cell (only for reference, not limiting).

[3]If the Certificate of Conformance number is to be displayed via menu and/or submenu, the means of access must be easily recognizable. In addition, instructions on how to obtain the remaining required information not hard-marked or continuously displayed shall be included on the NTEP CC.

Discussion/Conclusion: All GMMs and NIR Grain Analyzers currently holding active CCs are of Type P. For these devices it would appear that the requirement for marking the Software Version/Revision of the metrologically significant portion would be the only change required to comply with the proposed marking for Type P devices.

The Grain Analyzer Sector's Co-Technical Advisor suggested that the Software Sector's March 2009 proposal does not address the WMD's concerns regarding addressing various existing requirements and multiple non-retroactive dates. In the Software Sector's proposal, both ***G-S.1. Identification*** and ***G-S.1.1. Method of Marking Information for all Software-Based Devices*** include a statement indicating that the following subparagraphs apply to equipment **"manufactured after January 1, 201X"** implying that G-S.1. and G-S.1.1 do NOT apply to equipment manufactured prior to that date. However, the subparagraphs indicate added, amended, and non-retroactive dates ranging from 1968 to 2007. The Software Sector's proposal is unclear as to which, if any paragraphs/subparagraphs apply to equipment manufactured prior to 201X. The NIST WMD proposal clearly indicates which requirements are applicable to devices manufactured before January 1, 201X, and which are applicable to devices manufactured after January 1, 201X.

The Sector was in general agreement that the NIST WMD proposal was less confusing from an enforcement point of view.

4.c Identification of Certified Software

Background: The Software Sector's work on 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 that was evaluated and approved by the lab." The Software Sector is developing language to be added to HB 44 that will include requirements similar to those developed by OIML. The initial draft of the Software Sector's proposed language (for G-S.1.1. Location of Marking Information for Not-Built-for-Purpose, Software-Based Devices) is shown below:

Identification of Certified Software:

Software-based electronic devices shall be designed such that the metrologically significant software is clearly identified. The identification of the software shall be inextricably linked to the software itself.

- **Unique identifier must be displayable/printable on command or during operation, etc. (marking req't in addition)**
- **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)**

Discussion: All GMMs and NIR Grain Analyzers currently holding active CCs are of Type P. The metrologically significant, or legally relevant, software elements of these devices can be classified as either "Fixed" or "Other" as shown below:

Fixed:

- Main program
- Associated subroutines
- Type specific parameter tables (set by the manufacturer)

Other:

- Device specific parameter tables (set by the manufacturer or a competent service representative)
- Site specific parameter tables (set by user and verified by field inspection)
- Individual Grain Calibrations (periodically changed, frequently by user; verified by field inspection.)

In order for software to have a unique identifier that is "inextricably linked to the software itself" the software must be Fixed so that any change made after certification is reflected by a change in the unique identifier. Alternate methods may have to be found to identify the versions of the software elements classified as Other.

For Grain calibrations, the requirements for version identification are specified in existing HB 44 code. Grain calibrations are individually identified and are required to be self-checking against data corruption or alteration (see **HB 44, § 5.56.(a)** paragraphs **S.2.4.1. Calibration Version and S.2.4.2. Calibration Corruption** and **HB 44, §5.57.** paragraphs **S.2.5.2. Calibration Version** and **S.2.5.3. Calibration Corruption**)

Site specific parameters and device specific parameter tables (e.g., any tables or parameters residing in software to normalize the response of like instruments) currently are not required to be identified by version, but existing code requires these to be secured by a physical seal or an audit trail.

Dr. Richard Pierce, GIPSA (the NTEP Participating Laboratory for Grain Analyzers), wondered if there might be a problem with the way GMM CCs have been handled in the past. The example he cited was related to GMMs that also have test weight per bushel (TW) capability. Such devices have an extra sensor to determine if there is adequate sample in the hopper for a TW measurement. Presently, a GMM without TW capability and the same model with TW capability are both covered under the same CC. In some cases, they have the same instrument identifier. If they should happen to use two different software versions with different identifiers, it could be very difficult if all the different options have to be tracked. Many different CCs might be required for the same basic instrument.

The Sector Co-Technical Advisor did not think that separate CCs would be required. If the software had different identifiers, they could all be listed on the same CC with a description of which one was applicable to the basic instrument and which one was applicable to the version with TW capability.

Mr. Jim Truex, NTEP Administrator, reported that this was already being done on CCs for point of sale systems. NCR offers multiple software versions on the same device.

Dr. Charles Hurburgh, Iowa State University, remarked that device specific and site specific parameters for NIR Analyzers will become much more complicated than slope and bias. Eight to ten different algorithms, some very complex and some with virtual coefficients, are now available to adjust one instrument to match another. He was of the opinion that getting locked in as to what is Fixed could create problems. When asked if all the algorithms would behave the same over the operating temperature range his reply was, "Absolutely not!" It was pointed out that each algorithm would have to be evaluated separately to convince the NTEP lab that these device specific algorithms do not affect the operating characteristics of the device (temperature range, etc.).

It was later proposed that if these algorithms were calibration specific and the manufacturer could demonstrate that they would be invoked/applied only to non-NTEP grains or non-NTEP constituents, they would not have to be evaluated.

When the discussion returned to the subject of alternate ways to handle device specific parameters, Dr. Pierce suggested that if you standardize an instrument at the factory and have Device Specific adjustments (as opposed to type specific adjustments), a checksum could be used to protect those specific adjustments against corruption in the same manner that grain calibrations are protected. Although individual instruments would all have different standardizing packages, as long as those do not change, unless service is performed) the need to assign a version to those adjustments seems unnecessary.

Mr. Ole Rasmussen proposed defining actual code as the actual compiled machine code that is changed by re-compiling source code. Then, what is actual code can be separated from those parameters that are tracked by audit trail, parameters which could be user definable or service changeable. Code is not re-compiled when simply making an adjustment to that device.

Expanding on Dr. Pierce and Mr. Rasmussen's suggestions, the Sector Technical Advisor outlined how these parameters might be protected. Put service/standardization parameters in a module/table/file that contains all the adjustment parameters plus a stored checksum for that instrument's unique set of parameter values. At instrument start-up, the main program calculates a checksum based on that unique set of parameter values and compares it with the stored checksum. If they do not match, the instrument cannot proceed further and it displays an error code/message. To save audit trail memory space, he proposed that the individual corrupted parameter values not be logged in the audit trail. It would be sufficient to log only the error or error code for the type of error (e.g., corrupted standardization parameters).

The discussion moved to what the software identification might look like and how changes might be tracked.

Several members suggested that the software version might look like:

3.yy.xx where 3 is the version that was originally evaluated, yy are metrologically significant changes that are compatible with older instruments running other 3.yy.xx versions, and xx can be any sequentially issued change that does not need new approval, a non-metrologically significant change. Typically, yy versions do not require re-testing, but will require notifying the NTEP lab. A revised CC may or may not be required.

4.yy.xx where 4 is incompatible with older versions of the instruments in the field and cannot be used in instruments of that type manufactured prior to a given serial number or manufacturing date. A revised or new CC will be required. If a revised CC is issued, the revised CC must list the various older revisions and the range of serial numbers on which they can be used.

Mr. Jim Truex remarked on the importance of software having to be identified and that the identification is going to have to be available to the inspector.

The discussion shifted to what "inextricably linked" means; how much security is required to guarantee that the displayed software identification number has the actual approved software behind it? Is it sufficient to embed the version number in the fixed portion of the code (before it is compiled) and to include in the code a routine for displaying that number upon command, or must the version number be scrambled or otherwise hashed before being embedded in the fixed portion of the code? These questions were not answered.

Dr. Pierce commented that he does not see GIPSA with a software engineer in the NTEP lab examining the software, or the NTEP lab sending the device elsewhere for the software to be examined.

Mr. Truex replied, "We're not going to have software engineers, but we will be requesting information from manufacturers about their software." (See the following agenda item.)

4.d Software Protection/Security

Background: The Software Sector derived a trial Publication 14 checklist based on the OIML checklist to verify that the software adequately protected against fraudulent modification as well as accidental or unintentional changes. The checklist has been distributed to current NTEP labs for use on a trial basis for new type approval applications.

Devices with embedded software TYPE P (aka built-for-purpose)			
	Declaration of the manufacturer that the software is used in a fixed hardware and software environment, and		Yes☐ No ☐ N/A ☐
	cannot be modified or uploaded by any means after securing/verification		Yes☐ No ☐ N/A ☐
	***Note:** It is acceptable to break the "seal" and load new software, audit trail is also a sufficient seal.*		
	The software documentation contains:		
		description of the (all) metrologically significant functions OIML states that there shall be no undocumented functions	Yes☐ No ☐ N/A ☐
		description of the securing means (evidence of an intervention)	Yes☐ No ☐ N/A ☐
		software identification	Yes☐ No ☐ N/A ☐
		description how to check the actual software identification	Yes☐ No ☐ N/A ☐
	The software identification is:		
		clearly assigned to the metrologically significant software and functions	Yes☐ No ☐ N/A ☐
		provided by the device as documented	Yes☐ No ☐ N/A ☐
Personal computers, instruments with PC components, and other instruments, devices, modules, and elements with programmable or loadable metrologically significant software TYPE U (aka not built-for-purpose)			
	The *metrologically significant* software is:		
		documented with all relevant (see below for list of documents) information	Yes☐ No ☐ N/A ☐
		protected against accidental or intentional changes	Yes☐ No ☐ N/A ☐
	Evidence of intervention (such as, changes, uploads, circumvention) is available until the next verification/inspection (e.g., physical seal, Checksum, CRC, audit trail, etc. means of security)		Yes☐ No ☐ N/A ☐

Software with closed shell (no access to the operating system and/or programs possible for the user)			
	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 ☐
	Check whether the manufacturer has submitted a written declaration of the completeness of the set of commands		Yes☐ No ☐ N/A ☐
Operating system and/or program(s) accessible for the user:			
	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 W&M jurisdiction and type-specific parameters)		Yes☐ No ☐ N/A ☐
	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)		Yes☐ No ☐ N/A ☐
Software interface(s)			
	Verify the manufacturer has documented:		
		the program modules of the metrologically significant software are defined and separated	Yes☐ No ☐ N/A ☐
		the protective software interface itself is part of the metrologically significant software	Yes☐ No ☐ N/A ☐
		the *functions* of the metrologically significant software that can be accessed via the protective software interface	Yes☐ No ☐ N/A ☐
		the *parameters* that may be exchanged via the protective software interface are defined	Yes☐ No ☐ N/A ☐
		the description of the functions and parameters are conclusive and complete	Yes☐ No ☐ N/A ☐
		there are software interface instructions for the third party (external) application programmer	Yes☐ No ☐ N/A ☐

Discussion: It was pointed out that the draft checklist should have been distributed to manufacturers rather than NTEP labs. The checklist relates to information that the manufacturer might be asked to submit to the NTEP lab with a new application for evaluation. Grain Analyzer Sector members were asked to see what might be involved in supplying the requested information. There was no further discussion of this item.

4.e Software Maintenance and Reconfiguration

Background: The Software Sector has followed the lead of OIML in defining two procedures used to check software updates for authenticity and integrity and has agreed upon the following language:

> **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.

The Software Sector has worked on language for defining the requirements for a traced update. Their draft specifies, "For a traced update, an event logger is required . . .." The draft goes on to say that the use of a Category 3 audit trail is acceptable for the software update logger. The requirements the Software Sector has proposed for Category 3 audit trails are quite similar to the requirements for Category 3 audit trails in the GMM and NIR sections of HB 44 and Publication 14.

The Software Sector also proposed the addition of new text to the General Code section of HB 44:

> **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.

The NTEP Administrator was of the opinion that the proposed G-S.9. was unnecessary, because G-S.8. already requires that any changes that affect metrological function are sealable. The Software Sector felt that the explicit language proposed for G-S.9. is clearer than any implied requirement in G-S.8. The Software Sector decided to ask for clarification/interpretation from the S&T Committee.

Discussion: OIML D 31:2008 (E) includes flow charts illustrating the implementation of traced and verified updates (reproduced at the end of this agenda item). The Sector questioned the need for a definition of traced update. The traced update was probably intended to cover cases in Europe where the National Body controls a network of devices and wants to update all the devices simultaneously from a central location. Denmark and France do this with NIR Grain Analyzers. It is unlikely that a traced update would be used in the United States for Gain Analyzers that fall under state W&M jurisdiction. Verification would still be required by state inspectors.

Mr. Ole Rasmussen, Foss North America, commented on the OIML diagram for traced update, comparing it to the situation where a device in the field has calibrations and much of the device's specific information on a memory stick. It is possible to go to the company's website, download all the necessary new calibrations and information on the memory stick, and plug it back into the device. The downloaded information is serial number specific for that device. The user license is checked, and all the information is checked for integrity and authenticity. Because there is no person at place to verify it he believed that this is essentially a traced update.

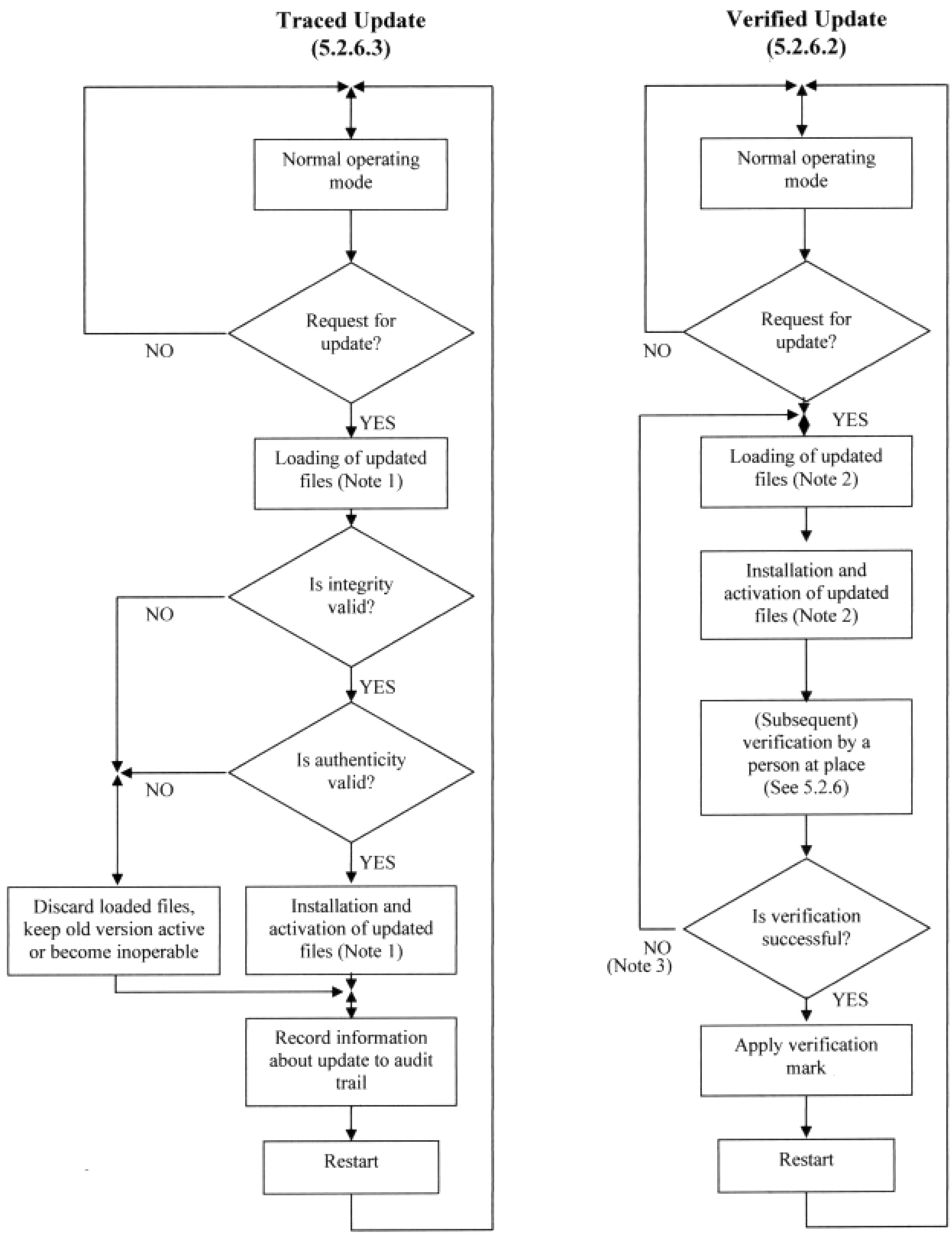
When asked whether information about the update was recorded to the audit trail, Mr. Rasmussen explained that it depended on how that was defined. The information is all on the server. That could be called an audit trail; it just does not reside on the device.

The Sector Co-Technical Advisor maintained that this example involves a Type P device, and that this update falls under the category of a verified update the same as if software was being downloaded (whether over a high-speed data link, a thumb drive, or from a local or remote PC, etc.), and, therefore, would have to meet the security requirements for a Type P device. It would be up to the local authority to verify that the downloaded version of software agrees with what's on the CC.

Dr. Pierce added that in this case, the user has no control over the process as he is simply moving the memory stick from the computer to the instrument. This says,in essence, that the manufacturer is installing the updates.

Verification is defined as a procedure, other than type approval, that includes the examination and marking and/or issuing of a verification certificate that ascertains and confirms that the measuring instrument complies with the statutory requirements. This means that the local authority (the state) confirms that the device meets the applicable requirements of HB44 and conforms to the CC.

In the OIML flow chart for verified update, the three boxes titled: "(Subsequent) verification by a person at place"; "Is verification successful?"; and "Apply verification mark" are decisions/operations that would be made by state W&M personnel.


Traced Update
(5.2.6.3)
Normal operating mode
Request for update?
NO
YES
Loading of updated files (Note 1)
Is integrity valid?
NO
YES
Is authenticity valid?
NO
YES
Discard loaded files, keep old version active or become inoperable
Installation and activation of updated files (Note 1)
Record information about update to audit trail
Restart
Verified Update
(5.2.6.2)
Normal operating mode
Request for update?
NO
YES
Loading of updated files (Note 2)
Installation and activation of updated files (Note 2)
(Subsequent) verification by a person at place (See 5.2.6)
Is verification successful?
NO
(Note 3)
YES
Apply verification mark
Restart

Software Update Procedure – from OIML D 31:2008 (E)

Notes:

(1) In the case of a Traced Update updating is separated into two steps: “loading” and “installing/activating.” This implies that the software is temporarily stored after loading without being activated because it must be possible to discard the loaded software and revert to the old version, if the checks fail.

(2) In the case of a Verified Update, the software may also be loaded and temporarily stored before installation but, depending on the technical solution, loading and installation may also be accomplished in one step.

(3) Here, only failure of the verification due to the software update is considered. Failure due to other reasons does not require re-loading and re-installing of the software symbolized by the NO-branch.

5. Report on New GIPSA/NIST Interagency Agreement for 2010 – 2014

The present five year Interagency Agreement that provides funding for the Grain Moisture Meter On-going Calibration Program (OCP) expires at the end of the Federal Government’s Fiscal Year 2009 (September 30, 2009). Under the proposed terms of the new agreement NIST and GIPSA each contribute one-third the cost of the program subject to an annual maximum of $30,000 each. The balance of costs is borne by manufacturers and is dependent on the number of meter models in the NTEP pool according to a fee schedule (see table below). Ms. Diane Lee, NIST/WMD, reported that NIST’s legal office has been reviewing the Interagency Agreement. She anticipated receiving their approval by early 2010 after which the Agreement would be forwarded to GIPSA for the appropriate signatures.

Dr. Rich Pierce, GIPSA, indicated that the fee schedule remains as shown in the table below. It appears that five meters will be in the plan at a cost to each manufacturer of $6000 per meter type, per year. If another meter type increases the number of meters to six, the cost to each manufacturer will increase to $8750 per meter type per year.

Explanation of columns in the Fee Schedule table:

Column	**Explanation (or formula for calculating)**
(1) Total Meters	The number of meter types (including the Official GIPSA meter) that will share in the NTEP calibration costs.
(2) Total Meters in NTEP Pool	The number of meter types other than the Official meter that will share in the NTEP calibration costs.
(3) Cost per Pool Meter	The cost associated with each pool meter in the program.
(4) Total Program Cost	A per meter type cost of $22,500 times the number of NTEP "pool" meters.
(5) NIST Contribution	One-third the total program cost up to a maximum of $30,000.
(6) GIPSA Contribution	One-third the total program cost up to a maximum of $30,000.
(7) Manufacturers Contributions (total funding from manufacturers)	Total Program Cost minus NIST Contribution minus GIPSA Contribution.
(8) Cost per Meter Type	Manufacturers' Contributions divided by Total Meters (including the Official meter).

Proposed NTEP On-going Calibration Program Fee Schedule For Year 2010 to 2014							
(1) TotalMeters (includingofficial meter)	(2) Meters In NTEP Pool	(3) Cost Per Pool Meter	(4) TotalProgram Cost	Funding Contribution From Participants			
				(5) NIST	(6) GIPSA	(7) Mfg's (total funding from mfg's)	(8) Cost Per Meter Type
2	1	22,500	22,500	7,500	7,500	7,500	3,750
3	2	22,500	45,000	15,000	15,000	15,000	5,000
4	3	22,500	67,500	22,500	22,500	22,500	5,625
5	4	22,500	90,000	30,000	30,000	30,000	6,000
6	5	22,500	112,500	30,000	30,000	52,500	8,750
7	6	22,500	135,000	30,000	30,000	75,000	10,715
8	7	22,500	157,500	30,000	30,000	97,500	12,185
9	8	22,500	180,000	30,000	30,000	120,000	13,335

6. Report on OIML TC 17/SC 1 R 59 "Moisture Meters for Cereal Grains and Oilseeds"

Background: This item was included on the Sector's agenda to provide a summary of the activities of OIML TC 17/SC 1. In October 2008, the Secretariat of TC 17/SC 1 was jointly allocated to China and the United States. The Co-Secretariats (China and the United States) are working closely with an IWG to revise OIML R 59 "Moisture meters for cereal grains and oilseeds." The 5 CD of **OIML R 59**, revised to comply with OIML's Guide ***Format for OIML Recommendations*** and to incorporate tests for the recommended disturbances of **OIML D 11** ***General Requirements for Electronic Measuring Instruments,*** was distributed to the U.S. National Working Group (USNWG) in March 2009 with a request for comments by May 21, 2009. The changes to R 59 5 CD are summarized below:

- Extensive reformatting to comply with OIML's Guide ***Format for OIML Recommendations***, OIML B 6-2, ***Directives for Technical Work –*** *Part 2*, and the April 2008 OIML Secretariat training.
- Changes to address the comments received to 4 CD.
- Changes to the MPE tables.
- Added requirements for software.
- Added OIML D11 tests.
- Added test report section - B.
- Added new Section 3, Description of instruments.
- Added definitions.
- Revised the bibliography section.
- Explanatory notes includes a history of the TC 17/SC 1 meetings and committee draft revisions.
- Added cross reference table of OIML R 59 5 CD and OIML ***Directives for Technical Work***
- Added cross reference table of OIML R 59 5 CD and OIML D 11

Discussion: Ms. Diane Lee, NIST/WMD, reported that she had received approximately 170 comments from 10 countries. The next version, R 59 CD 6, will be sent out for a vote. She asked the Sector to discuss the OIML D 11 tests that are included in R 59, and if some of the tests are not appropriate for moisture meters, provide technical reason as to why they should not be included. She explained that this may be the last opportunity to provide comments, because the next step for this draft recommendation will be voting for its acceptance as an approved OIML Recommendation. Special attention should be paid to the .disturbance tests from OIML D 11.

The following table lists the tests in question and shows where their test procedures are located in 5 CD of R 59.

Immunity tests of IEC 61326 and/or Recommended Disturbances in OIML D 11	**Test Procedure Section (As appropriate, severity levels are included in test procedures, Annex A)**
Sand and Dust	A.4.1
Short time power reduction	A.4.2
Bursts	A.4.3
Radiated radiofrequency, electromagnetic susceptibility	A.4.4
Conducted radiofrequency fields	A.4.5
Electrostatic discharges	A.4.6
Mechanical shock	A.4.7

Ms. Cassie Eigenmann, DICKEY-john Corporation, expressed concern over the inclusion of the sand and dust test. She was of the opinion that grain moisture meters (GMMs) are not located in areas subject to the sand and dust concentrations that they would be exposed to under the conditions described in D 11, citing paragraph **8.2.4 Sand and Dust** from OIML D 11:

> This test is mainly applicable for instruments or parts of instruments typically being used in dusty warehouses and in the building industry (for instance production of concrete) or, in some climatic regions, in the open air. Therefore, it is advised to prescribe test 10.5 in the relevant Recommendation only for those measuring instruments that can be expected to be typically used under sandy/dusty conditions (refer to 4.4).

(Note: **D 11 4.4** shown below for reference)

> **4.4** Some of the tests described in this Document may be relevant only for specific kinds of instruments. Therefore, a test should be included for a particular kind of instrument only if that instrument is likely to be significantly influenced by the test, under the instrument's specified operating conditions.

The Sector's Co-Technical Advisor noted that D 11 gives only a vague description of how the test is to be performed: A brief description of the test in D 11 Section 10.5 states:

> The test consists of exposure to cyclic temperature variation between 30 °C and 65 °C, maintaining the following conditions:
> - Relative humidity: less than 25 %
> - Air velocity: 3 m/s
> - Particle concentration: 5 g/m^3
> - Composition of the particles: as specified in 3.2.1 of IEC 60512-11-8 [17]

He questioned the severity of the test with regard to the concentration of 5 grams per cubic meter.

Mr. Dave Krejci, Grain Elevator & Processing Society (GEAPS), remarked that 5 grams per cubic meter seems excessively dusty, and that he couldn't imagine people operating a meter in those conditions without wearing a respirator. Table Z-1, Limits for Air Contaminants, in OSHA Regulation 29CFR1910-1000 originally set grain dust limits of no more than 10 milligrams per cubic meter for wheat, barley, and oats grain dust and 15 milligrams per cubic meter for other grains. Those limits were set aside by a court challenge, because they were based on limits established by the American Conference of Governmental Industrial Hygienists (ACGIH) without sufficient scientific basis. Table Z-1 in the current issue of 29CFR1910-1000 lists a limit of 10 milligrams per cubic meter for particulates not otherwise regulated (PNOR). Grain dust falls under that category. He believed that an argument could be made that people operating GMMs are not wearing respirators so the instruments are not being exposed to dust concentrations anywhere near 5 grams per cubic meter.

In addition, he pointed out that if a GMM was expected to operate in an atmosphere of 5 grams per cubic meter, it would be required to have a dust-tight or weather-tight enclosure. There is nothing in R 59 requiring a dust-tight or weather-tight enclosure, so it seems illogical to require a sand and dust test. In the United States, if a GMM was being operated in the sand and dust environment tested for, it would be a violation of the electrical codes for hazardous locations unless the enclosure was a NEMA9 or the GMM was intrinsically safe (which they are not).

One Sector member asked if a case could be made for retaining the sand and dust test on the basis of accelerated testing for an operating environment with a low level of dust (below 10 mg/m^3) that is allowed to accumulate over a long period of time. Sector members were quick to respond that there are user requirements that specify that instruments are to be maintained in good working condition, so there should be no large accumulation. Others also pointed out that user manuals typically specify the installation conditions such as, “Avoid a hazardous (classified) location as defined in Article 500 of the NFPA Handbook of the National Electrical Code,” and “Choose a clean environment …”

The Sector agreed that A.4.1 sand and dust should be removed from R59.

Dr. Rich Pierce, GIPSA (the NTEP Participating Laboratory for Grain Analyzers), took issue with the D 11 tests as they had been incorporated in R 59 5 CD. It was his opinion that they are too vague, and do not give sufficient details (e.g., what grains are to be used, how many drops, initial conditions, whether the instrument was turned on or turned off, etc.) When D11 tests are incorporated in specific Recommendations, these additional details have to be specified. This detail is needed to assure that when a device is tested in country “B it’s done the same way it was done in country “A.”

The Co-technical Advisor called the Sector’s attention to several other shortcomings to 5 CD:

> **A.4.4 Radiated radio-frequency electromagnetic fields** – R 59 should also specify wiring to and from the GMM from any and all ports. The paragraph:
>
> The equipment under test is subjected to 20 discrete frequency bands of electromagnetic radiation in the frequency range 26 MHz to 1000 MHz, at a field strength of either 10 V/m (for electromagnetic environment E1) or 10 V/m (for electromagnetic environment E2) appears to be in conflict with the previously described tests.
>
> **A.4.5 Conducted radio-frequency fields** – This item is missing from Annex B. R 59 should also specify wiring to and from the GMM for any and all ports.
>
> Need to add:
> The difference between the intrinsic error and the error (of indication) measured while the EUT is subjected to conducted radio-frequency fields, at the same reference conditions, shall not exceed the maximum permissible error in the specified operating range (or significant faults are detected and acted upon by means of a checking facility).
>
> **A.4.7 Mechanical shock** – This item is missing from Annex B.
>
> Need to add:
> The difference between the intrinsic error and the error (of indication) measured after the EUT is subjected to mechanical shock, at the same reference conditions, shall not exceed the maximum

permissible error in the specified operating range (or significant faults are detected and acted upon by means of a checking facility).

Conclusions/Summary: The Sector agreed that A.4.1 sand and dust should be removed from R 59. The sand and dust concentration specified for that test far exceeds the acceptable level of particulate concentration for human health unless an approved respirator (or OSHA approved dust mask) is worn, and it is known that GMM operators do not wear respirators. [References: Table Z-1 Limits for Air Contaminants for PNOR in OSHA Regulation 29CFR1910-1000.]

The Sector is also concerned that the present wording of the new tests in Annex A is too vague. They are not detailed enough to specify which grains are to be used. Is it necessary to use all grains for this test? Can a single grain be used? Can another grain be substituted? From what moisture range should the test samples be selected? Do you drop the sample one time through the instrument or multiple times? If multiple times, can you average the results? If you have to repeat the tests under several different conditions (as at maybe 20 or more different frequencies), is the same grain sample going to be used for each frequency? By the time D 11 requirements come into a Recommendation, the test procedures should be very specific.

The corrections/additions to **A.4.4**, **A.4.5**, and **A.4.7** detailed above, should be incorporated. **Annex B** should be edited to include references to A.4.5 and A.4.7.

The Sector is of the opinion that CD 5 as it exists today is not ready for a final vote.

7. Report on OIML TC17/SC8 Draft IR "Protein Measuring Instruments for Cereal Grain"

Background: This item was included on the Sector's agenda to provide a summary of the activities of OIML TC 17/SC 8. A new subcommittee has been formed to study the issues and write a working draft document "Measuring instruments for protein determination in grains." Australia is the Secretariat for this new subcommittee. A TC 17/SC 8 meeting was hosted by NIST in September 2007 to discuss the 2 CD. Discussions on 2 CD dealt mostly with maximum permissible errors (MPEs) and harmonization of the TC 17/SC 8 Recommendation for protein with the TC 17/SC 1 Recommendation for moisture.

Discussion: Ms. Diane Lee reported that she had not received an updated draft Protein Recommendation from Australian Secretariat, Dr. Grahame Harvey, so she was not sure what the status is concerning the Protein Recommendation. It has been difficult to follow the version and revisions to the protein document because the United States has not received regular updates or lists of comments to the revisions.

Dr. Pierce commented that at the conclusion of the joint meeting of SC 1 and SC 8 in October 2007, the two respective documents were closely aligned. However, the 5 CD of R 59 does not look anything like the version of R 59 that came out of the meeting in October 2007. He speculated that SC 8 was waiting to see what SC 1 comes up with before they come out with another draft.

8. Air-Oven Collaborative Study

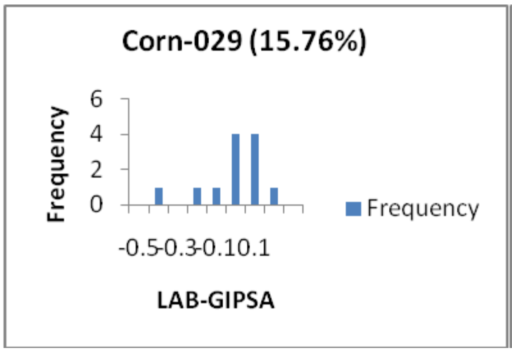
Background: NIST-WMD's laboratory measurement traceability program requires that laboratories participate in interlaboratory and other collaborative experiments. A structured collaborative air oven study was last conducted following the 2000 harvest. Results of that study were reported at the Sector's August 2001 meeting. At its August 2008 meeting, the Sector agreed that a collaborative study was long overdue. It was also noted that such a study addresses the measurement traceability requirements of **ISO 17025** ***General requirements for the competence of testing and calibration laboratories***. Mr. Karl Cunningham, Illinois, subsequently agreed that the State of Illinois Moisture Meter Laboratory would serve as the pivot laboratory.

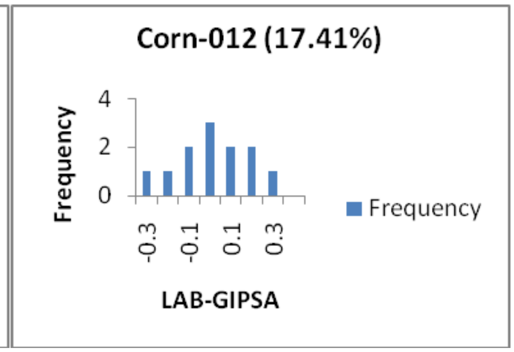
Discussion: Mr. Karl Cunningham reported that 14 laboratories participated in this study. Participants included: USDA/GIPSA (as reference laboratory), Arkansas, Colorado, Illinois, Iowa, Maryland, Mississippi, Missouri, North Carolina, South Carolina, Wisconsin (corn only), Wyoming, and DICKEY-john. Perten was sent samples but did not return results. With the exception of one or two outliers, results were fairly good. The histograms below show the distribution of lab error (participant lab result minus reference lab result) for each of the grain samples. A more detailed analysis of results will be distributed at a later date.

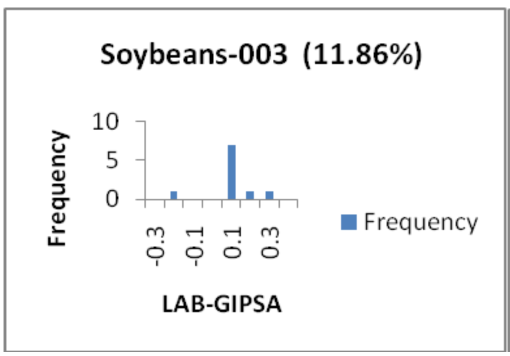
The Sector agreed that when detailed results are distributed, participants should not be identified by name (except for USDA/GIPSA.) Individual participants will be told which laboratory number they were assigned (e.g., you are lab #4.)

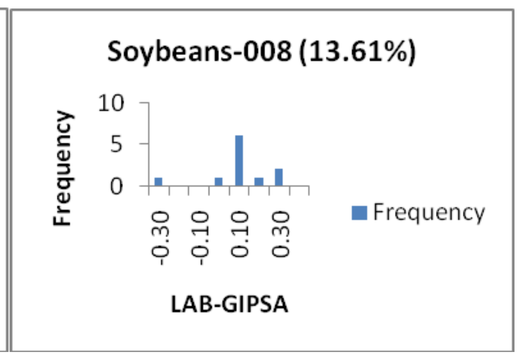
In response to the question if a collaborative air oven study was something that should be scheduled to happen on a regular basis, Mr. Cunningham suggested that every two years might be appropriate.

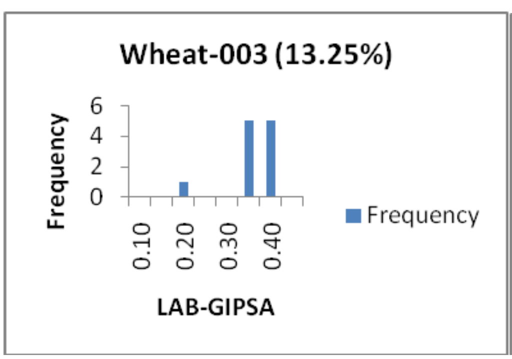
Dr. Hurburgh, Iowa State University, urged the representatives from the American Oil Chemists Society (AOCS) to prepare a proposal so that the collaborative study could be conducted on an on-going basis rather than on an ad hoc basis. He cautioned that the proposal would have to include corn and wheat, as well as soybeans.

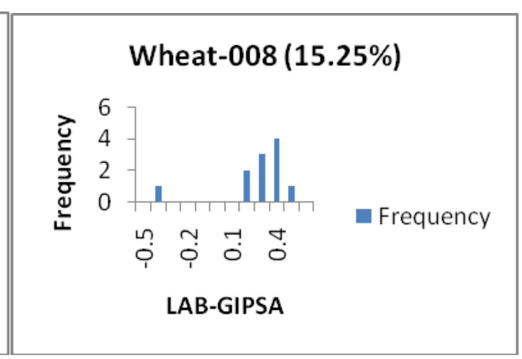












9. Item 310-1: G-S.8. Provision for Sealing Electronic Adjustable Components, G-S.8.1. Access to Calibration and Configuration Adjustments, and G-S.8.2. Automatic or Semi-automatic Calibration Mechanism

Background: At its 2007 Annual Meeting, the SWMA received a proposal to add requirements to G-S.8. to assure that a device could not be sealed in the configuration mode and continue to operate normally. Such a condition could facilitate fraud. The proposal, as submitted, required that a device continuously indicate when access to the set-up mode was not disabled.

At the 2008 Interim Meeting, the S&T Committee reviewed comments received during the open hearing and discussed alternate proposals provided by WMD and SMA. At the 2008 Annual Meeting, the WMD suggested that the S&T Committee amend the recommendation to address some of the concerns noted by the CWMA, NTEP participating laboratories, and WMD since the 2008 Interim Meeting.

During the open hearings at the 2009 Interim Meeting, WMD stated that it had received comments questioning how the application of a physical seal, as recommended by the manufacturer and listed on the CC, ensures that the calibration and configuration modes are disabled. What does that presence of the physical seal, pressure sensitive or lock and wire, due to the device that disables the calibration and configuration modes?

The S&T Committee agreed with the comments that the proposal ***is not ready*** to become a Voting item and suggested that further development to the proposal addresses the following concerns:

1. Avoid language that allows the indication of usable metrological values while in the adjustment mode for devices that do not have an event logger.

2. Recognize that more than one method of sealing is acceptable on a single device, such as using a lock and wire seal, for the mechanical adjustments and an audit trail for electronic adjustments.

3. Recognize that other codes in HB 44 do not have language for device categories and corresponding methods of sealing.

4. Require an obvious indication when a device is being adjusted if it is provided with a physical security seal.

5. Clarify that the application of a physical security seal to a specially designed and sealable plate or cover that disables external access to the configuration and adjustment mode is not the only method to seal adjustable components.

Consequently, the S&T Committee recommended that this item remain Informational.

After the 2009 Interim Meeting, the NIST Technical Advisor developed the following language for further development by the regional weights and measures associations, NTETC sectors, and other interested parties with the intent that a revised proposal can be forwarded to the S&T Committee for consideration at the 2010 NCWM Interim Meeting.

> ***G-S.8. Provision for Sealing Electronic Adjustable Components.*** *– A device shall be designed with provision(s) for**:** **~~applying a security seal that must be broken, or for using other approved means of providing security (e.g., data change audit trail available at the time of inspection), before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism.~~***
>
> > ***(a) applying a physical security seal that must be broken, or***

(b) ***using other approved means of providing security (e.g., data change audit trail available at the time of inspection)***

before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism.
[Nonretroactive as of January 1, 1990]

(Amended 201X)

A device may be fitted with an automatic or a semi-automatic calibration mechanism. This mechanism shall be incorporated inside the device. After sealing, neither the mechanism nor the calibration process shall facilitate fraud.

(Added 1985) (Amended 1989 and 1993)

***G-S.8.1. Multiple Weighing or Measuring Elements that Share a Common Provision for Sealing.* - (Unchanged)**

G-S.8.2. Multiple Sealing Methods. – Weighing and measuring devices may be approved for use with multiple methods for sealing adjustable components such as physical seals for calibration adjustment (e.g., load cells, meters, etc.) and event counters or event logger for the configuration parameters (e.g., capacity, interval size, octane blend settings, etc.).
[Nonretroactive as of January 1, 201X]

(Added 201X)

G S.8.3. Adjustment Mode Indications. – During the calibration and configuration adjustment mode, the device shall:

(a) ***Not provide metrological indications that can be interpreted, or transmitted into memory, or printed while it is in the calibration and/or configuration adjustment mode as a correct measurement value, or***

(b) ***Clearly and continuously indicate that it is in the calibration and/or configuration adjustment mode, and record such message if capable of printing in this mode.***

Nonretroactive as of January 1, 201X)

(Added 201X)

Discussion: The proposed changes to **G-S.8.** and the proposed language of **G-S.8.2.** do not appear to affect the provisions for sealing GMMs and NIR Grain Analyzers (see **HB 44, Section 5.56.(a)**, paragraph **S.2.5. Provision for Sealing** and **HB 44 Section 5.57**., paragraph **S.2.6. Provision for Sealing.)** The requirements of **G-S.8.3.**, however, may affect some instruments. This proposal stipulates that during any adjustment mode, the device must either not provide any metrological result that could be interpreted as a correct measurement, or must clearly and continuously indicate that it is in the adjustment mode.

In response to a request for feedback from manufacturers on the proposed changes and additions to **G-S.8.3**, Mr. Sean Bauer, Steinlite, described how the SL95 seals a switch that gives access to "adjustment mode". A wire seal must be broken to slide the switch to "adjustment mode" position. The device cannot be re-sealed without returning the switch to normal "operate" position. In "operate" position, the user cannot access "adjustment mode". Mr. Truex, NTEP Administrator, offered the opinion that this sort of arrangement sounded as if it would meet the requirements of option (a) of the proposal. He mentioned that some devices display CAL OPEN or CON OPEN continuously whenever the device is in adjustment mode to comply with option (b) of the proposal.

During a discussion of **G-S.8. Provision for Sealing Electronic Adjustable Components**, and use of a data change audit trail as a method of sealing, there was some concern that the two Grain Analyzer chapters of Publication 14 might contain wording that allows certain manufacturer/service company adjustments to be excluded from the audit trail. A cursory examination of Pub 14 did not reveal any obvious exclusions.

The Co-technical Advisor suggested that the GMM and NIR grain analyzer code of HB44 appears to cover the proposed changes to **G-S.8., G-S.8.2**, however, **Table S.2.5. Categories of Device and Methods of Sealing** in the GMM code may require some minor changes to expand the meaning of remote configuration capability to include the ability of the device to accept a new memory chip or to accept new parameters from anything plugged into a universal serial bus (USB) port or other port.

[Note the following definitions from **Appendix B - Philosophy for Sealing** in the GMM Chapter of Publication 14.]

Remote configuration capability.
The ability to adjust a weighing or measuring device or change its sealable parameters from or through some other device that is not itself necessary to the operation of the weighing or measuring device or is not a permanent part of that device.

Remote device.
A device that (1) is not required for the measurement operation of the primary device or computing the transaction information in one or more of the available operating modes for commercial measurements or (2) is not a permanent part of the primary device. In the context of this paper, a remote device has the ability to adjust another device or change its sealable configurable parameters.

The Sector decided to make this a carryover item for the next meeting so it could be studied in more depth.

9.5 Properly Standardized Reference Meters

[Submitted by Mr. Karl Cunningham, Illinois Department of Agriculture; received after the formal Agenda was published.]

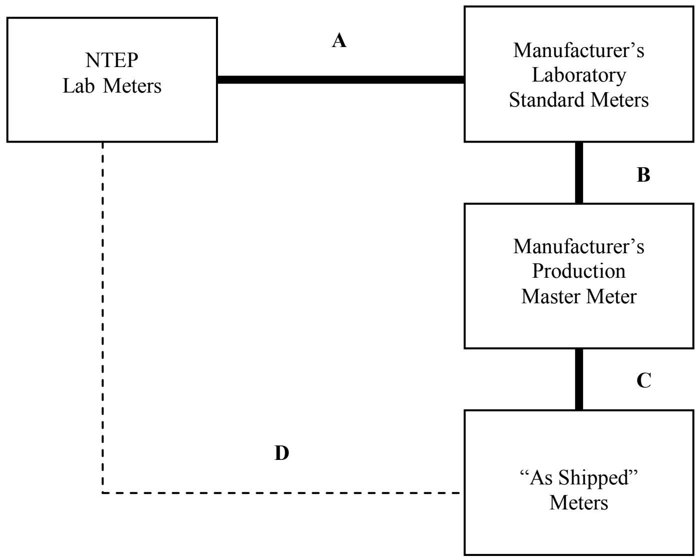
The State of Illinois is requesting a definition for properly standardized reference meter and what the requirements are to qualify a meter as such. As with all standards there must be traceability. What criteria must these reference meters" meet? Also, for non-NTEP meters the testing procedure allows for air-oven testing to be performed, not meter to like-meter testing. What suggestions does the sector have on traceability of grain standards?

Background and Discussion:
[Note: The Illinois Bureau of Weights and Measures licenses companies and individuals who sell, install, or repair commercially used weighing and measuring devices through the Registered Serviceperson Program. Before becoming licensed, servicepersons are examined on their proficiency and understanding of applicable regulations. Licenses must be renewed annually. A registered serviceperson in good standing may place a commercially used device into service and the device may be used in trade or commerce until a state test is performed. Anyone who sells, installs, services, reconditions, or repairs a commercially used weighing or measuring device must be registered with the Illinois Department of Agriculture. On the bureau's list of Registered Repair Companies, eight are classified as registered to service moisture meters. Two of these companies carry the note "Sell only." Whenever a GMM has been serviced **or has had updated grain calibrations installed**, the meter must be "returned to service" by a registered serviceperson before it can be used. It is still subject to later inspection by Illinois Weights and Measures personnel.]

This item originated because the State of Illinois is concerned that some of its Registered Service Companies do not have the required procedures or equipment to comply with Handbook 44 test requirements when placing meters back into service.

For NTEP meters HB 44 permits meter to like-meter testing using "properly standardized reference meters …." Mr. Cunningham asked, "What is the definition of a properly standardized reference meter? How are they maintaining these standardized reference meters to know that they are operating properly and accurately?"

He was referred to **Section VI. Standardization of Instruments** in the GMM chapter of Publication 14 that shows the relationship and maximum permissible errors between the NTEP Lab meters, Manufacturer's Laboratory Standard Meters, Manufacturer's Production Master Meter, and "As Shipped" meters. It was explained that a properly standardized reference meter for a Service Company should have the same traceability to the NTEP Lab Meters as the Manufacturer's Production Master Meter has.



Ms. Eigenmann explained how DICKEY-john checks and maintains the traceability required by Publication 14. DICKEY-john has three Laboratory Standard Meters that never leave the moisture laboratory. In the factory they have production line standards corresponding to the "Manufacturer's Production Master Meter shown in the above diagram. Once a month the production line standards are brought into the laboratory and checked against the three lab instruments. Six drops of grain are run though each of the four meters. This is done in a sequence that minimizes the effect of any moisture loss in the grain being used. Averages and standard deviations are calculated, and several other comparison tests are performed. The mean moisture difference between the Laboratory Standard Meters and a Production Line Standard (path B in the diagram) must not exceed 0.08 % moisture. Similarly, remote service locations bring their working standards to the DICKEY-john moisture laboratory once a year for the same kind of checks that are given to production line standards.

It was pointed out that there was no way to standardize a non-NTEP meter to the NTEP Laboratory Standard Meters. This is why HB44 requires that grain samples with air-oven moisture values be used for testing non-NTEP meters. Mr. Cunningham was concerned that there were service agencies and manufacturer's dealers who were placing non-NTEP meters into service without using air-oven samples. He thought that this was going to be another issue for these service companies, because they were going to be required to have air-oven capability or to show how they can obtain air-oven samples for putting non-NTEP meters back into service.

Mr. Tom Runyon, Seedburo Equipment Company, expressed the opinion that it is not reasonable to expect some dealers working out of their home, especially those not doing any repair work, to have air-oven capabilities rather they only need a set of air-oven samples. Dr. Hurburgh suggested that Illinois could offer a service supplying state certified air-oven samples for use by a registered service company to verify that a meter meets the accuracy requirements of HB 44 when it places a meter back into service. The State could require the service company to use a monitor meter and maintain a log of initial moisture and results of periodic monitor meter checks, just as Illinois inspectors do.

10. Time and Place for Next Meeting

The next meeting is tentatively planned for Wednesday, August 25 and Thursday, August 26, 2010, at the Chase Suites by Woodfin at Kansas City International Airport in Kansas City, Missouri. Sector members are asked to hold these days open pending determination of agenda items, exact meeting times, and meeting duration. Final meeting details will be announced by early June 2010.

If you would like to submit an agenda item for the 2010 meeting, please contact any of the following persons by June 1, 2010.

Mr. Jim Truex, NTEP Administrator, jim.truex@ncwm.net
Ms. G. Diane Lee, NIST Technical Advisor, diane.lee@nist.gov
Mr. Jack Barber, Technical Advisor, barber.jw@comcast.net

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Appendix B

National Type Evaluation Technical Committee (NTETC) Measuring Sector

October 2 - 3, 2009, Clearwater, Florida Annual Meeting Summary

Appendices to Summary:

National Type Evaluation Technical Committee (NTEC)
Measuring Sector Annual Meeting
Meeting Summary

October 2 - 3, 2009
Clearwater, Florida

Chairman, Mr. Mike Keilty, Endress and Hauser, opened the meeting by welcoming participants and asking for introductions. Mr. Keilty also described the purpose of the Measuring Sector (hereafter referred to as the "Sector") and others contributed insights on how the Sector interacts with other committees in the National Conference on Weights and Measures (NCWM). Mr. Keilty also described procedures for commenting on issues during the meeting and indicated that, should an item be presented for an official "vote" during the meeting, only those listed on the "voting members" list provided by the NCWM will be recognized.

Accompanying this summary as "Appendix A" is a list of "Action Items" agreed to at the meeting.

Carry-over Items:

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

Source: Carryover Item – 2007 and 2008 Measuring Sector Agenda

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

Background: At its 2006 Annual Meeting, the Sector established a small work group (WG) tasked with developing proposed changes to the Product Families for Meters table in NCWM Pub 14 to help improve consistent application and ease of use of the table. In 2007, the Sector heard a progress report from the WG and considered a number of proposed revisions (see the 2007 meeting summary for details). The WG also noted additional work was needed to list the various liquids, describing their viscosity, specific gravity, and conductance.

At its 2008 meeting, the Sector was asked to consider another proposal from the WG, consisting of (1) a proposed table listing product families/groups along with typical product names and corresponding viscosities and specific gravities; and (2) a proposed revision to the product families table outlining test requirements for different meter types within each product family. The Sector also discussed the categorization of liquid CO_2 and the inclusion of milk and dairy products under separate agenda items.

After considerable review and discussion and on-screen editing of proposed variations of the table, the Sector reached a consensus on the format of the table, agreeing to divide the information into three tables: Table C.1. Tests to be Conducted (identifying tests to be conducted); Table C.2. Product Family Table (outlining product families broken down by meter technology and referencing tests from Table C.1.); and Table C.3. Typical Product Family Characteristics (listing typical products in each product family and the viscosity and specific gravity of each). At the end of the meeting, there was general agreement that the proposed revisions represent major improvements, while acknowledging that additional work was needed (see 2008 Sector Summary for additional details).

At the conclusion of the 2008 meeting, the Sector once again agreed that a consensus had been reached on the general revisions to the format, but that additional content changes are needed. Based on a reluctance to wait an additional year to implement the corrections already agreed upon, Sector members present agreed that additional revisions should be made and the Sector balloted. Following the 2008 meeting, Mr. Keilty prepared and distributed a ballot. The results of the vote indicated a lack of consensus for the additional changes proposed.

Recommendation: Based upon comments received as a result of the ballot and additional research on product characteristics, Sector Chairman Mr. Keilty developed a revised version of Policy C. Product Families for Meters (including revisions to the three "product family" tables) for consideration by the Sector in September 2009. This version was distributed as an attachment to the 2009 Sector Agenda (see Appendix B) and Sector members were asked to review the draft and consider it for inclusion in the 2010 edition of NCWM Pub 14.

Discussion: At the 2009 Sector Meeting, Mr. Keilty reviewed the history of the item and then described key features of the most recent version Policy C. Product Families for Meters that was included with the 2009 Agenda. Mr. Keilty noted that:

(1) Table C.1. (Tests to be Conducted) tests are identical to the current Pub 14;
(2) Table C.3. (Typical Product Family Characteristics) is an extraction of the products and their characteristics;
(3) There were some items that need to be addressed. For example, the Sector agreed to add "juices and beverages" to the table last year, but this didn't show up in Pub 14.
(4) In Table C.3., there was originally a question about the abbreviations for centipoises and the abbreviation now appears as "cP" with P capitalized because it is an abbreviation of a proper name.
(5) The breakout of the terms in the remainder of Table C.3. were taken from current version of Pub 14.
(6) References are closer to branded chemical names.
(7) Additional data in the agrichemicals area that people provided to Mr. Keilty are included.
(8) Additional information is still needed in defining "crop chemicals."
(9) Additional items need to be corrected, such as the addition of the "juices and beverages" categories.

Mr. Keilty suggested that the Sector begin its discussion of this item by first focusing on the format of the proposed table and then discussing its contents. Many positive comments were made regarding the format. Some questioned how to handle products that are not presently referenced in the table. Mr. Steve Patoray, Consultants on Certification, questioned the use of the term "normal liquids," noting its meaning is not clear.

Some questioned why different metering technologies are treated differently. For example, "normal liquids" for mass flow meters encompasses a much wider range of products than do other technologies. Mr. Keilty and Mr. Will Wotthlie, Maryland Weights and Measures, pointed out that for technologies new to the type evaluation program, more testing is required until data and NTEP experience with the technology illustrates expected performance for given product groupings. For example, when NTEP first began testing with turbine meters, the number of tests and flow rates were greater than for other technologies, which were more familiar to the NTEP program. As experience with turbine meters increased, NTEP broadened the coverage that could be obtained with a given test. An additional reason for the variation in how meter technologies are addressed in the table relates to how a given meter technology is affected by product characteristics. For example, changes in viscosity may affect one meter technology more than another meter technology. Others reiterated that the goal in establishing the "product family" table(s) was to minimize the amount of testing required by identifying groups of products which would give similar test results. For example, testing with one or two products from the group would illustrate performance similar to what would be expected for other products in the group.

Mr. Rich Miller, FMC Technologies, commented that the basic format and approach used in the table seems to have originated with PD meters; the Sector is trying to fit other meter technologies in to the same format without acknowledging that some of the criteria do not make sense for those technologies. He further commented that meter technology should not matter; the criteria should be based on performance and the criteria should be applied equally across all meter technologies. Mr. Rich Tucker, RL Tucker Consulting, observed that the "normal liquids" seem to be causing some confusion for people, noting that the term only appears to be significant for mass flow meters and perhaps clarifying that term might eliminate some of the concerns. He also observed that the current criteria have been in Pub 14 for years; the current effort is to attempt to make the table more manageable and, if there are concerns about the criteria, perhaps this needs to be worked on and brought back as a separate proposal. Sector Technical Advisor, Ms. Butcher (NIST Weights and Measures Division) noted that, since the format seems acceptable to many, footnotes regarding the application of the term "normal liquids" might be used as an interim measure to allow the current criteria to be more easily applied, and alternative proposals could be developed as a separate effort to address concerns about inconsistencies found in other sections of the current criteria. The Sector discussed the use of the term "normal liquids" at greater length without coming to any resolution on how to address its use.

In the course of discussing the criteria and format of the tables, several people suggested that a better approach might be to separate the tables by technology. Mr. Patoray and Mr. Henry Oppermann (Weights and Measures Consulting) both offered to develop alternative formats and presented them to the Sector on the second day of the meeting. Mr. Keilty and Ms. Butcher agreed to make modifications to the three proposed tables in an attempt to clarify the use of current terminology.

On October 3, Mr. Patoray and Mr. Oppermann each presented alternative versions of the table which they had developed for two different metering technologies. The Sector reviewed the alternative prepared by Mr. Patoray and the alternative prepared by Mr. Oppermann as well as modifications to the existing proposal prepared by Mr. Keilty and Ms. Butcher.

Comments indicated that most prefer the approach in which technologies are addressed in separate tables, though Mr. Miller expressed disappointment that technologies are broken into separate tables and treated differently. Mr. Mr. Wotthlie noted that the version prepared by Mr. Oppermann appears to be the easiest to use, also noting that the ascending order of the product by specific property values is more relevant to the metrologically significant factors. Participants noted that additional work is needed to further develop an alternative table that combines or includes this approach and format, and a small work group was formed for this purpose as described in the "Decision" below.

Decision: Of three alternative versions of the table presented to the Sector during its 2009 meeting, the approach in which technologies are addressed in separate tables was viewed as a more appropriate approach.

[Technical Advisor's Note: An example of this format is illustrated in Appendix C in a draft prepared by Mr. Oppermann and further revised and reformatted by Mr. Keilty. This work is still in progress and the draft in this appendix is provided only to illustrate the general format agreed upon.]

Mr. Keilty will continue to shepherd this work, coordinating with those who have expressed interest in this issue and welcoming additional input from other Sector members. Work will be done to integrate the separated technology proposal with that presented at the 2009 Sector meeting. This newly edited version will be circulated among Measuring Sector members and discussed with those members who are able to attend the January 2010 NCWM Interim Meeting. Based on any comments received, additional revisions may be made prior to presenting a revised draft to the Sector at the 2010 Sector meeting. The goal is to develop a version for inclusion in NCWM Pub 14 in which it is easy to understand which tests and procedures must be followed for type evaluation testing.

2. NTEP Checklist for Hydrocarbon Gas Vapor Meters in Sub-metering Applications

Source: NTEP Director

Purpose: California Division of Measurement Standards (CA DMS), working with members of industry, has updated a draft checklist for hydrocarbon gas vapor meters in sub-metering applications. This item is included on the Sector agenda to allow for an update on this work and to discuss further action required by the Sector.

Background: At its 2006 meeting, the Sector was asked by the NTEP Committee to consider and develop a checklist for residential hydrocarbon gas vapor meters. These devices will most likely be used for sub-metering. At that meeting, the Sector heard that several states had recently contacted NTEP regarding these devices. California already has type evaluation and certification of these devices in their state. The Sector was asked to review the procedures used by California (which were included as Appendix D of the 2006 meeting agenda) and rework them into a format acceptable for NCWM Pub 14. The Sector agreed at that time that the best approach for developing a Pub 14 checklist for Liquid Petroleum Gas (LPG) vapor meters would be the utilization of a WG made up of technical experts and other interested parties. Mr. Dan Reiswig (CA DMS), was to provide a list of vapor meter manufacturers to be contacted for participation in the WG.

At its 2007 meeting, the Sector reviewed a draft presented by the California NTEP laboratory and agreed that the California NTEP laboratory and the NTEP director would continue to develop this checklist for presentation and discussion at the next Sector meeting.

At its 2008 meeting, the Sector, at the suggestion of the NTEP Measuring Laboratories, raised the question of whether or not there is interest in developing this checklist, particularly given the small number submitted for evaluation in the past and the availability of California's certificate as an alternative. Since the bulk of work remaining was in the reformatting of the checklist, the Sector agreed that the CA NTEP Laboratory will work to reformat the checklist into a Pub 14 format. Norman Ingram (CA Division of Measurement Standards, NTEP Laboratory) agreed to coordinate with Mr. Maurice Van Puten (meter manufacturer) and Jim Truex to work on this issue between now and the next Sector meeting.

A copy of a revised draft checklist was distributed to the Sector prior to its 2009 Meeting; a copy of the draft checklist is included in Appendix D to this summary. At its 2009 meeting, the Sector revisited the need to include a checklist for these devices in Pub 14. Mr. Oppermann, who noted he had experience testing these devices prior to his career at NIST, questioned the need for a separate checklist. Others questioned where they would fall in the product family table and what test criteria would apply. Mr. Reiswig noted that the meters recently tested are of a different technology than previously encountered. Mr. Keilty asked the Sector to consider the general question of whether or not the checklist is complete and ready to move forward and whether or not the checklist references anything that isn't currently referenced in NIST Handbook 44.

Decision: While some Sector members present at the meeting have tested these devices, there were no manufacturers of these devices present at the Sector meeting. The Sector heard no specific comments on the checklist and, hearing no real opposition, decided to forward the checklist to the NTEP Committee for their consideration.

The Sector agreed that Ms. Tina Butcher, NIST Technical Advisor, would forward the HydroCarbon (HC) Vapor Meter Checklist developed by CA to the NTEP Committee by November 1, 2009, for their consideration for inclusion in NCWM Pub 14.

3. Testing Meters Made of Different Materials

Source: California NTEP Laboratory – Carryover from 2007 Measuring Sector Agenda

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

Background: The Sector reviewed this issue at its 2007 and 2008 meetings, but was unable to reach a consensus on the item. The Meter Manufacturers Association had also prepared a white paper in which they noted that it is the manufacturer's responsibility to ensure that a meter meets type, noting the long history of meter compliance and also that NIST Handbook 44 is not intended to differentiate between measurement technologies, only the intended application. They also pointed out questions to be answered in order to make an informed decision on this issue include: (1) Is there a real world problem that requires a solution by inclusion of a new section in NCWM Pub 14 specifically aimed at materials?; and (2) Is there an inequity in the market or facilitation of fraud?

At its 2008 meeting, the Sector had extensive discussion over specific examples of meter sizes, product applications, and component materials. There were clearly divided opinions regarding how these combinations should be addressed. Manufacturers generally seemed to feel that component materials relative to the intended meter application are a design issue and should be left to the manufacturer to address, particularly since they will ultimately be responsible for ensuring that the meters work accurately and their customers are satisfied. Some NTEP laboratory representatives were comfortable with the idea of allowing the marketplace to take care of this issue, whereas others were not, particularly citing their feeling of responsibility in attesting to the accuracy of what is listed on a CC. However, it was clear that all laboratories felt the need for additional guidance in how to handle variations with regard to the amount of testing required and on how to handle listing materials information on the CC to ensure consistency among all of the laboratories.

The Sector was unable to reach any consensus on this issue; however, the Sector acknowledged that the issue is not going to be eliminated from the Sector's agenda. Criteria (whatever that may be) regarding how to address materials must be included in Pub 14, and guidance needs to be given to the NTEP Laboratories to ensure this issue is consistently addressed for all evaluations.

Recommendation: The Sector was asked to reconsider this issue and attempt to reach a resolution. The original proposal first considered at the Sector's 2006 meeting is included for reference along with an excerpt of the discussion from the Sector's 2008 discussion of this item.

Original Proposal from 2006 Sector Meeting:

The following proposal was offered as a possible solution. The Sector reviewed the proposal for possible forwarding to the NTEP Committee for inclusion in Publication 14.

Proposal: Add a new Section F. to the Publication 14 Technical Policy as follows and renumber subsequent sections:

U. Meters Made of Different Materials within the Same Family

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

Excerpt from Item 3 of the 2008 Measuring Sector Final Meeting Summary:

Discussion: Steve Patoray described (from his perspective as past NTEP Director) the scenario discussed at the 2006 and 2007 Sector meetings. He noted that materials used in devices are considered metrologically significant for weighing applications and questions were raised about whether or not materials are metrologically significant for metering applications. Some had suggested that using criteria similar to that used by Underwriters Laboratories might be considered. He indicated that many were uncomfortable with the concept of defining a "worst case" scenario for particular materials. He further noted that the question was raised of where to stop in the examination of device components: the body of the meter, or the seals, or other location? Manufacturers indicate that these questions are all part of the design process and inherent with assembling a device intended for a given application. Steve concluded his overview by noting that a key question is whether or not additional testing is needed based on variations in the materials used in the metering system and further commented that it is not likely that a field official will be able to determine these differences by visual examination. The inspector just needs to have confidence that the meter they are examining is covered by the CC. An overriding concern of NTEP is to ensure that the evaluation is fair and that the requirements are being applied consistently to all manufacturers. At present, NTEP has no guidance on how to handle these different scenarios.

Allen Katalinic (NC) commented that while changes to significant components of a meter will make a difference, there are many parts in a meter where changes will not have any metrological impact. Mike Frailer (MD) noted that a key difficulty on the part of the evaluator is in assessing how to consistently assess whether a given change is metrologically significant, and Jim Truex (NCWM NTEP Director) noted that this depends on how one defines "metrologically significant." Paul Glowacki (Murray Equipment) commented that Jim's point touches on the basic issue, which is how to define what changes can be made without reevaluation. A manufacturer may be confident that a change in material will not affect a meter's performance; however, an evaluator may not agree and may require re-evaluation. There have to be some guidelines because, at present, Paul feels as if every CC is a negotiation and what is applied to one company may be different than what is applied to another company. Tina Butcher (NIST WMD) commented that the technical policies in Publication 14 strive to minimize the amount of testing required for a manufacturer to list the maximum number of devices on a CC. She stated that, for the NTEP laboratories, key questions are: (1) whether the laboratories and NTEP management have adequate information to enable them to assess when additional testing is needed in order to list particular variations on the CC, and (2) how they can make that assessment consistently from manufacturer to manufacturer and from laboratory to laboratory. NTEP has developed experience with some basic types of changes to devices through trial and error and in consulting with manufacturers; the laboratories are asking for specific guidelines with regard to materials variation. Mike Keilty noted that manufacturers submit a sample(s) of a device in good faith and expect a rigorous evaluation; however, manufacturers are concerned that the amount of testing not be expanded beyond what is economically feasible.

Relaying discussions from the NTEP laboratory meeting prior to the Sector meeting, Jim Truex commented that the laboratories also have a dilemma in assessing how to avoid "horror stories" such as experiences with E85 while establishing reasonable guidelines. Jerry Butler (NC) also noted that, while many manufacturers such as those who have long participated in NTEP Sector meetings and evaluations are conscientious and laboratories may trust their judgment, laboratories are seeing an influx of equipment from sources (sometimes off shore) with which they have had little experience and whose manufacturers sometimes have little if any experience with legal metrology requirements, let alone U.S. requirements. This concern was echoed by other laboratories who also noted confidence in manufacturers participating in this discussion, but recognized that policies must be in place to ensure fair treatment. Several manufacturers commented that the industry will take care of substandard products produced by competitors by bringing such instances to NTEP's attention; reputable manufacturers cannot afford to allow substandard products to undercut the market when they themselves are expending the resources needed to comply.

The Sector also had some discussions about replacement parts and how these affect metrological integrity, with some members noting that field officials are unable to determine when non-metrologically equivalent or inferior components are used by visual examination. Several members commented that this is not something that can be prevented by increased evaluation at the type evaluation level, but is rather addressed by performance testing in initial and subsequent verification. In addition, the manufacturer is equally concerned about unauthorized substitutions since this can affect the reputation of their product. In that same vein, a manufacturer would not make a change in materials unless he is confident that the change would not affect the performance of the device in his customer's application. Rodney Cooper (Actaris) pointed out that reputable manufacturers police themselves to ensure their customer's continued confidence. Norm Ingram (CA) pointed out that manufacturers have designed these products and know from experience what will work, so perhaps the best approach is to allow them to make these changes and allow the marketplace to take care of itself. Norm did note, however, as did Dan Reiswig (CA), that even if the issue is tabled, the laboratories still need guidance on how to consistently approach proposed changes with regard to issuing CCs.

Dmitri Karimov (Liquid Controls) and others pointed out that NTEP has largely relied on the integrity of the manufacturer in reporting changes to devices and that, in many cases, NTEP or a field official would never be able to tell the difference. For example, if a rotor is changed, there is no reasonable way that weights and measures officials can determine that the clearances are different. In addition, NTEP has also relied primarily on the manufacturer to provide guidance on when a particular change is metrologically significant. With regard to material, the manufacturer's concern is in making sure that the materials are compatible with the product being measured in the application. Sector Chairman Mike Keilty (Endress and Hauser) questioned how conformity assessment might factor into this issue and contribute to resolving some of these questions.

Rich Tucker (RL Tucker Consulting) echoed an earlier comment by Norm Ingram, noting that most manufacturers change materials because of the products with which the meter will be used. When a manufacturer finds through experience that a particular change creates problems, manufacturers make adjustments accordingly to ensure continued performance. Rich even noted there were instances when NTEP passed a material in an evaluation and that material later proved to be problematic. The majority of the time materials issues will resolve themselves and most of the testing requirements imposed by the product families table are going to address any question about materials.

The Sector also discussed numerous examples of specific materials and their effect on metering of different product types; however, these discussions provided no insight on how to best address the materials issue. Steve Patoray reminded the Sector that its purpose is to advise the NTEP administrator, and Publication 14 will only be changed if the NTEP Committee agrees with the Sector's recommendations.

Will Wotthlie (MD) commented that the laboratories are putting their reputation on the line by issuing a CC and saying that it covers everything listed on the CC; the laboratories want to have confidence that the devices will work and field officials are, in turn, relying on that assurance. Will also questioned why NTEP is needed if the feeling is that everything in the field will take care of itself. Mike Keilty noted that a balance needs to be achieved between a system that can be practically executed and one that will still provide confidence; manufacturers are concerned about expanding testing beyond what is economically feasible.

Will Wotthlie suggested that an alternative is for the labs to simply list what is tested on the CC under the testing conditions section; however, some manufacturers indicated they want to continue to list materials of construction on the CC under the "Standard Features and Options" section. Jim Truex noted that a CC is not meant to be a marketing tool. Tina Butcher commented that, in its early days, NTEP decided that only metrologically significant things should be listed on the CC. If this position is to be maintained, then the Sector needs to decide whether or not to include the metals on the CC if all options are covered. If the Sector concludes that the material is not significant, then perhaps a statement needs to be included in Publication 14 to that effect. She also reminded the Sector that the laboratories are not only trying to assess whether or not a new variation in material can be covered on the CC, but also how to determine which of two meters to select for testing when they are made of different materials.

Some members, including NTEP laboratory representatives as well as manufacturers, stated that if the materials feature or attribute is not metrologically significant, it doesn't belong on the CC; the information can be listed in the test conditions, but not on the front of the CC under the "Standard Features and Options." Dmitri Karimov questioned why the information would be listed in the test conditions if it isn't metrologically significant. Others noted that this record of the test conditions may eliminate the need for additional testing should policies change at a later date. Jim Truex also pointed out that if the information is to be listed on the front of the CC, it will be necessary for the laboratory to determine the "worst case" scenario with regard to materials.

At present there is a great variation among existing CCs with regard to how materials are referenced. Steve Patoray noted that there are differences in how manufacturers request this information be reflected on their CCs; some want various model numbers listed, including different materials. Some believe that the only thing that should be listed on the CC is the product application for which the meter is approved, not the materials. Jerry Butler (NC) questioned why the manufacturers want to list all of these different products on the CC, commenting that it is up to the manufacturer and the customer to make sure the meter is right for the application. He further noted it would be helpful to have materials construction identified through the model designation.

Questions were raised by the manufacturers and laboratories about how CCs will be handled until the Sector can reach an agreement with regard to testing requirements for materials variations. Jim Truex reiterated that the purpose of a CC is not a marketing tool. Jim indicated that, as NTEP Director, he is not comfortable with listing all these different features unless the laboratory has tested them. Without taking a position on whether or not "materials" are considered a metrologically significant feature, Jim indicated that, for consistency purposes, NTEP will not list materials in the standard features and options; however, the information will be listed in the test conditions for the meter(s) tested during the NTEP evaluation(s). He noted this will be an administrative decision to ensure consistency. In response to a question about whether eliminating the reference to materials of construction in the "standard features and options" section would affect existing CCs that presently list this information, Jim stated that no changes would be made until the CC is being revised for other reasons.

After extensive debate on the first day of the meeting without resolution, the Sector returned to the discussion the following day with little additional progress. At that point, Mike Keilty noted that there are manufacturers who have product materials listed on their CCs and those who do not have the materials listed. He commented that, in establishing guidelines, the Sector has tended to draw a broad brush across metering technologies and, in many instances, treated them as the same even though people know they are not made the same way. Manufacturers generally make the materials of the meter to be compatible with the product to be measured and manufacturers may take different approaches in ensuring this compatibility. Andre Noel (Neptune) pointed out that some meters are made of different materials for different product applications, and the change in product necessitates an additional evaluation. Andre noted that a manufacturer can't make a meter out of bronze, for example, and use it to meter a caustic material because it will fail. Manufacturers take the product application and other application details into account when designing and choosing a meter for a given application and will relay this information to the customer with regard to where the meter can be used. Andre further noted that this becomes a question of liability for the manufacturer since the customer will hold the manufacturer accountable. Some members also made note that the materials may be more significant for some meter technologies than for others.

The NTEP laboratories are asking for guidance to ensure consistency, but the Sector seems to be at an impasse with regard to how to provide that guidance. The Sector was not able to agree upon and general guidance that would assist the laboratories in understanding material construction and its impact on device performance. The laboratories need to be comfortable that the testing they have conducted supports the variations listed on the CC. Dennis Beattie (Measurement Canada) observed that the issue seems to focus on the question of how the materials affect the definition of what constitutes a "family" of devices. He also pointed out in response to an example of a manufacturer choosing a lighter material for a vehicle-mounted than a stationary application that some materials such as aluminum respond differently to changes in temperature.

Discussion: At its 2009 Meeting, the Sector once again spent considerable time discussing this issue.

Mr. Dmitri Karimov (Liquid Controls) advised that a number of manufacturers present, met separately just prior to the second day of the Sector meeting to discuss this issue. He reported that most manufacturers felt that the issue should be dropped from the Sector's agenda.

Mr. Reiswig (CA) and Mr. Wotthlie (MD) commented that, if the item is dropped, then this would mean that the NTEP laboratories would test what is submitted and list the material on the NTEP Certificate under the test conditions. Mr. Miller, (FMC) clarified that listing the material on the NTEP CC was not the intent of the manufacturers' position. He stated that materials of construction should not be considered a metrological issue. He noted that the premise of the manufacturers' arguments in past discussions of this issue is that, if the meter is misapplied in the application, then the customer is going to come back to the manufacturer to resolve the problem. The manufacturers should be looked to as the experts since they are the designers of the meters and understand what must be done to ensure continued compliance in different applications. He also questioned whether the meter would pass the NTEP test to begin with if the materials weren't suitable for the application.

Mr. Jerry Butler (NC), pointed out that failures from improper material selection do not always arise in the limited space of time involved in an NTEP test. As stated by NTEP laboratories and others in previous discussions of this issue, Mr. Butler reminded the audience that NTEP evaluations include meters manufactured by companies who are not as conscientious as the manufacturers present at this meeting and who are not familiar with the process and requirements for legal-for-trade applications. It is largely with these manufacturers that the concerns lie and weights and measures officials rely on the NTEP laboratories for the credibility of the NTEP CCs. Mr. Rodney Cooper (Actaris) stated that the manufacturers believe that this should be up to the manufacturers to control. The Sector had similar discussions about companies that "clone" meters covered by existing NTEP CCs, but that don't use the same (appropriate) materials. Mr. Gordon Johnson (Gilbarco) noted that if manufacturers are competing with clones, they will go out of business.

Mr. Miller reiterated that a key point with this issue is that this is really a question of a misapplication of the meter. If the meter with the right materials is not selected for the application, then problems can arise. For example, if a meter with carbon steel bearings is selected to measure water and the meter eventually failed, it was a misapplication of the meter. It is not the meter design itself that is a problem, but rather the selection of the meter materials for that product application.

Mr. Patoray, (Consultants on Certification), pointed out that meter failure can also arise from other factors such as other influences or components in the system. Manufacturers will work to resolve the problem, but the problem is not always the meter or its materials. He reminded the Sector that this entire issue was raised because some manufacturers were advising NTEP of materials changes and were subjected to additional NTEP testing. Others made materials changes, but did not notify NTEP of the changes and were not subjected to additional NTEP testing.

This inconsistency led to the inclusion of this issue on the agenda. He also noted that the CCs should reflect a clear definition of type and that differences should be noted in some manner on the CC such as in the model designation.

Mr. Mike Frailer (MD) reiterated that the NTEP laboratories are looking for additional guidance to assist them in determining when a change is metrologically significant and would, therefore, require additional testing. Mr. Wotthlie pointed out that, if this item is dropped from the agenda entirely, the labs will revert to their previous approach of conducting additional testing when a materials change is made; this is not something that is desirable for the manufacturers.

Ms. Butcher (NIST) questioned whether, if the materials are changed based on the product application, wouldn't the NTEP laboratories have done testing with different materials when the tests were done for the different product applications. Couldn't this tie to the product family table? The manufacturers present indicated that testing of different materials by virtue of testing different product applications would generally be the case. Mr. Patoray noted that this is also a reason that there is concern about the product family table; that the current table was developed for a specific technology, positive displacement meters. Mr. Reiswig (CA) observed that he doesn't oppose changes to the product family table, particularly if it would help provide uniform information about the effect of material changes.

Mr. Wotthlie (MD) pointed out that the product family tables were actually further broken down several years ago based on an effort led by Ms. Charlene Numrych (LC) and involving other manufacturers. With regard to the materials issue, we can't seem to get all manufacturers to agree that materials are metrologically significant. Mr. Paul Glowacki (Murray Equipment) noted that the manufacturers were asked to identify what guidelines and criteria they could accept; however, the manufacturers may be going too far in one direction for the regulators' comfort. He noted that the manufacturers want clarity and also discussion about what defines "metrologically significant" rather than focusing only what is metrologically significant with regard to product families and materials.

Sector Chairman, Mr. Keilty (Endress and Hauser), questioned whether this issue should be dropped since it has been on the agenda for an extended period of time without resolution and no data has been provided to move the issue in any direction. Mr. Miller, (FMC), indicated that they are willing to provide data, but noted that eliminating product subcategories in the product family tables might eliminate some of the issues related to materials.

After discussing this issue at great length and examining various aspects of the points raised earlier in this discussion, the Sector concluded that this issue will not reach resolution by continuing to discuss it at the Sector meetings alone. They agreed that it would be better to form a small work group of interested parties who can focus their attention on trying to come up with a solution to this issue using the expertise available within the various metering technologies. Mr. Oppermann (Weights and Measures Consulting) pointed out that this topic is related to the product family topic in Agenda Item 1. The two topics should be discussed together since both are focused on trying to identify and define what constitutes metrologically significant factors.

Decision: The Sector agreed to form a work group, the "Metrologically Significant Characteristics of Technologies Work Group," to arrive at a uniform, appropriate, and clear approach for initial, subsequent, and additional tests for the performance of a device technology. The following people agreed to serve on the work group:

Chair:	Mr. Rodney Cooper
Co-Chair:	Mr. Rich Miller
Work Group Members:	Mr. Marc Buttler
	Mr. Paul Glowacki
	Mr. Mike Guidry
	Mr. Gordon Johnson
	Mr. Dmitri Karimov
	Mr. Henry Oppermann
	Mr. Steve Patoray
	Mr. Dan Reiswig

The work group was tasked to:

(1) Create a short list of features/options affecting the metrological characteristics of each device technology by December 15, 2009;
(2) Prepare a one-page analysis that briefly documents and provides the rationale for including each metrological characteristic in the list (referenced in task 1) by December 15, 2009;
(3) Review the first draft list of significant constituents and condense that list to only relevant characteristics;
(4) Prepare a final list for a work group meeting during the NCWM Interim Meeting by January 15, 2010.

Should revisions be needed prior to presenting an updated draft of Policy C. to the general Sector membership, the WG could potentially meet again at the July 2010 NCWM Annual Meeting in addition to completing additional work through electronic communication in the interim period.

4. Add Testing Criteria to NTEP Policy U "Evaluating electronic indicators submitted separate from a measuring element"

Source: California NTEP Lab

Purpose: Since 2007, work has been underway to develop a checklist to evaluate electronic indicators submitted separate from a measuring element. This item is included on the Sector agenda to allow for an update on this work and to discuss further action required by the Sector.

Background: At its 2007 meeting, the Sector heard that Section U of the NTEP Policy in NCWM Pub 14 allows for testing an indicator separate from a measuring element. However, specific test criteria had not been developed for this section. The Sector heard a recommendation to develop and add specific criteria for testing an indicator separate from a measuring element to this section. The California NTEP Laboratory recommended using Canada's test criteria as a guideline for developing the tests outlined in 2007 Sector Agenda Appendices A, B, and C.

The Sector agreed the California NTEP laboratory should lead a WG to develop a specific test procedure and ready the document for review at the 2008 Sector meeting. Members of the WG selected at the 2007 meeting were Mr. Dave Rajala (Veeder-Root Company), Mr. Miller (FMC Technologies), Mr. Maurice Forkert (Tuthill Transfer Systems), Mr. Karimov (Liquid Controls), Mr. Cooper (Actaris Neptune), and Mr. Ralph Richter (NIST WMD).

At the 2008 Sector meeting, Mr. Reiswig (CA DMS) reported that he had developed and circulated an initial draft of criteria for separate indicators and a lot of additional input was provided by manufacturers and Measurement Canada were significant contributors to the development of the draft (See the 2008 Sector Meeting Summary for details). Sector Chairman Mr. Keilty asked for a renewed commitment from the WG volunteers and asked if others were interested in participating. The WG made plans for additional meetings to further develop the draft.

A copy of the draft criteria to date was included as an attachment to the Sector's 2009 meeting agenda and appears as Appendix E to this summary.

Discussion: At the 2009 Sector meeting, Mr. Reiswig provided an update to the Sector on progress to develop criteria for separate electronic indicators. He reported that the draft checklist provided to the Sector follows the general format of Pub 14 and the main test procedures are at the end of the document. The procedure specifies tests for applying specific pulses over a range of temperatures and the procedure allows the laboratories to simulate the effects of changes in temperature. Mr. Reiswag noted that he has worked with Measurement Canada's type evaluation laboratory and has completely revised the document from the previous versions based on the collaborations with Canada. The current draft should be viewed as a starting point for the NTEP procedure.

Since the Canadian procedure and test criteria are well developed for testing indicators separately, some questioned the needed to undertake a major project to develop criteria for NTEP testing, suggesting that an agreement to accept Canadian test data be pursued instead. Others noted that the turnaround time for Canadian tests are about six to seven months and the NTEP process is much faster, so pursuing NTEP testing would be beneficial. The Sector discussed how arrangements between NTEP and Measurement Canada for accepting test data are designed to work.

Mr. Patoray, (Consultants on Certification and former NTEP Director) provided information and an explanation on how such arrangements generally work. In the case of a "one-way" agreement, where the Canadian test criteria are more stringent, testing is performed to the more stringent requirements and then the test data is forwarded to NTEP.

Questions were raised about the readiness of the checklist for inclusion in NCWM Pub 14. The Sector agreed that some additional work is needed and suggested that a small work group be formed to further develop the checklist. One additional question to consider is whether or not the checklist would apply to indicators across all technologies and applications.

Decision: The Sector agreed to the following.

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

Work Group Members:	Mr. Rodney Cooper (Actaris)
	Mr. Maurice Forkert (Tuthill Transfer Systems)
	Mr. Dmitri Karimov (Liquid Controls)
	Mr. Rich Miller (FMC Technologies)
	Mr. Dave Rajala (Veeder-Root)
	Mr. Ralph Richter (NIST WMD)
Checklist Developer:	Mr. Dan Reiswig (CA)

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

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

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

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

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

New Items:

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

Source: Mr. Johnson, Gilbarco, Inc.

Purpose: Underwriters Laboratories (UL) has modified the upper limit for oxygenates in oxygenated fuel blends specified in its standard UL87A Edition 5. A proposal has been submitted by the Sector to change a reference in the "Product Family" tables to correspond with the revised UL upper limit. This item is included on the Sector agenda to allow input and discussion by the Sector on the proposed change.

Background: Mr. Johnson (Gilbarco, Inc.) submitted information to the Sector regarding changes to the upper limit specified by UL on oxygenates in oxygenated fuel blends and proposed changes to NCWM Pub 14 to reflect those changes. Mr. Johnson noted that UL recently issued UL87A Edition 5. This standard details the tests and specifications needed to list dispensers for Ethanol and Ethanol blends. The 5th edition specifies three major gasoline fuel categories:

(a) Gasoline for Use as Automotive Spark-Ignition Engine Fuel, ANSI/ASTM D4806 (Up to E10) (Current)
(b) Gasoline/ethanol blends with nominal ethanol concentrations up to 25 % ethanol (E25) (NEW)
(c) Gasoline/ethanol blends with nominal ethanol concentrations above 25 % (E85) (Current)

When the EPA set the new ethanol limits, "standard gasoline" will include more ethanol. This affects all gasoline motor fuel dispensers currently in use. Typically the need to re-calibrate a dispenser's meter is seen when adding ethanol to the motor fuel. The ethanol acts as a solvent washing away gasoline varnish and the meter may shift its calibration point.

The following additional information regarding the fifth issue of UL's Outline Subject 87A is provided for the Sector's reference:

UL SUBJECT 87A
OUTLINE OF INVESTIGATION FOR POWER-OPERATED DISPENSING DEVICES FOR GASOLINE AND GASOLINE/ETHANOL BLENDS WITH NOMINAL ETHANOL CONCENTRATIONS UP TO 85 PERCENT (E0 – E85)
Issue Number: 5 AUGUST 10, 2009

Summary of Topics

This Fifth issue of Outline Subject 87A contains requirements pertaining to a new rating option. This new option will include an E25 rating along with the original E85 rating. This addition will allow for products to carry the lower rating when they are not intended for use with higher blends of gasoline/ethanol. New requirements have been added for blending options in dispensers. This required a new test, the Blending Cycling Test, which addresses the cycling of ethanol blends inherent in this type of use. Various editorial changes have also been included to address testing with one sample rather than two when evaluating for the E25 rating and other editorial changes have been made for clarification.

The Sector was asked to review NCWM Pub 14, Technical Policy C. Product Families for Meters, Note 4 in the product families table, which currently states:

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

(Note: This footnote appears in Table C.2. Product Family Test Table in the revised version of the Tables currently under consideration by the Sector in Agenda Item 1.)

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

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

Discussion: At the 2009 Sector meeting, Mr. Johnson (Gilbarco) outlined the history of this issue, noting that UL has made several significant changes to UL 87 (to include an alternative fuel standard) as a result of a push by EPA to coincide with a federal mandate to increase the levels of ethanol in vehicle fuel. The old standard for gasoline (15 % oxygenate) was revised this year to specify a 10 % limit. Mr. Johnson noted that the old standard of 15 % was not selected based on any equipment data. UL also revised the standard to create a third category which allows up to a 25 % blend. Mr. Johnson stated that his company is currently is recertifying its dispensers up to E85, 10 %, and 15 % and will mark the dispensers as such. He expressed concern regarding what will happen to existing dispensers when used for deliveries of 25 %. Previously, UL put out a statement that it was up to the local fire marshal accept the electrical system for use with 15 %. There is a program to buy back some 30-year old equipment. Some dispensers that are currently in use (standard pumps) were never UL rated or weights and measures approved for E85. Mr. Johnson stated that ethanol tends to wash out the sediment resulting in the dispenser giving away some product. He proposed changing the current reference in Pub 14 from 15 % standard to

25 %, noting that he has no data to illustrate the impact of the change. He indicated that both Gilbarco and Wayne are completing tests for E85, but no tests have been conducted for 25 %. There is not enough ethanol in production at the moment and he foresees a gradual increase in the amount of 25 % fuels. He is concerned that the limits will go above 15 % and if weights and measures apply the 15 % limit currently referenced in NTEP CCs, then all dispensers will be tagged and place out of service.

In its discussion of this issue prior to the 2009 Sector meeting, the NTEP Measuring Laboratories took the position that it is acceptable for a device to be used with product up to 15 % oxygenate with testing of only gasoline; however, for blends above this percent, the device must be retested with the higher percentage blends. Mr. Wotthlie (MD) noted concerns on the part of the labs that there is no data available to illustrate the impact on the dispenser's performance of the higher blends. Mr. Butler (NC) also commented that some in the room believe that higher blends should be considered an alcohol and that alcohol and gasoline are treated differently in the current product tables. Several lab representatives also commented that, if a supporting statement can be obtained from UL, EPA, and other relevant bodies to say there will not be a problem with the existing dispensers, they might be able to accept the 25 % limit.

Decision: After discussing this issue, the Sector was unable to reach agreement on the propose change. The Sector expressed its appreciation to Mr. Johnson for information regarding recent changes to the upper limit that Underwriters Laboratories (UL) has specified for levels of oxygenates in oxygenated fuel blends. The Sector agreed that this should remain an information item on the Sector's agenda.

6. Electronic Linearization for Positive Displacement Meters

Source: Mr. Maurice Forkert, Tuthill Transfer Systems

Purpose: The Sector received a proposal to establish more definitive criteria for electronic linearization internal to positive displacement meters. This item is included on the Sector's agenda to allow for review and discussion of proposed criteria.

Background/Recommendation: Mr. Forkert (Tuthill Transfer Systems) submitted a request for the Sector to consider adding criteria to NCWM Pub 14 for electronic linearization internal to positive displacement meters, noting that there is apparently no regulation for this feature. Mr. Forkert suggested considering Measurement Canada's "Approval Procedure for Linearization Functions Incorporated in Measuring Systems" (Document Number VO-AP-037) as the basis for the criteria, provided there is no objection by Measurement Canada or copyright violation by doing so.

A copy of Mr. Forkert's letter proposing this addition along with the Measurement Canada document was included as an attachment to the Sector's 2009 Agenda and is included in Appendix F to this Summary.

Mr. Forkert suggested the following revisions to the Measurement Canada document:

- **Section 1.2. Scope**

  Add paragraph to the "Scope" of the document as shown below. This paragraph would bring electronic output PD meters, turbine meters, etc. that do not have a shaft output on equal requirements as other meters that currently incorporate electronics in the measuring device.

  1.2 Scope

  This procedure applies to pulse processing electronic devices incorporating the linearization of the pulse per unit volume versus pulse frequency. This includes all flow computers, electronic registers, correction devices and supporting software external to the measuring device. The tests verify the proper functioning and accuracy of the linearization schemes.

For processing electronic devices incorporating the linearization of the pulse per unit that is within the measuring device, the results of the device accuracy and endurance tests will verify the complete measuring device capabilities. The linearization electronics of the measuring device must be protected from tampering and fraud utilizing a physical seal. No separate tests on parts of the measuring device are required.

- **2.1. Equipment Requirements.**

  This section needs to be reviewed by the work group developing criteria for electronics. When Tuthill tested their linearization board in Canada, they had problems because their Dual Channel Pulser "off" position of the pulse did not go close enough to zero volts. Tuthill furnished a dual channel pulser that goes down to within 0.2 volts in the "off" part of the pulse and then the Measurement Canada counters worked fine.

- **Section 2.5.1. and 2.5.3.**
  The word "devices" should be "EUT."

- **Section 2.6.2.1. and 2.6.2.3.**
  Do not limit "meter Factors" to 4 or 5 points. See proposed revisions to 2.6.2.5. below as a method to test all points for which the device is capable.

- **Section 2.6.2.5.**
  Delete runs number 2 through number 5 and replace with:

  2. Select frequencies that result in flow rates that lie between each pair of points programmed in Section 2.6.2.3. Test at each frequency.

  Change Run number 6 to number 3.

- **Factor Limit**
  The limit of 3 to 5 factors should be changed to cover any number of factors.

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

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

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

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

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

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

Decision: The Sector agreed that a small work group comprised of the following individuals be established to further develop this issue for the Sector's review.

Chairman:	Mr. Steve Patoray
Work Group Members:	Mr. Maurice Forkert
	Mr. Mike Frailer
	Mr. Mike Guidry
	Mr. Dmitri Karimov
	Mr. Rich Miller
	Mr. Ken Smith

The WG was tasked with the following:

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

2) Develop Language in Policy G. Range of Data Points to Allow for Uniform Interpretation and Application of the Criteria by the United States and Canadian Stakeholders by February 2010, including
   a. Where necessary to clarify the intent of the criteria:
      i. Modify Language
      ii. Define Terminology

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

7. Next Meeting

Source: NTETC Measuring Sector

Background/Discussion: The Sector was asked to develop a proposed date and location for the next meeting. The Sector agreed that holding the meeting in conjunction with the SWMA is still acceptable.

Decision: The Sector agreed to recommend to the NTEP Committee that the next Sector meeting be held in conjunction with the 2010 Southern Weights and Measure Association meeting, which is tentatively scheduled to be held in South Carolina. The NCWM is asked to communicate with the SWMA regarding its past difficulties booking lodgings for the Sector meetings and ask for assistance to prevent these difficulties in the future.

Additional Items as Time Allows:

The NCWM S&T Committee would appreciate input from the Measuring Sector on the following measuring-related issues on its agenda. If time permits, the Measuring Sector was asked for comments on these issues. In the interest of brevity, the narrative for each item was abbreviated. Full descriptions of the items can be found in the S&T Committee's 2009 Interim Report and 2010 Interim Agenda.

8. G-S.1. Marking (Software)

Source: NCWM S&T Committee

Purpose: This item is included on the Sector's agenda to allow for the Sector to review proposed changes to NIST Handbook 44 General Code paragraph G-S.1. Identification and provide comments to assist the NCWM S&T Committee in its deliberations on these proposals.

Background: The S&T Committee is considering changes to NIST Handbook 44 General Code paragraph G-S.1. Identification to better address software-based systems. The Committee has considered multiple proposals under this item.

Recommendation: A copy of the most recent proposal to modify G-S.1. was included in the 2009 Sector Agenda (see also the 2009 Final S&T Report). The Sector was asked to provide input to the S&T Committee on this issue.

Discussion: During the 2009 Sector meeting, Mr. Patoray, (Consultants on Certification) noted that an updated version of the proposal from the Software Sector is now available. In the more recent version, software-based devices must have a version number for both built-for-purpose and not-built-for purpose devices. The version number can be included in a "look-up" menu. A serial number could be required for a built-for-purpose device. Additional work is being done on definitions and the Sector is encountering a significant amount of opposition from the general weighing industry whose members hold a large number of CCs.

Mr. Wotthlie (MD) made comment that the previous version of the proposal (prior to the one with the most recent modifications) was reasonable. The latest changes by the Software Sector include requirements for hard marking which do not seem reasonable.

Decision: While the Sector briefly discussed this item, it did not have comments to offer the S&T Committee.

9. G-S.8.1. Access to Calibration and Configuration Adjustments, Proposed Changes to Language

Source: NCWM S&T Committee

Purpose: This item is included on the Sector's agenda to allow for the Sector to review proposed changes to NIST Handbook 44 General Code paragraph G-S.8. Sealing and associated paragraphs and provide comments to assist the NCWM S&T Committee in its deliberations on these proposals.

Background: The S&T Committee has considered multiple proposals to modify and expand NIST Handbook 44 General Code paragraph G-S.8. Provision for Sealing Electronic Adjustable Components and associated subparagraph G-S.8.1. Multiple Weighing or Measuring Elements that Share a Common Provision for Sealing. The Committee agreed that if a device designed for commercial applications is capable of being "sealed" while leaving available either external or remote access to the calibration or configuration mode, it is clearly in violation of the current G-S.8. Provision for Sealing Electronic Adjustable Components and General Code paragraph G-S.2. Facilitation of Fraud and, therefore, no change to the existing language is needed. However, because of the ongoing disagreement on the interpretation of G-S.8. among the NTEP laboratories, the Committee agreed to make changes to the proposal based on the concerns raised during multiple open hearings.

Although multiple iterations of proposed language have been submitted, reviewed, and discussed, at the 2009 NCWM Interim Meeting, the Committee concluded that the item is not ready for a vote. However, the Committee decided to maintain the item on its agenda in anticipation that language would be developed by the 2010 Interim Meeting.

During the 2009 NCWM Annual Meeting, the S&T Committee received comments during the open hearing that no action may be needed and that the existing language in HB 44 is sufficient. Additional comments indicated that other proposals are overly complex. Oregon and Maryland believe that amended requirements for sealing are needed by the NTEP labs and field officials in order to consistently interpret and apply sealing requirements.

The Committee believes that all parties agree with the intent of the proposal. Both the WMD and SMA proposals include language that restates the existing language in G-S.8., but is essentially reformatted for clarification. Additionally, both proposals include new requirements for providing indications when a device is in adjustment mode. WMD proposed further language to address devices that may have more that one method of sealing.

Recommendation: Proposals considered by the Committee were included in the 2009 Sector agenda (and are also available as part of the S&T Committee's 2009 Interim and Final Reports). The Sector was asked for technical input on this issue that could be provided to the S&T Committee to help them in their assessment of the proposed changes.

Discussion: The Sector briefly discussed this issue, giving examples of how the requirements in paragraph G-S.8. have been applied to measuring devices. Mr. Patoray, (Consultants on Certification) noted that some weighing devices could be left in the calibration mode even though a physical security seal has been affixed and he further commented that the term "effective" has been questioned in discussions on this issue.

Most Sector members agreed that the Sector and NTEP measuring labs have consistently understood and applied the criteria in paragraph G-S.8. Mr. Wotthlie observed that, if the Sector sends a statement to the S&T Committee, it should say measuring devices either cannot function in the calibration or configuration mode or it should not be possible to seal the device while in that mode. Mr. gave the example of the mechanical temperature compensators that must be deactivated in order to reapply a security seal; this is considered an acceptable means of security and it complies with paragraph G-S.8. He also noted that the measuring laboratories have been consistently applying this requirement. Mr. Wotthlie noted that clarification is needed so the weighing labs are consistent in applying these requirements. Even though paragraph G-S.8. is relatively clear, he would suggest only changing a few words for clarification.

Decision: The Sector reviewed the proposed changes to General Code paragraph G-S.8.1. currently under consideration by the NCWM S&T Committee. The Sector agreed that measuring devices with NTEP CCs have been evaluated to either:

(1) not function in the calibration or configuration mode;
(2) not be sealed in the calibration or configuration mode; or
(3) clearly indicate the device is in the calibration or configuration mode.

The Sector agreed that these options reflect the intent of General Code paragraph G-S.8. and, because the intent of the paragraph is understood and appropriately applied by the measuring community, the Sector recommends that no changes be proposed to General Code paragraph G-S.8.

10. Temperature Compensation for Liquid Measuring Devices Code

Source: NCWM S&T Committee

Purpose: This item is included on the Sector's agenda to allow for the Sector to review proposed changes to the NIST Handbook 44 Liquid Measuring Devices Code to address temperature compensation for retail motor-fuel devices and to provide comments to assist the NCWM S&T Committee in its deliberations on these proposals.

Background: The NCWM S&T Committee is considering a proposal to modify Section 3.30. Liquid-Measuring Devices (LMD) Code by modifying paragraphs S.2.6., S.2.7.1., S.2.7.3., N.4.1.1.(a) and (b), N.5., UR.3.6.1.1., and UR.3.6.1.2., to add new paragraphs S.1.6.8., S.2.7.2., S.4.3., UR.3.6.1.3., and UR.3.6.4., and to renumber other existing paragraphs as appropriate to recognize temperature compensation for retail devices.

Based on comments heard from the floor at the 2009 NCWM Annual Meeting, the S&T Committee acknowledged that additional work may be needed to specific sections of the proposed changes to the code. Points raised and discussed by the Committee include the following:

- There was a question of whether to reference "15 °C" or "15.56 °C." The Committee agreed that industry practice has been to use "15 °C" and that this is the reference used internationally; consequently, they believe it should be kept as "15 °C." This is also supported by the L&R Committee's 2009 Interim Report which references a statement by the Meter Manufacturers' Association indicating that 15 °C is used internationally and industry would likely follow that convention should SI units be used.
- Clarification is needed for the differences between wholesale devices and systems. In question were paragraph S.1.6.8. Representations from Devices with Temperature Compensation and paragraph S.2.7.2. Display of Temperature.
- Clarification is needed for how S.2.7.2. applies to electronic registers that can only indicate in terms of compensated quantities when the compensator is activated; the compensator would need to be activated and an additional run completed in order to view an uncompensated reading.
- Review the use of the term "invoice" and consider if the term is well understood for retail transactions which have typically used terminology such as "printed receipt" or recorded representation.
- Review the language in the VTM code under Item 331-2 and consider where changes might be needed to ensure consistency for the conditions and period of use for this feature.

The Committee decided to keep the status of this item as an "Information" item and acknowledges that some jurisdictions are already facing the imminent possibility of temperature-compensated retail motor-fuel equipment in their jurisdictions. The Committee believes that these standards are necessary whether or not the issue of a model method sale regulation is adopted in NIST Handbook 130 since weights and measures jurisdictions may decide to permit this equipment based upon their individual State laws or regulations.

Recommendation: Proposed changes to the Liquid-Measuring Devices Code currently under consideration by the NCWM S&T Committee were included in the 2009 Sector agenda (and are also available as part of the S&T Committee's 2009 Interim and Final Reports). At its 2009 meeting, the Sector was asked for technical input on this issue that could be provided to the S&T Committee to help them in their assessment of the proposed changes.

Discussion: Mr. Karimov (Liquid Controls) noted that he questioned how paragraph S.2.7.3. would apply with regard to the simultaneous display of net and gross volumes, particularly for equipment that delivers multiple product types and product types under both compensated and uncompensated conditions. Other Sector members agreed that paragraph S.2.7.3. as modified would not require simultaneous display of net and gross volume. The Sector agreed that the gross and net volumes should not be required to be simultaneously displayed.

Mr. Wotthlie encouraged manufacturers to carefully review the proposed changes to ensure that the changes would not negatively affect their equipment. By identifying changes early in the process, this can avoid having to revisit the requirements after they have already been adopted in Handbook 44.

The Sector also had a great deal of discussion on proposed paragraph UR.3.6.1.1. Use of Automatic Temperature Compensation regarding temperature compensator and nontemperature compensated meters where the delivery is temperature compensated. Mr. Wotthlie (MD) suggested that a search needs to be done for the terms “retail” and “wholesale” to ensure that they have been inserted or deleted as appropriate to reflect the expanded application. A related question was raised by Mr. Oppermann (Weights and Measures Consulting) regarding how revised paragraph UR.3.6.1.3. Recorded Representations (Invoices, Receipts, and Bills of Lading) (formerly numbered UR.3.6.1.2.) was intended to apply in applications where the sale is to the end user.

Decision: The Sector discussed the proposed changes to the LMD Code to recognize temperature compensation for retail motor-fuel devices, particularly paragraph UR.3.6.1.1. Use of Automatic Temperature Compensation; however, it had no specific comments to forward to the S&T Committee.

11. T.2.1. Tolerances – Vehicle-Tank Meters (VTMs)

Source: NCWM S&T Committee

Purpose: This item is included on the Sector’s agenda to allow for the Sector to review proposed changes to the tolerances in NIST Handbook 44 Vehicle Tank Meters Code paragraph T.2.1. Automatic Temperature-Compensating Systems devices and to provide comments to assist the NCWM S&T Committee in its deliberations on these proposals.

Background: The S&T Committee continues to consider the following proposed changes to decrease the ATC tolerances on VTMs.

> **T.2.1. Automatic Temperature-Compensating Systems.** The difference between the meter error (expressed as a percentage) for results determined with and without the automatic temperature-compensating system activated shall not exceed:
>
> (a) **~~0.4~~<u>0.2 </u>%** for mechanical automatic temperature-compensating systems; and
>
> (b) **~~0.2~~<u>0.1 </u>%** for electronic automatic temperature-compensating systems.
>
> The delivered quantities for each test shall be approximately the same size. The results of each test shall be within the applicable acceptance or maintenance tolerance.
>
> **<u>(Amended 201X)</u>**

The Committee requested data (in addition to that provided by the submitter) to be submitted in either support or opposition to the proposed changes. At the 2009 Annual Meeting, the Committee reported that it received additional VTM test data from the State of Maine. This data supports the proposed change to the tolerances; the change would not impact the compliance rate for the devices included in these tests. The Committee noted that to date it has received only data in support of the proposed change.

The Committee heard opposition from the Meter Manufacturers Association and received a letter from David Rajala (Veeder-Root) expressing similar concerns over the proposed change to the tolerances. Both expressed concerns over the test procedures and test equipment that might be used by some jurisdictions, noting that, should non-NIST traceable thermometers or improper test procedures be used, the proposed tolerances would be too small.

Recommendation: The Committee asks for additional input from the Measuring Sector regarding these proposed changes. Data in support or opposition of the changes would be appreciated.

Decision: Time did not permit the Sector to discuss these proposed changes. Consequently, the Sector took no position on this proposal.

12. Water Meters – Test Draft Sizes, Repeatability Tests, and Tolerance Values

Source: NCWM S&T Committee

Purpose: This item is included on the Sector's agenda to allow for the Sector to review proposed changes to the NIST Handbook 44 Water Meters Code for test draft sizes, repeatability test criteria, and tolerances values and to provide comments to assist the NCWM S&T Committee in its deliberations on these proposals.

Background: The S&T Committee has reviewed multiple proposals to modify the test procedures and tolerances associated with testing water meters under NIST Handbook 44 Section 3.36. Water Meters Code. These proposals were included on the Committee's 2009 agenda under Information Item 336-3 N.3. Test Drafts and N.4. Testing Procedures and Developing Item. The water meter manufacturers who submitted the proposed changes have expressed concerns that the test draft sizes for some tests are not adequate and may result in erroneous test results. These manufacturers are also proposing that the test procedures and draft sizes be aligned with the standards of the American Water Works Association (AWWA).

At the 2009 NCWM Annual Meeting, the S&T Committee reported receiving additional data from the water meter manufacturers; a comparison of current H44 requirements, AWWA standards, and the proposed changes; comments from NIST WMD; and excerpts from corresponding international standards.

The above information as well as correspondence between the water meter manufacturers and the S&T Committee is available upon request from the Sector technical advisor and S&T Committee technical advisor, Ms. Butcher.

The Committee recently received eight additional alternate proposals from five water meter manufacturers. These proposals are being discussed between the five manufacturers, the State of California Division of Measurement Standards (represented on the S&T Committee by Ms. Kristin Macey), and several California counties (including 2010 S&T Committee Chairman, Mr. Brett Saum, San Luis Obispo County, CA). The S&T Committee anticipates receiving an update of these eight revisions from the fall regional weights and measures associations.

Recommendation: The Sector was asked to provide any comments regarding this issue to the S&T Committee.

Decision: Time did not permit the Sector to discuss these proposed changes. Consequently, the Sector took no position on this proposal.

13. Draft Code Section 3.3X. Hydrogen Gas-Measuring Devices

Source: NCWM S&T Committee

Purpose: This item is included on the Sector's agenda to allow for the Sector to review a draft code being proposed for inclusion in NIST Handbook 44 to address commercial hydrogen gas-measuring devices and to provide comments to assist the NCWM S&T Committee in its deliberations on these proposals.

Background: The NCWM S&T Committee's Agenda added a new item to its Developing Item in 2008 to recognize work being done to develop a code for commercial hydrogen gas-measuring devices by the U.S. National Work Group (USNWG) for the Development of Commercial Hydrogen Measurement Standards. The WG, which presently includes weights and measures officials, manufacturers and users of hydrogen measuring devices, and federal agency representatives, continues to look for input and participation from the weights and measures community in the development of the code and associated test procedures. The most current version of the draft code can be found on NIST WMD's home page at http://ts.nist.gov/WeightsAndMeasures/Developing-Commercial-Hydrogen-Measurement-Standards.cfm. This web page is a resource for the U.S. weights and measures and hydrogen community regarding the latest information and status of ongoing work to develop uniform and appropriate legal metrology standards for commercial hydrogen measurements.

At its August 2009 meeting, the USNWG on Hydrogen agreed that the code is ready to propose for adoption as a tentative code, with the caveat that some additional verification needs to be completed over the coming months to validate the proposed tolerances and test notes.

Recommendation: This item was included on the Sector's agenda to make the Sector aware of the work and to encourage input and participation from Sector members. A copy of the most recent draft code was provided to the Sector for reference.

Decision: Time did not permit the Sector to discuss these proposed changes. Consequently, the Sector took no action on this item. This item was included on the Sector's agenda to make the Sector aware of the work and to encourage input and participation from Sector members.

Appendix A
NTETC Measuring Sector (MS)
Action List – October 2009

	Responsible Party	Task	Details	Deadline
1	Mike Keilty working with interested Sector members	Refine the example for a "separated technology" proposal and circulate it for review.	<Integrate the separated technology proposal with that presented at the 2009 Sector meeting. <Circulate the newly edited version among Measuring Sector members.	December 15, 2009, to complete a revised example of Policy C.
		Discuss revisions with interested Sector members.	<Discuss revision with members who are able to attend the January 2010 NCWM Interim Meeting. <Solicit additional comments via electronic communication	January 2010 Interim Meeting
		Make additional revisions and present draft to the Sector for review and approval.	<Make any additional revisions as needed. <Distribute revised version to Sector.	2010 Sector Meeting
3	Metrologically Significant Characteristics of Technologies Work Group (WG) Chair: Rodney Cooper Co-Chair: Rich Miller Work Group: Marc Buttler Paul Glowacki Mike Guidry Gordon Johnson Dmitri Karimov Henry Oppermann Steve Patoray Dan Reiswig	Form new MS Metrologically Significant Characteristics of Technologies Work Group to arrive at a uniform, appropriate, and clear approach for initial, subsequent, and additional tests for the performance of a device technology	<Create a Short List features/options affecting the metrological characteristics of each device technology <Provide a 1-page analysis that briefly documents and provides the rationale for including each metrological characteristic in the list <WG reviews First Draft List of significant constituents and condenses to only relevant characteristics[1] <WG prepares Final List for its January 2010 NCWM Meeting[2]	[1]December 15, 2009, to complete the First Draft List that is ready for the WG's Review [2]January 15, 2010, for the Final List for the WG's First Meeting
3	Mike Keilty Tina Butcher	Coordinate with NCWM to enable Metrologically Significant Characteristics of Technologies Work Group to meet briefly at the: (1) January 2010 NCWM Meeting and (2) July 2010 NCWM Meeting	<Contact NTEP Admin Director (Don Onwiler) for meeting approvals	October 15, 2009

Appendix A
NTETC Measuring Sector (MS)
Action List – October 2009

	Responsible Party	Task	Details	Deadline
2	Tina Butcher	Forward HydroCarbon (HC) Vapor Meter Checklist developed by CADMS for consideration of the NTEP CMTE	<Add HC Vapor Meter Checklist to NCWM Pub 14 <NOTE Input is needed on HC Vapor Meter Checklist from HC Vapor Meter OEMs	November 1, 2009
4A	Test Criteria for an Electronic Indicator Submitted Separately from a Measuring Element for NTEP Evaluation Work Group: Rodney Cooper Maurice Forkert Dmitri Karimov Rich Miller Dave Rajala Ralph Richter	WG Provides Input on the Checklist developed by CADMS	<WG Provides Input to Dan Reiswig 1 month prior to March 2010 NTEP Lab Meeting	February 2010
4B	Checklist Developer: Dan Reiswig	Modify the Checklist for Discussion at the March 2010 NTEP Lab Meeting	<Dan Reiswig Modifies Draft Checklist based on Input of the WG	March 2010
4C	Checklist Developer: Dan Reiswig	MS Labs Discuss and Make Necessary Modification at the March 2010 NTEP Lab Meeting	<Dan Reiswig Modifies Draft Checklist based on Labs' Input from the March 2010 NTEP Lab Meeting	Late August 2010 Final Draft Checklist Distributed 1 month prior to the Fall 2010 MS Meeting
4D	Dan Reiswig/Tina Butcher	Finalize the Checklist for the 2011 NCWM Pub 14	<Dan Reiswig works with Technical Advisor to incorporate input from Fall 2010 Sector meeting. <If further Sector review is not required, Technical Advisor submits draft to the NTEP Committee to consider for 2011 Pub 14.	November 1, 2010, MS Submits Final Checklist for consideration of the NTEP CMTE to include in the 2011 NCWM Pub 14
6A	Maurice Forkert Mike Frailer Mike Guidry Dmitri Karimov Rich Miller Lead: Steve Patoray Ken Smith	Clarify Policy G. Range of Data Points	Bounce ideas off of Mike Frailer for: (1) Defining what is meant by multi-point calibration shall be "blind and integral" to the measuring element (2) Clarifying what is	

Appendix A
NTETC Measuring Sector (MS)
Action List – October 2009

	Responsible Party	Task	Details	Deadline
			meant by multi-point calibration shall be not "accessible" in the field	
6B	Maurice Forkert Mike Frailer Mike Guidry Dmitri Karimov Rich Miller Lead: Steve Patoray Ken Smith	Develop Language in Policy G. Range of Data Points to Allow for Uniform Interpretation and Application of the Criteria by the U.S. and Canadian Stakeholders	<In Policy G, where necessary to clarify the intent of the criteria: (1) Modify Language (2) Define Terminology <Review and Discuss Modifications to Policy G. at the March 2010 Lab Mtg	February 2010
9	Tina Butcher	Forward the MS Position on the Proposal to Modify HB44 General Code G-S.8 to the 2010 NCWM S&T CMTE	<Measuring Devices with CCs have been evaluated to either: (1) not function in the calibration or configuration mode (2) not be sealed in the calibration or configuration mode or (3) clearly indicate the device is in the calibration or configuration mode <MS recommends no changes to paragraph G-S.8 since the intent is understood and appropriately applied by MS members	November 1, 2009

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Appendix B
Proposed Revisions to Policy C – Product Family Table, prepared by Mike Keilty, Attachment to 2009 Agenda (Agenda Item 1)

C. Product Families for Meters

When submitting a meter for evaluation, the manufacturer must specify the product family and critical parameters for which the meter is being submitted.

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

Table C.1. Tests to be Conducted
Test A – Products must be individually tested and noted on the Certificate of Conformance.
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 product family within the specific gravity range tested.
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 product family within the viscosity range tested.
Test D – To obtain coverage for a product family: Test with one product in the product family. The Certificate of Conformance will cover all products in the family.
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.
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 both of the families with conductivity equal to or above the conductivity of the tested liquid.

<table>
<tr><th colspan="4">Table C.2. Product Family Test Table</th></tr>
<tr><th>Mass Meter Product Family & Test Requirements</th><th>Magnetic Flow Meter Product Family & Test Requirements</th><th>Positive Displacement Flow Meter Product Family & Test Requirements</th><th>Turbine Flow Meter Product Family & Test Requirements</th></tr>
<tr><td rowspan="4">Test B
Normal Liquids
Includes the following for Mass Flow Meters:

Fuels, Lubricants, Industrial and Food Grade Liquid Oils, Solvents General, Solvents Chlorinated, Pure Alcohols & Glycols, Water (De-mineralized &</td><td rowspan="4">Test F
Fuels, Lubricants, Industrial and Food Grade Liquid Oils, Solvents General, Solvents Chlorinated, Pure Alcohols & Glycols, Water (De-mineralized & de-ionized), Heated Products (above 50 °C)*</td><td>Test C
Fuels, Lubricants, Industrial and Food Grade Liquid Oils</td><td>Test E
Fuels, Lubricants, Industrial and Food Grade Liquid Oils</td></tr>
<tr><td>Test C
Solvents General</td><td>Test E
Solvents General</td></tr>
<tr><td>Test C
Solvents Chlorinated</td><td>Test A
Solvents Chlorinated</td></tr>
<tr><td>Test C
Alcohols, Glycols, & Water Mixes Thereof</td><td>Test E
Alcohols, Glycols, & Water Mixes Thereof</td></tr>
</table>

Table C.2. Product Family Test Table

Mass Meter Product Family & Test Requirements	**Magnetic Flow Meter Product Family & Test Requirements**	**Positive Displacement Flow Meter Product Family & Test Requirements**	**Turbine Flow Meter Product Family & Test Requirements**
de-ionized), Heated Products (above 50 °C)* Water (Tap, Potable & Nonpotable), Water Mixes of Alcohols & Glycols, Juices, Beverages, Clear Liquid and Suspensions Fertilizers, Crop Chemicals, Liquid Feeds, Chemicals	**Test D** Water (Tap, Potable & Nonpotable), Water Mixes of Alcohols & Glycols, Juices, Beverages, Clear Liquid and Suspensions Fertilizers, Crop Chemicals, Liquid Feeds, Chemicals		
		Test D Water	**Test D** Water
		Test C Clear Liquid Fertilizers	**Test A** Clear Liquid Fertilizers
		Test C Crop Chemicals *(Type A)*	**Test A** Crop Chemicals *(Type A)*
		Test C Crop Chemicals *(Type B)*	**Test A** Crop Chemicals *(Type B)*
		Test C Flowables	**Test A** Flowables
		Test C Crop Chemicals *(Type C)*	**Test A** Crop Chemicals *(Type C)*
		Test C Crop Chemicals *(Type D)*	**Test A** Crop Chemicals *(Type D)*
		Test C Suspension Fertilizers	**Test A** Suspension Fertilizers
		Test C Liquid Feeds	**Test A** Liquid Feeds
		Test C Chemicals	**Test A** Chemicals
Test B Heated Products (above 50 °C)	*See above	**Test C** Heated Products (above 50 °C)	**Test A** Heated Products (above 50 °C)
Test D Compressed Liquids	Not Applicable (conductivity too low)	**Test C** Fuels and Refrigerants	**Test E** Fuels and Refrigerants
		Test C NH_3	**Test A** NH_3
Test D Compressed Gases	*Note: CNG is only included in Section 3.37 Mass Flow Meters of Handbook 44*		*CNG*

Table C.2. Product Family Test Table			
Mass Meter Product Family & Test Requirements	**Magnetic Flow Meter Product Family & Test Requirements**	**Positive Displacement Flow Meter Product Family & Test Requirements**	**Turbine Flow Meter Product Family & Test Requirements**
Test D Cryogenic Liquids and Liquefied Natural Gas	Not Applicable (conductivity too low)	**Test A** Cryogenic Liquids and Liquefied Natural Gas –	**Test D** Cryogenic Liquids and Liquefied Natural Gas –

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

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

$$\text{Centistokes} = \frac{\text{Centipoise}}{\text{Specific Gravity}}$$

[5] Kinematic viscosity is measured in centistokes.

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

Table C.3. Typical Product Family Characteristics			
Product Families	**Typical Products**	**Reference Viscosity* (60 °F) Centipoise (cP)**	**Reference Specific Gravity* (60 °F)**
Normal Liquids Fuels, Lubricants, Industrial and Food Grade Liquid Oils	Diesel Fuel	10	0.72
	Gasoline	0.28	0.72
	Fuel Oil (#1, #2, #3, #4)	8 to 88	0.9
	Kerosene	1.94	0.75
	Light Oil	13.47	0.86
	Spindle Oil		
	Lubricating Oils	20 to 1000	0.80 to 0.90
	SAE Grades	192 to 3626	0.9
	Bunker Oil	11,200	0.99
	6 Oil (#5, #6)	66-13,000	0.9
	Crude Oil	3-1783	0.79 to 0.97
	Asphalt	100 to 5000	
	Vegetable Oil	133	0.92
	Biodiesel above B20	10.12	0.86
	Avgas	1.5 to 6	
	Jet A	1.5 to 6	
	Jet A-1	1.36	0.76
	Jet B	1.5 to 6	
	JP4	1.02	0.76
	JP5	1.94	0.76
	JP7 JP8	1.82	0.76
	Cooking Oils	9.93	0.92
	Sunflower Oil	90.1	0.93
	Soy Oil	90.6	0.93
	Peanut Oil	11 to 110	0.9 to 1.0
	Olive Oil	116.8	0.92
	Corn Oil	4.0	0.91
Normal Liquids Solvents General	Acetates	0.44	0.93
	Acetone	0.34	0.8
	Ethylacetate	1.36	0.96
	Hexane	0.34	0.66
	MEK	0.45	0.81
	Toluene	0.62	0.87
	Xylene	0.86	0.89
Normal Liquids Solvents Chlorinated	Carbon Tetra-Chloride	0.99	1.6
	Methylene-Chloride	0.46	1.34
	Perchloro-Ethylene	1	1.6
	Trichloro-Ethylene	0.6	1.47
Normal Liquids Alcohols, Glycols & Water Mixes thereof	Ethanol	1.29	0.79
	Methanol	0.64	0.80
	Butanol	3.34	0.81
	Isopropyl	2.78	0.79
	Isobutyl	4.54	0.81
	Ethylene glycol	25.5	1.19
	Propylene glycol	54	1.04

Product Families	Typical Products	Reference Viscosity* (60 °F) Centipoise (cP)	Reference Specific Gravity* (60 °F)
Normal Liquids Water	Tap Water	1.0	1.0
	Deionized	1.0	1.0
	Demineralized	1.0	1.0
	Potable	1.0	1.0
	Nonpotable	1.0	1.0
	Juices	1.0	1.0
	Beverages	1.0	1.0
	Milk	1.0	1.0
Normal Liquids Fertilizers	Clear Liquid Fertilizers	31 to 110	1.17 to 1.44
	Nitrogen Solution	31 to 110	1.17 to 1.44
	28%, 30% or 32%	31 to 110	1.28 to 1.32
	20% Aqua-Ammonia	1.1 to 1.3	0.89
	Urea	1.0	1.89
	Ammonia Nitrate	11.22	1.16 to 1.37
	N-P-K solutions		1.2 to 1.4
	10-34-0	48	1.39
	9-18-9		1.32
Normal Liquids Crop Chemicals *(Type A)*	Herbicides	4 to 400	0.7 to 1.2
	Round-up		
	Touchdown		
	Banvel		
	Treflan		
	Paraquat		
	Prowl		
Normal Liquids Crop Chemicals *(Type B)*	Fungicides	0.7 to 100	0.7 to 1.2
	Insecticides		
	Adjuvants		
	Fumigants		
Normal Liquids Flowables	Dual	20 to 900	1 to 1.2
	Bicep		
	Marksman		
	Broadstrike		
	Doubleplay		
	Topnotch		
	Guardsman		
	Harness		
Normal Liquids Crop Chemicals *(Type C)*	Fungicides	20 to 900	1 to 1.2
Normal Liquids Crop Chemicals *(Type D)*	Micronutrients	20 to 1000	0.9 to 1.65
Normal Liquids Suspension Fertilizers	3-10-30	100 to 1000	0.9 to 1.65
	4-4-27	20 to 215	0.9 to 1.65
Normal Liquids Liquid Feeds	Liquid Molasses	8640	1.25
	Molasses plus Phos Acid and/or Urea (Treacle)	2882	1.1 to 1.3
Normal Liquids Chemicals	Sulfuric Acid	1.49	1.83
	Hydrochloric Acid	0.80 to 1. 0	1.1
	Phosphoric Acid	161	1.87

Product Families	**Typical Products**	**Reference Viscosity* (60 °F) Centipoise (cP)**	**Reference Specific Gravity* (60 °F)**
Heated Products	Bunker C	11,200	1.99
	Asphalt	100 to 5000	
Compressed Liquids Fuels and Refrigerants NH_3	LPG		
	Propane	0.098	0.504
	Butane	0.19	0.595
	Ethane		
	Freon 11	0.313	1.49
	Freon 12	0.359	1.33
	Freon 22	1.99	1.37
	Anhydrous Ammonia	0.188	0.61
Compressed Gases	Compressed Natural Gas (CNG)		0.6 to 0.8 (1=Air)
Cryogenic Liquids and Liquefied Natural Gas	Liquefied Oxygen	0.038	0.66
	Nitrogen	1.07	0.31
	Liquefied Natural Gas		

*Reference fluid properties are not all inclusive and are representative examples only.

Appendix C

Proposed Revisions to NCWM Publication 14, Policy C, Product Families for Meters – By Henry Oppermann and Mike Keilty Following October 2009 Sector Meeting

C. Product Families for Meters

When submitting a meter for evaluation, the manufacturer must specify the product family and critical parameters for which the meter is being submitted.

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

<table>
<tr><th colspan="3">Mass Meter Product Category & Test Requirements</th><th colspan="2">Magnetic Flow Meter Product Category & Test Requirements</th><th colspan="2">Positive Displacement Flow Meter Product Category & Test Requirements</th><th colspan="2">Turbine Flow Meter Product Category & Test Requirements</th></tr>
<tr><td colspan="3">Test B: To cover a range of the following products, test with one product having a low specific gravity and test with a second product having a high specific gravity. The Certificate of Conformance will cover <u>all products in all product categories listed in the table</u> within the specific gravity range tested.</td><td colspan="2">Test F – To cover a range of the following products, test with one product having a specified conductivity. The Certificate of Conformance will cover all products in both of the families with conductivity equal to or above the conductivity of the tested liquid.</td><td colspan="2">Test C - To cover a range of products <u>within each product category</u>, test with one product having a low viscosity and test with a second product having a high viscosity <u>within each category</u>. The Certificate of Conformance will cover <u>all products in the product category</u> within the viscosity range tested.</td><td colspan="2">Test E – To cover a range of products <u>within each product category</u>, test with one product having a low kinematic viscosity and test with a second product having a high kinematic viscosity <u>within each category</u>. The Certificate of Conformance will cover <u>all products in the product category</u> within the kinematic viscosity range tested.</td></tr>
<tr><th>Typical Products</th><th>Specific Gravity* (60 °F)</th><th>Product Category</th><th>Typical Products</th><th>Product Category</th><td colspan="2">Product Category: Fuels, Lubricants, Industrial and Food Grade Liquid Oils (FL&O)</td><td colspan="2">Product Category: Fuels, Lubricants, Industrial and Food Grade Liquid Oils (FL&O)</td></tr>
<tr><td>Asphalt</td><td></td><td>FL&O</td><td>Gasoline</td><td>FL&O</td><th>Typical Products</th><th>Reference Viscosity* (60 F)</th><th>Typical Products</th><th>Reference Viscosity* (60 °F)</th></tr>
<tr><td>Asphalt</td><td></td><td>Heated</td><td>JP4</td><td>FL&O</td><td></td><th>Centipoise (cP)</th><td></td><th>Centipoise (cP)</th></tr>
<tr><td>Avgas</td><td></td><td>FL&O</td><td>Jet A-1</td><td>FL&O</td><td>Gasoline</td><td>0.28</td><td>Gasoline</td><td>0.28</td></tr>
<tr><td>Jet A</td><td></td><td>FL&O</td><td>JP7 & JP8</td><td>FL&O</td><td>JP4</td><td>1.02</td><td>JP4</td><td>1.02</td></tr>
<tr><td>Jet B</td><td></td><td>FL&O</td><td>Kerosene</td><td>FL&O</td><td>Jet A-1</td><td>1.36</td><td>Jet A-1</td><td>1.36</td></tr>
<tr><td>Spindle Oil</td><td></td><td>FL&O</td><td>JP5</td><td>FL&O</td><td>JP7 & JP8</td><td>1.82</td><td>JP7 & JP8</td><td>1.82</td></tr>
<tr><td>Adjuvants</td><td>0.7 to 1.2</td><td>CC</td><td>Corn Oil</td><td>FL&O</td><td>Kerosene</td><td>1.94</td><td>Kerosene</td><td>1.94</td></tr>
</table>

Mass Meter Product Category & Test Requirements			**Magnetic Flow Meter Product Category & Test Requirements**		**Positive Displacement Flow Meter Product Category & Test Requirements**		**Turbine Flow Meter Product Category & Test Requirements**	
Banvel	0.7 to 1.2	CC	Cooking Oils	FL&O	JP5	1.94	JP5	1.94
Fumigants	0.7 to 1.2	CC	Diesel Fuel	FL&O	Corn Oil	4	Corn Oil	4
Fungicides	0.7 to 1.2	CC	Biodiesel above B20	FL&O	Cooking Oils	9.93	Cooking Oils	9.93
Herbicides	0.7 to 1.2	CC	Light Oil	FL&O	Diesel Fuel	10	Diesel Fuel	10
Insecticides	0.7 to 1.2	CC	Sunflower Oil	FL&O	Biodiesel above B20	10.12	Biodiesel above B20	10.12
Paraquat	0.7 to 1.2	CC	Soy Oil	FL&O	Light Oil	13.47	Light Oil	13.47
Prowl	0.7 to 1.2	CC	Olive Oil	FL&O	Sunflower Oil	90.1	Sunflower Oil	90.1
Round-up	0.7 to 1.2	CC	Vegetable Oil	FL&O	Soy Oil	90.6	Soy Oil	90.6
Touchdown	0.7 to 1.2	CC	Bunker Oil	FL&O	Olive Oil	116.8	Olive Oil	116.8
Treflan	0.7 to 1.2	CC	Avgas	FL&O	Vegetable Oil	133	Vegetable Oil	133
Ammonia Nitrate	1.16 to 1.37	Fert	Jet A	FL&O	Bunker Oil	11,200	Bunker Oil	11,200
Crude Oil	0.79 to 0.97	FL&O	Jet B	FL&O	Avgas	1.5 to 6	Avgas	1.5 to 6
Lubricating Oils	0.80 to 0.90	FL&O	Asphalt	FL&O	Jet A	1.5 to 6	Jet A	1.5 to 6
Peanut Oil	0.9 to 1.0	FL&O	Peanut Oil	FL&O	Jet B	1.5 to 6	Jet B	1.5 to 6
Hexane	0.66	Sol Gen	SAE Grades	FL&O	Asphalt	100 to 5000	Asphalt	100 to 5000
Diesel Fuel	0.72	FL&O	Lubricating Oils	FL&O	Peanut Oil	11 to 110	Peanut Oil	11 to 110
Gasoline	0.72	FL&O	Crude Oil	FL&O	SAE Grades	192 to 3626	SAE Grades	192 to 3626
Kerosene	0.75	FL&O	6 Oil (#5, #6)	FL&O	Lubricating Oils	20 to 1000	Lubricating Oils	20 to 1000
Jet A-1	0.76	FL&O	Fuel Oil (#1, #2, #3, #4)	FL&O	Crude Oil	3 to 1783	Crude Oil	3 to 1783
JP4	0.76	FL&O	Spindle Oil	FL&O	6 Oil (#5, #6)	66 to 13,000	6 Oil (#5, #6)	66 to 13,000
JP5	0.76	FL&O	Acetone	Sol Gen	Fuel Oil (#1, #2, #3, #4)	8 to 88	Fuel Oil (#1, #2, #3, #4)	8 to 88
JP7 JP8	0.76	FL&O	Hexane	Sol Gen	Spindle Oil		Spindle Oil	
Ethanol	0.79	Alc Gly	Acetates	Sol Gen	**Product Category:** Solvents General (Sol Gen)		**Product Category:** Solvents General (Sol Gen)	
Isopropyl	0.79	Alc Gly	MEK	Sol Gen	**Typical Products**	**Reference Viscosity* (60 °F)**	**Typical Products**	**Reference Viscosity* (60 °F)**
Acetone	0.8	Sol Gen	Toluene	Sol Gen		**Centipoise (cP)**		**Centipoise (cP)**
Methanol	0.80	Alc Gly	Xylene	Sol Gen	Acetone	0.34	Acetone	0.34

Mass Meter Product Category & Test Requirements			**Magnetic Flow Meter Product Category & Test Requirements**		**Positive Displacement Flow Meter Product Category & Test Requirements**		**Turbine Flow Meter Product Category & Test Requirements**	
Butanol	0.81	Alc Gly	Ethylacetate	Sol Gen	Hexane	0.34	Hexane	0.34
Isobutyl	0.81	Alc Gly	Methylene-Chloride	Sol Chl	Acetates	0.44	Acetates	0.44
MEK	0.81	Sol Gen	Trichloro-Ethylene	Sol Chl	MEK	0.45	MEK	0.45
Biodiesel above B20	0.86	FL&O	Carbon Tetra-Chloride	Sol Chl	Toluene	0.62	Toluene	0.62
Light Oil	0.86	FL&O	Perchloro-Ethylene	Sol Chl	Xylene	0.86	Xylene	0.86
Toluene	0.87	Sol Gen	Methanol	Alc Gly	Ethylacetate	1.36	Ethylacetate	1.36
20 % Aqua-Ammonia	0.89	Fert	Ethanol	Alc Gly	**Product Category:** Solvents Chlorinated (Sol Chl)		**Product Category:** Alcohols, Glycols & Water Mixes Thereof (Alc Gly)	
Xylene	0.89	Sol Gen	Isopropyl	Alc Gly	**Typical Products**	**Reference Viscosity* (60 F)**	**Typical Products**	**Reference Viscosity* (60 F)**
6 Oil (#5, #6)	0.9	FL&O	Butanol	Alc Gly		**Centipoise (cP)**		**Centipoise (cP)**
Fuel Oil (#1, #2, #3, #4)	0.9	FL&O	Isobutyl	Alc Gly	Methylene-Chloride	0.46	Methanol	0.64
SAE Grades	0.9	FL&O	Ethylene glycol	Alc Gly	Trichloro-Ethylene	0.6	Ethanol	1.29
Corn Oil	0.91	FL&O	Propylene glycol	Alc Gly	Carbon Tetra-Chloride	0.99	Isopropyl	2.78
Cooking Oils	0.92	FL&O	Demineralized	Water	Perchloro-Ethylene	1	Butanol	3.34
Olive Oil	0.92	FL&O	Deionized	Water	**Product Category:** Alcohols, Glycols & Water Mixes Thereof (Alc Gly)		Isobutyl	4.54
Vegetable Oil	0.92	FL&O	Asphalt	Heated	**Typical Products**	**Reference Viscosity* (60 °F)**	Ethylene glycol	25.5
Acetates	0.93	Sol Gen	Bunker C	Heated		**Centipoise (cP)**	Propylene glycol	54
Soy Oil	0.93	FL&O	Test D – To obtain coverage for a product category: Test with one product in the product category. The Certificate of Conformance will cover all products in the category.		Methanol	0.64	Compressed liquids: Fuels and Refrigerants, NH_3	
							Typical Products	**Reference Viscosity* (60 °F) Centipoise (cP)**
Sunflower Oil	0.93	FL&O			Ethanol	1.29	Propane	0.098
							Anhydrous Ammonia	0.188

Mass Meter Product Category & Test Requirements			**Magnetic Flow Meter Product Category & Test Requirements**		**Positive Displacement Flow Meter Product Category & Test Requirements**		**Turbine Flow Meter Product Category & Test Requirements**	
Ethylacetate	0.96	Sol Gen			Isopropyl	2.78	Butane	0.19
Bunker Oil	0.99	FL&O			Butanol	3.34	Freon 11	0.313
Beverages	1.0	Water	Tap water	Water	Isobutyl	4.54	Freon 12	0.359
Deionized	1.0	Water	Potable	Water	Ethylene glycol	25.5	Freon 22	1.99
Demineralized	1.0	Water	Nonpotable	Water	Propylene glycol	54	Ethane	
Juices	1.0	Water	Juices	Water	**Product Category:** Clear Liquid Fertilizers (Liq Fert)		Test A – The following products must be individually tested and noted on the Certificate of Conformance.	
Milk	1.0	Water	Beverages	Water	**Typical Products**	**Reference Viscosity* (60 °F)**		
Nonpotable	1.0	Water	Water mixes of alcohols & glycols	Alc Gly		**Centipoise (cP)**	**Typical Products**	**Product Category**
Potable	1.0	Water	Urea	Fert	Urea	1	Methylene-Chloride	Sol Chl
Tap Water	1.0	Water	Ammonia Nitrate	Fert	Ammonia Nitrate	11.22	Trichloro-Ethylene	Sol Chl
Propylene glycol	1.04	Alc Gly	10-34-0	Fert	10-34-0	48	Carbon Tetra-Chloride	Sol Chl
Hydrochloric Acid	1.1	Chem	20 % Aqua-Ammonia	Fert	20 % Aqua-Ammonia	1.1 to 1.3	Perchloro-Ethylene	Sol Chl
Ethylene glycol	1.19	Alc Gly	Chlear Liquid Fert	Fert	Chlear Liquid Fert	31 to 110	Urea	Liq Fert
Liquid Molasses	1.25	Liq Feed	Nitrogen Solution	Fert	Nitrogen Solution	31 to 110	Ammonia Nitrate	Liq Fert
9-18-9	1.32	Fert	28 %, 30 % or 32 %	Fert	28 %, 30 % or 32 %	31 to 110	10-34-0	Liq Fert
Methylene-Chloride	1.34	Sol Chl	N-P-K solutions	Fert	N-P-K solutions		20% Aqua-Ammonia	Liq Fert
10-34-0	1.39	Fert	9-18-0	Fert	9-18-0		Chlear Liquid Fert	Liq Fert
Trichloro-Ethylene	1.47	Sol Chl	4-4-27	Sus Fert	**Product Category:** Suspension Fertilizers (Sus Fert)		Nitrogen Solution	Liq Fert
Carbon Tetra-Chloride	1.6	Sol Chl	3-10-30	Sus Fert	**Typical Products**	**Reference Viscosity* (60 °F)**	28 %, 30 % or 32 %	Liq Fert
Perchloro-Ethylene	1.6	Sol Chl	Molasses plus Phos Acid and/or Urea (TreaChle)	Liq Feed		**Centipoise (cP)**	N-P-K solutions	Liq Fert

Mass Meter Product Category & Test Requirements			**Magnetic Flow Meter Product Category & Test Requirements**		**Positive Displacement Flow Meter Product Category & Test Requirements**		**Turbine Flow Meter Product Category & Test Requirements**	
Sulfuric Acid	1.83	Chem	Liquid Molasses	Liq Feed	4-4-27	20 to 215	9-18-0	Liq Fert
Phosphoric Acid	1.87	Chem	Sulfuric Acid	Chem	3-10-30	100 to 1000	4-4-27	Sus Fert
Urea	1.89	Fert	Phosphoric Acid	Chem	**Product Category:** Liquid Feeds (Liq Feed)		3-10-30	Sus Fert
Bunker C	1.99	Heated	Hydrochloric Acid	Chem	**Typical Products**	**Reference Viscosity* (60 °F)**	Molasses plus Phos Acid and/or Urea (TreaChle)	Liq Feed
Fungicides	1 to 1.2	CC	Herbicides	CC-A		**Centipoise (cP)**	Liquid Molasses	Liq Feed
Micronutrients	1 to 1.2	CC	Round-up	CC-A	Molasses plus Phos Acid and/or Urea (TreaChle)	2882	Asphalt	Heated
Molasses plus Phos Acid and/or Urea (TreaChle)	1.1 to 1.3	Liq Feed	Touchdown	CC-A	Liquid Molasses	8640	Bunker C	Heated
3-10-30	0.9 to 1.65	Liq Fert	Banvel	CC-A	**Product Category:** Heated Products (Heated)		Sulfuric Acid	Chem
4-4-27	0.9 to 1.65	Liq Fert	Treflan	CC-A	**Typical Products**	**Reference Viscosity* (60 °F)**	Phosphoric Acid	Chem
Micronutrients	0.9 to 1.65	Liq Fert	Paraquat	CC-A		**Centipoise (cP)**	Hydrochloric Acid	Chem
28%, 30% or 32%	1.28 to 1.32	Fert	Prowl	CC-A	Asphalt	100 to 5000	Herbicides	CC-A
N-P-K solutions	1.2 – 1.4	Fert	Herbicides	CC-A	Bunker C	11,200	Round-up	CC-A
Chlear Liquid Fert	1.17 to 1.44	Fert	Fungicides	CC-B	**Product Category:** Chemicals (Chem)		Touchdown	CC-A
Nitrogen Solution	1.17 to 1.44	Fert	Insecticides	CC-B	**Typical Products**	**Reference Viscosity* (60 °F)**	Treflan	CC-A
Test D – To obtain coverage for each of the following product categories, test with one product in **each** product category. The Certificate of Conformance will cover all of the products in **the** product category in which a product was tested.			Adjuvants	CC-B			Banvel	CC-A
			Fumigants	CC-B	Sulfuric Acid	1.49	Paraquat	CC-A
			Fungicides	CC-C	Phosphoric Acid	161	Prowl	CC-A

Mass Meter Product Category & Test Requirements			**Magnetic Flow Meter Product Category & Test Requirements**		**Positive Displacement Flow Meter Product Category & Test Requirements**		**Turbine Flow Meter Product Category & Test Requirements**	
Product Category	**Typical Products**	**Specific Gravity* (60 F)**	Micronutrients	CC-D	Hydrochloric Acid	0.80 to 1. 0	Herbicides	CC-A
Comp gas	Compressed Natural Gas (CNG)	0.6 to 0.8 (1=Air)			**Product Category:** Crop Chemicals (Type A) (CC-A)		Fungicides	CC-B
					Typical Products	**Reference Viscosity* (60 °F)**	Insecticides	CC-B
Comp liq	Anhydrous Ammonia	0.61				**Centipoise (cP)**	Adjuvants	CC-B
Comp liq	Butane	0.595			Herbicides	4 to 400	Fumigants	CC-B
Comp liq	Ethane				Round-up	4 to 400	Fungicides	CC-C
Comp liq	Freon 11	1.49			Touchdown	4 to 400	Micronutrients	CC-D
Comp liq	Freon 12	1.33			Banvel	4 to 400	Dual	Flow
Comp liq	Freon 22	1.37			Treflan	4 to 400	Bicep	Flow
					Paraquat	4 to 400	Marksman	Flow
Comp liq	Propane	0.504			Prowl	4 to 400	Broadstrike	Flow
					Product Category: Crop Chemicals (Type B) (CC-B)		Doubleplay	Flow
Cryo LNG	Liquefied Natural Gas				**Typical Products**	**Reference Viscosity* (60 °F)**	Topnotch	Flow
Cryo LNG	Liquefied Oxygen	0.66				**Centipoise (cP)**	Guardsman	Flow
Cryo LNG	Nitrogen	0.31			Fungicides	0.7 to 100	Harness	Flow
					Insecticides	0.7 to 100	NH_3	
					Adjuvants	0.7 to 100	Test D – To obtain coverage for a product category: Test with one product in the product category. The Certificate of Conformance will cover all products in the category.	
					Fumigants	0.7 to 100		
					Product Category: Crop Chemicals (Type C) (CC-C)			
					Typical Products	**Reference Viscosity* (60 °F)**	Tap Water	Water
						Centipoise (cP)	Deionized	Water
					Fungicides	20 to 900	Demineralized	Water

Mass Meter Product Category & Test Requirements			**Magnetic Flow Meter Product Category & Test Requirements**		**Positive Displacement Flow Meter Product Category & Test Requirements**		**Turbine Flow Meter Product Category & Test Requirements**	
					Product Category: Crop Chemicals (Type D) (CC-D)		Potable	Water
					Typical Products	**Reference Viscosity* (60 °F)**	Nonpotable	Water
						Centipoise (cP)	Juices	Water
					Micronutrients	20 to 1000	Beverages	Water
					Product Category: Flowables (Flow)		Milk	Water
					Typical Products	**Reference Viscosity* (60 °F)**	Liquefied Oxygen	Cryo LNG
						Centipoise (cP)	Nitrogen	Cryo LNG
					Dual	20 to 900	Liquefied Natural Gas	Cryo LNG
					Bicep	20 to 900		
					Marksman	20 to 900		
					Broadstrike	20 to 900		
					Doubleplay	20 to 900		
					Topnotch	20 to 900		
					Guardsman	20 to 900		
					Harness	20 to 900		
					Product Category: Compressed Liquids: Fuels and Refrigerants (Comp liq)			
					Typical Products	**Reference Viscosity* (60 °F)**		
						Centipoise (cP)		
					Propane	0.098		
					Anhydrous Ammonia	0.188		
					Butane	0.19		
					Freon 11	0.313		
					Freon 12	0.359		
					Freon 22	1.99		
					Ethane			

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

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

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

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

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

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

$$\text{Centistokes} = \frac{\text{Centipoise}}{\text{Specific Gravity}}$$

[5] Kinematic viscosity is measured in centistokes.

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

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Appendix D

Draft Hydrocarbon Gas Vapor-Measuring Devices Checklist

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Measuring Devices

Hydrocarbon Gas-Vapor Measuring Devices

Technical Policy • Checklists • Test Procedures

N C W M

Publication 14

Hydrocarbon Gas-Vapor Measuring Devices 2009

Table of Contents

Hydrocarbon Gas-Vapor Measuring Devices

Hydrocarbon Gas-Vapor Measuring Devices Checklist and Test Procedures

Introduction

The checklist is designed so that the user can determine and record in a logical sequence the conformance of the device with the elements of the checklist. The user should make copies of the checklist to serve as worksheets and preserve the original for reference. Unless specifically requested to do so, the applicant is not required to submit a completed checklist to NTEP prior to the evaluation; however, the applicant is urged to carefully review the checklist prior to submission to ensure that the device meets the requirements of the checklist. In most cases, the results of evaluation for each element can be recorded by checking the appropriate response. In some cases, the user is required to record values, results, or comments. In those cases, space is provided; examples are:

1. **Yes** ☐ **No** ☐ **N/A** ☐

2. ☐ EXTERNAL ☐ INTERNAL ☐ N/A

3. Comments:

This checklist is a guide for conducting prototype examinations to determine compliance with the requirements of NIST Handbook 44. These criteria shall apply only to type evaluation examinations, not on a retroactive basis to devices that are currently in service. The General Code requirements apply to all classes of devices. The specific code requirements supersede General Code requirements in all cases of conflict.

1. General

Code Reference: G-S.1. Identification

Virtually all weighing and measuring equipment must be clearly and permanently marked with the manufacturer's name or trademark, model designation, and serial number. Dispensers, consoles, cash registers interfaced with dispensers, retrofit computing registers, and customer card-activated terminals must all have these markings. As a practical matter, some equipment does not need a serial number. "Satellite" modules in a modular system (e.g., keyboard module and cash drawer) need not have serial numbers because they do not have any "intelligence."
A serial number is required in the following circumstances:

Separate Device: A device is capable of operating as a weighing or measuring device without being interfaced with or connected to other components.

Separate Main Element: Primary indicating elements must be marked. The device is a major element in the weighing or measuring system. That is, it is metrologically significant to the operation and/or performance of the system and interfaces with different compatible main elements. Examples: Indicating elements, weighing elements, meter registers, meter measuring elements (vehicle tank meters and loading rack meters).

Component: The device is a component in a system, may be used in different models of devices, and is sufficiently complex to warrant a separate evaluation and a separate CC (e.g., load cells and vapor recovery nozzles). Such a device may or may not be placed into an enclosure with other components of the system. When installed in an enclosure, the complete device must be marked with a serial number, and the one serial number will suffice for the entire collection of components. If it is not placed in an enclosure with other components, the component must be marked with a serial number.

Equipment must be marked on a surface that is an integral part of the device, and the marking must be visible after installation. If the required information is not positioned in a visible location after installation, a duplicate, permanent identification badge must be located in a visible location. A removable cover is an acceptable location for the required information only if a permanent ID badge is located elsewhere on the device.

The information may be on a metal or plastic plate that is attached with pop rivets, adhesive, or other means, but may not be fastened by removable bolts or screws. A foil or vinyl badge may be used provided that the badge can survive wear and tear, remains legible, and is difficult to remove. The printing on a foil badge must be easily readable and not easily obliterated by rubbing with a relatively soft object (e.g., the wood of a pencil)

Location of the information:

1. Identification

All equipment shall be clearly and permanently marked on an exterior visible surface after installation. It must contain the following information (prefix lettering may be initial capitals, all capitals, or all lower case):

Code Reference: G-S.1.

1.1. Name, initials, or trademark of the manufacturer. Yes☐ No ☐ N/A ☐

1.2. A model designation that positively identifies the pattern or design. The Model designation shall be prefaced by the word "Model", "Type", or "Pattern". These terms may be followed by the term "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, at a minimum, begin with the letter "N" (e.g., No or No.) The abbreviation for the word "Model" shall be "Mod" or "Mod.". Yes☐ No ☐ N/A ☐

1.3. Except for not built-for-purpose, software-based devices, a nonrepetitive serial number. The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number. 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.). Yes☐ No ☐ N/A ☐

1.4. For not built-for-purpose, software-based devices the current software version or revison designation. The version or revision identifier shall be prefaced by the word "Version" or "Revision" as appropriate and either word may be followed by the word "Number." The abbreviations for the word “Version” shall, as a minimum, begin with the letter "V". The abbreviation for the word “Number” shall, as a minimum, begin with the letter "N" (e.g., No or No.). Yes☐ No ☐ N/A ☐

Code Reference: G-S.1. (e).

1.5. The NTEP Certificate of Conformance (CC) Number or a corresponding CC addendum number for devices that have a CC. 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.). Yes☐ No ☐ N/A ☐

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, then note its intended location below 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

1.6. For not built-for-purpose, software-based devices the following shall apply:

1.6.1. 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 ☐

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

- permanently marked on the device; or
- continuously displayed; or
- 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."

Note: For (1.6.2.), 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.

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

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

Code Reference: S.4.1. Marking Requirements – Limitation of Use

1.9 If a device is intended to measure accurately only products having particular properties, or to measure accurately only under specific installation or operating conditions, or to measure accurately when used in conjunction with specific accessory equipment, these limitations shall be clearly and permanently marked on the device. Yes☐ No ☐ N/A ☐

Code Reference: S.4.2. Marking Requirements -Discharge Rate

1.10. A volume-measuring device shall be marked to show it's rated gas capacity in cubic meters or cubic feet per hour. Yes☐ No ☐ N/A ☐

Code Reference: S.4.3. Temperature Compensation

1.11. If a device is equipped with a temperature compensator, this shall be marked on the badge or immediately adjacent to the badge and on the register. Yes☐ No ☐ N/A ☐

Code Reference: S.4.4. Badge

1.12. A badge affixed in a prominent position on the front of the device shall show the manufacturer's name, serial number and model number of the device, and capacity rate of the device for the particular products that it was designed to meter as recommended by the manufacturer. Yes☐ No ☐ N/A ☐

Code Reference: G-S.2. Facilitation of Fraud

This applies to all metering systems, including dispensers controlled from a remote location and vehicle tank meters. An exception is permitted if the unit price can be changed at a dispenser only through the use of a key to gain access to the unit price mechanism, e.g., mechanical computing registers. Such action would be obvious to a consumer and would inhibit changing the unit price during a delivery.

1.13. All equipment and all mechanisms, software, and devices attached to or used in conjunction therewith shall be so designed, constructed, assembled, and installed for use such that they do not facilitate the perpetration of fraud. Yes☐ No ☐ N/A ☐

Code Reference: G-S.3. Permanence

Equipment shall be of such materials, design, and construction that, under normal service conditions:

1.14. Accuracy will be maintained. Yes☐ No ☐ N/A ☐

1.15. Operating parts will continue to function as intended, Yes☐ No ☐ N/A ☐

1.16. Adjustments will remain reasonably permanent. Yes☐ No ☐ N/A ☐

Code Reference: G-S.4. Interchange or Reversal of Parts

If a metering system has parts that may be interchanged or reversed in normal field assembly, the system shall either be constructed so that reversal will not affect the accuracy of the system or the parts must be marked to indicate their proper position. For most metering devices, this applies only to the reversal of connectors of cables to peripheral devices.

If a metering system has any parts that may be interchanged or reversed in normal field assembly, the parts must either be:

1.17. Constructed so that reversal will not affect performance, Yes☐ No ☐ N/A ☐

1.18. Marked or keyed to indicate the proper position. Yes☐ No ☐ N/A ☐

2. Graduations, Indications, and Recorded Representations

Several general requirements facilitate the reading and interpretation of displayed and recorded values. Each display for quantity must be appropriate in design and have sufficient capacity for particular applications to be suitable for the application. Metering devices must be capable of indicating the maximum quantity that can normally be expected in a particular application.

Code Reference: S.1.1. Primary Elements

2.1. **General.** -A device shall be equipped with a primary indicating element and may also be equipped with a primary recording element. Yes☐ No ☐ N/A ☐

2.2. **Units.** - A volume-measuring device shall indicate, and record if equipped to record, its deliveries in terms of cubic meters or cubic feet, or multiple or decimal subdivisions of cubic meters or cubic feet. Yes☐ No ☐ N/A ☐

Code Reference: S.1.1.3. Value of the Smallest Unit – Volume Measuring Devices

2.3. The value of the smallest unit of indicated delivery, and recorded delivery if the device is equipped to record, shall not exceed:

2.3.1. (a) 1 m^3 (1 000 dm^3) (100 ft^3) when the maximum rated gas capacity is less than 100 m^3/h (10 000 ft^3/h); Yes☐ No ☐ N/A ☐

2.3.2. (b) 10 m^3 (1 000 ft^3) when the maximum rated gas capacity is 280 m^3/h (10 000 ft^3/h) up to but not including 1 700 m^3/h (60 000 ft^3/h); Yes☐ No ☐ N/A ☐

2.3.3. (c) 100 m^3 (10 000 ft^3) when the maximum rated gas capacity is 1 700 m^3/h (60 000 ft^3/h) or more. Yes☐ No ☐ N/A ☐

Code Reference: S.1.1.4.

2.4. Primary indicating and recording elements shall advance digitally or continuously and be susceptible to advancement only by the mechanical operation of the device. Yes☐ No ☐ N/A ☐

Code Reference: S.1.1.5. Proving Indicator

2.5. Devices rated less than 280 m^3/h (10 000 ft^3/h) gas capacity shall be equipped with a proving indicator measuring 0.025, 0.05, 0.1, 0.2, or 0.25 m^3 per revolution (1, 2, 5, or 10 ft^3 per revolution) for testing the meter. Devices with larger capacities shall be equipped as follows: Yes☐ No ☐ N/A ☐

2.5.1. (a) Devices rated 280 m^3 (10 000 ft^3) up to but not including 1 700 m^3/h (60 000 ft^3/h) gas capacity shall be equipped with a proving indicator measuring not greater than 1 m^3 (100 ft^3) per revolution. Yes☐ No ☐ N/A ☐

2.5.2. (b) Devices rated 1 700 m^3/h (60 000 ft^3/h) gas capacity or more shall be equipped with a proving indicator measuring not more than 10 m^3 (1 000 ft^3) per revolution. Yes☐ No ☐ N/A ☐

2.5.3. The test circle of the proving indicator shall be divided into 10 equal parts. Additional subdivisions of one or more of such equal parts may be made. Yes☐ No ☐ N/A ☐

Code Reference: S.1.2. Graduations

2.6.	**Length.** - Graduations shall be so varied in length that they may be conveniently read.	Yes☐ No ☐ N/A ☐
2.7.	**Width.** - In any series of graduations, the width of a graduation shall in no case be greater than the width of the minimum clear interval between graduations, and in no case should it exceed 1.0 mm (0.04 in) for indicating elements and 0.5 mm (0.02 in) for proving circles.	Yes☐ No ☐ N/A ☐

Code Reference: S.1.2.3. Clear Interval Between Graduations

2.8.	The clear interval shall be not less than 1.0 mm (0.04 in). If the graduations are not parallel, the measurement shall be made:	Yes☐ No ☐ N/A ☐
2.8.1.	(a) along the line of relative movement between the graduations at the end of the indicator, or	**Yes**☐ **No** ☐ **N/A** ☐
2.8.2.	(b) if the indicator is continuous, at the point of widest separation of the graduations.	**Yes**☐ **No** ☐ **N/A** ☐

Code Reference S.1.3. Indicators

2.9.	**Symmetry.** - The index of an indicator shall be symmetrical with respect to the graduations, at least throughout that portion of its length associated with the graduations.	Yes☐ No ☐ N/A ☐
2.10.	**Length.** - The index of an indicator shall reach to the finest graduations with which it is used.	Yes☐ No ☐ N/A ☐

Code Reference: S.1.3.3. Indicator Width

2.11.	The width of the index of an indicator in relation to the series of graduations with which it is used shall be not greater than:	
2.11.1.	(a) the width of the widest graduation, and	Yes☐ No ☐ N/A ☐
2.11.2.	(b) the width of the minimum clear interval between graduations.	Yes☐ No ☐ N/A ☐
2.11.3.	When the index of an indicator extends along the entire length of a graduation, that portion of the index of the indicator that may be brought into coincidence with the graduation shall be of the same width throughout the length of the index that coincides with the graduation	Yes☐ No ☐ N/A ☐
2.12	**Clearance.** - The clearance between the index of an indicator and the graduations shall in no case be more than 1.5 mm (0.06 in).	Yes☐ No ☐ N/A ☐
2.13.	**Parallax.** - Parallax effects shall be reduced to the practicable minimum.	Yes☐ No ☐ N/A ☐

3. Code Reference: S.2. Design of Measuring Elements

Code Reference: S.2.1. Pressure Regulation

3.1. Except when measured as a retail motor fuel, the vapor should be measured at a normal gauge pressure (psig) of:

3.1.1. (a) 2 740 Pa ± 685 Pa [11 in of water column (0.40 psig) ± 2.75 in of water column (0.10 psig)] for liquefied petroleum gas vapor; or — Yes☐ No ☐ N/A ☐

3.1.2. (b) 1 744 Pa ± 436 Pa [7 in of water column (0.25 psig) ± 1.75 in of water column (0.06 psig)] for natural and manufactured gas. — Yes☐ No ☐ N/A ☐

When vapor is measured at a pressure other than what is specified above for the specific product, a volume multiplier shall be applied within the meter or to the billing invoice based on the following equation:
Where

VPM = Volume pressure multiplier
AAP = Assumed atmospheric pressure in psia
GP = Gauge pressure in pascal or psig
NGP = Normal gauge pressure in pascal or psig

The assumed atmospheric pressure is to be taken from HB 44 Sec 3.33. Tables 2 and 2M
.

3.1.3. When liquefied petroleum gas vapor is measured at a pressure of 6 900 Pa (1 psig) or more, the delivery pressure shall be maintained within ± 1 725 Pa (± 0.25 psig). — Yes☐ No ☐ N/A ☐

3.1.4. Pressure variations due to regulator lock off shall not increase the operating pressure by more than 25%. — Yes☐ No ☐ N/A ☐

3.2. **Provision for Sealing.** - Adequate provision shall be made for applying security seals in such a manner that no adjustment may be made of any measurement element. — Yes☐ No ☐ N/A ☐

3.3. **Maintenance of Vapor State.** - A device shall be so designed and installed that the product being measured will remain in a vapor state during passage through the meter. — Yes☐ No ☐ N/A ☐

3.4. **Automatic Temperature Compensation.** - A device may be equipped with an adjustable automatic means for adjusting the indication and registration of the measured volume of vapor to the volume at 15 °C (60 °F). — Yes☐ No ☐ N/A ☐

4. Design of Discharge Lines

Code Reference S.3.

4.1 **Diversion of Measured Vapor.** - No means shall be provided by which any measured vapor can be diverted from the measuring chamber of the meter or the discharge line therefrom. — Yes☐ No ☐ N/A ☐

5. Repeatability of Indications

Code Reference: G-S.5.4.

The quantity measured by a device shall be repeatable within tolerance for the same indication. One condition that may create a problem is that the value of the quantity division may be large relative to the tolerance. A delivery must be within tolerance wherever the delivery is stopped within the nominal indication of the test draft. Meters that may be at the tolerance limit may be out of tolerance at an extreme limit of the nominal quantity indication.

5.1. When a digital indicator is tested, the delivered quantity shall be within tolerance at any point within the quantity-value division for the test draft. — Yes☐ No ☐ N/A ☐

The following philosophy and list of sealable parameters applies to provision for sealing all liquid/vapor-measuring devices.

An electronic data audit trail is a means of allowing a weights and measures inspector to review how many times any electronic adjustment, which affects the accuracy of a weight, or volume measurement has been changed. The information contained in the audit trail shall consist of a cumulative and non-destructible number (even if a power failure occurs) which increments each time any of the adjustments required to be sealed have been changed. The electronic data audit trail information shall be capable of being recalled by the official on the main display of the device.

As a minimum, devices which use an audit trail to provide security for sealable parameters shall satisfy the following criteria and shall use the format set forth in Appendix A of the checklist for Liquid-Measuring Devices.

Philosophy for Sealing
Typical Features to be Sealed

Principles for Determining Features to be Sealed

The need to seal some features depends upon:

- The ease with which the feature or the selection of the feature can be used to facilitate fraud; and
- The likelihood that the use of the feature will result in fraud not being detected.

Features or functions which the operator routinely uses as part of device operation, such as setting the unit prices on dispensers and maintaining unit prices in price look-up codes stored in memory, are not sealable parameters and shall not be sealed.

If a parameter (or set of parameters) selection would result in performance that would be obviously in error, such as the selection of parameters for different countries, then it is not necessary to seal the selection of these features.

If individual device characteristics are selectable from a "menu" or a series of programming steps, then access to the "programming mode" must be sealable. (Note: If an audit trail is the only means of security, then the audit trail shall update only after at least one sealable parameter has been changed; simply accessing the sealable parameters via a menu shall not update the audit trail.)

If a physical act, such as cutting a wire is required to change a parameter setting and physically repairing the cut is required to reactivate the parameter, then this physical repair process would be considered an acceptable way to select parameters without requiring a physical seal or an audit trail.

Typical Features and Parameters to be Sealed

The following provides examples of configuration and calibration parameters that are to be sealed. The examples are provided for guidance and are not intended to cover all possible parameters.

Calibration Parameters: Calibration parameters are those parameters whose values are expected to change as a result of accuracy adjustments. Examples include the following.

1. Measuring element adjustments where linearity corrections are used, e.g., flow rate 1 and meter factor 1, flow rate 2 and meter factor 2, etc.
2. Mass flow meter adjustments for zero adjustments (not simply setting the display to zero) and span settings.

Configuration Parameters: Configuration parameters are those parameters whose values are expected to be entered only once and not changed after all initial installation settings are made. Examples include the following.

1. Octane or other blend setting ratios (optional in Canada at this time)
2. Temperature, pressure, density, and other sensor settings for zero, span, and offset values
3. Measurement units (in Canada, only if not displayed or printed on the primary register)
4. Temperature compensation table, liquid coefficient of expansion, or compressibility factors or tables
5. Liquid density setting (in Canada, only if not displayed or printed on the primary register) and allowable liquid density input range
6. Vapor pressures of liquids if used in calculations to establish the quantity
7. Meter or sensor temperature compensation factors
8. False or missing pulse limits for dual pulse systems (Canada only)
9. On/off status of automatic temperature, pressure, or density correction
10. Automatic or manual data input for sensors
11. Dual pulse checking feature status on or off
12. Flow control settings (optional in Canada)
13. Filtering constants

Hydrocarbon Gas-Vapor Measuring Device Features and Parameters	
Typical Features or Parameters to be Sealed	**Typical Features or Parameters Not Required to be Sealed**
Measuring element adjustment (both mechanical and electronic)	Analog-to-digital converters
Linearity correction values	Quantity division value (display resolution)
Measurement units (e.g., cubic feet to cubic meters)	Double pulse counting
~~Octane blend setting for retail motor-fuel dispensers~~	Communications
Any tables or settings accessed by the software or manually entered to establish the quantity (e.g., specific gravity, pressure, etc.)	
Density ranges	
Pulsers	
Signal pick-up (magnetic or reluctance)	
Temperature probes and temperature offsets in software	
Pressure and density sensors and transducers	
Flow control settings, e.g., flow rates for slow-flow start, quantity for slow-flow start and stop	
Temperature compensating systems (on/off)	
Differential pressure valves	
As a point of clarification, the flow control settings referenced above are those controls typically incorporated into the installations of large-capacity meters (wholesale meters). The reference does not include the point at which retail motor-fuel dispensers slow product flow during a prepaid transaction to enable the dispenser to stop at the preset amount.	

Note: The above examples of adjustments, parameters, and features to be sealed are to be considered "typical" or "normal." This list may not be all inclusive. Some parameters other than those listed, which affect the metrological performance of the device, must be sealed. If listed parameters or other parameters, which may affect the metrological function of the device, are not sealed, the manufacturer must demonstrate that all settings comply with the most stringent requirements for the application of the device (i.e., the parameter does not affect compliance with Handbook 44).

(Section 3.33. of Handbook 44, Code for Hydrocarbon Gas Vapor-Measuring Devices, does not include specific design criteria for electronic audit trails. Based upon G-A.3., Special and Unclassified Equipment, and G-S.8., Provisions for Sealing Electronic Adjustable Components, Table S.2.2.of the Liquid-Measuring Devices Code, Categories of Device and Methods of Sealing, will be applied to the type evaluation of cryogenic devices until specific design criteria are added to Section 3.33. of Handbook 44 for the design of audit trails installed in Hydrocarbon Gas Vapor-measuring devices.)

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. 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):

- 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 though 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. 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.

Code Reference: G-UR.1.1. Suitability of Equipment

A device must be properly designed and have sufficient capacity to be suitable to use in a particular application. A device must measure the appropriate characteristics of a commodity to accurately determine the quantity, have the necessary components (e.g. vapor eliminator) to eliminate factors that may cause measurement errors during normal use, have sufficient capacity to indicate the quantity measured and the associated total price if it is a computing device. The meter must have the proper flow rate capacity to operate over the actual flow rates for the application, and the device must have a quantity division appropriate for the application. Some specific requirements for device characteristics are given in the specific codes for particular devices.

2.25. The equipment is suitable for its intended application. Yes☐ No ☐ N/A ☐

Code Reference: G-UR.1.2. Environment

2.26. Equipment shall be suitable for use in the environment in which it will be used. Suitability with respect to environment includes the effects of wind, weather, temperature variations, and radio frequency interference. A device must work and remain accurate under its actual conditions of use. Yes☐ No ☐ N/A ☐

Code Reference: G-UR.3.3. Position of Equipment

Paragraph G-UR.3.3. requires that the primary indicating element be visible from a reasonable customer position. Many electronic vehicle-mounted metering/controlling systems on which transaction information is displayed are mounted inside the cab of the delivery vehicle. This location is not considered visible from a reasonable customer position. Some systems provide a remote customer display as a standard feature and some do not. The application section of any Certificate of Conformance issued to a vehicle-mounted metering/controlling system must limit the system to installations where a customer indicator is provided and located in a reasonable customer position (e.g., at the meter on the rear of the vehicle).

A. Field Evaluation and Permanence Test for Hydrocarbon Gas Vapor Meters

The following tests are to be run on vapor meter as part of the permanence test:

1. Three tests at the maximum discharge rate.
2. Three slow-flow tests. (Refer to slow-flow tests below)
3. One low-flame test. (Refer to low-flame test below)

Only one meter will be required for the initial test, after which the meter must have air or product passed through it as part of the permanence test. The amount of air or product shall be at least the maximum flow rate times 1000. California weights and measures performs this test in approximately 60 days. Although it is longer than the usual 30-day test, this is considered appropriate because these meters are usually tested only every ten years.

Following the period of use, the tests listed above are to be repeated. All results within the range of flow rates to be included on the certificate of conformance must be within the applicable tolerances. Extended flow range testing performed at the manufacturer's discretion may be included on the certificate of conformance provided the results are within the acceptable tolerances.

B. **Test Medium** – The device shall be tested with air or the product to be measured.

C. **Temperature and Volume Change** - Care should be exercised to reduce to a minimum any volume changes. The temperature of the air, bell-prover oil, and the meters under test should be within 1 °C (2 °F) of one another. The devices should remain in the proving room for at least 16 hours before starting any proving operations to allow the device temperature to approximate the temperature of the proving device.

D. **Test Drafts** - Except for low-flame tests, test drafts shall be at least equal to one complete revolution of the largest capacity proving indicator, and shall in no case be less than 0.05 m^3 or 2 ft^3. All flow rates shall be controlled by suitable outlet orifices.

E. **Test Procedures** - If a device is equipped with an automatic temperature compensator, the proving device reading shall be corrected to 15 °C (60 °F), using an approved table.

F. **Normal Tests** - The normal test of a device shall be made at a rate not to exceed the capacity rate given on the badge of the meter.

G. **Automatic Temperature Compensation** - If a device is equipped with an automatic temperature compensator, the quantity of the test draft indication of the standard shall be corrected to 15°C (60 °F).

H. **Repeatability Tests** – Tests for repeatability should include a minimum of three consecutive test drafts of approximately the same size and be conducted under controlled conditions where variations in factors, such as temperature pressure, and flow rate are reduced to the extent that they will not affect the results obtained.

I. **Special Tests** - "Special" tests shall be made to develop the operating characteristics of a device, and any special elements and accessories attached to or associated with the device. Any test except as set forth in N.4.1. shall be considered a special test.

J. **Slow Test.** - The device shall be tested at a rate not less than 20 percent of the marked capacity rate, or (at the check rate) not less than the minimum flow rate if marked on the device, whichever is less.

K. **Low-Flame Test.** - The device shall be tested at an extremely low-flow rate as given in HB 44 Sec 3.33.Table 1. The test shall consist of passing air at a pressure of 375 Pa (1.5 in water column) through the meter for not less than 60 minutes. The meter shall continue to advance at the conclusion of the test period.

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Appendix E

Checklist for Testing Electronic Digital Indicators with Simulated Pulses

This checklist is used for Technical Policy **U. Evaluating electronic digital indicators submitted separate from a measuring element.**

Code Reference: G-S.1. Identification

All equipment shall be clearly and permanently marked on an exterior visible surface after installation. It must contain the following information (prefix lettering may be initial capitals, all capitals, or all lower case):

1.1.	Name, initials, or trademark of the manufacturer.	**Yes** ☐ **No** ☐ **N/A** ☐
1.2.	A model designation that positively identifies the pattern or design. The Model designation shall be prefaced by the word "Model", "Type", or "Pattern". These terms may be followed by the term "Number" or an abbreviation of that word. The abbreviation for the word "Number" shall, at a minimum, begin with the letter "N" (e.g., No or No.) The abbreviation for the word "Model" shall be "Mod" or "Mod.".	**Yes** ☐ **No** ☐ **N/A** ☐
1.3.	Except for not built-for-purpose, software-based devices, a nonrepetitive serial number. The serial number shall be prefaced by words, an abbreviation, or a symbol, that clearly identifies the number as the required serial number. 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.).	**Yes** ☐ **No** ☐ **N/A** ☐
1.4.	For not built-for-purpose, software-based devices the current software version or revision designation. The version or revision identifier shall be prefaced by the word "Version" or "Revision" as appropriate and either word may be followed by the word "Number." The abbreviations for the word "Version" shall, as a minimum, begin with the letter "V". The abbreviation for the word "Number" shall, as a minimum, begin with the letter "N" (e.g., No or No.).	**Yes** ☐ **No** ☐ **N/A** ☐

Code Reference G-S.1. (e).

1.5.	The NTEP Certificate of Conformance (CC) Number or a corresponding CC addendum number for devices that have a CC. 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.).	**Yes** ☐ **No** ☐ **N/A** ☐

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, then note its intended location below 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, Software-Based Devices Not Built-for-Purpose Devices, Software-Based

1.6. For not built-for-purpose, software-based devices the following shall apply:

1.6.1. The required information in G-S.1 Identification. (a), (b), (d), and (e) shall be permanently marked or continuously displayed on the device; or

1.6.2. The Certificate of Conformance (CC) Number shall be:

- permanently marked on the device; or
- continuously displayed; or
- 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."

Note: For (1.6.2.), 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.

1.7. The identification badge must be visible after installation. **Yes** ☐ **No** ☐ **N/A** ☐

1.8. The identification badge must be permanent. **Yes** ☐ **No** ☐ **N/A** ☐

Code Reference: G-S.2. Facilitation of Fraud

This applies to all metering system indicators installed at a fixed location or vehicle tank meter applications and controlled remotely or within the device itself.
This requirement addresses the process of changing the unit price or unit prices set in a metering system.

1.9. The system shall prevent a change of unit price during a delivery. **Yes** ☐ **No** ☐ **N/A** ☐

Code Reference: G-S.3. Permanence

Equipment shall be of such materials, design, and construction that, under normal service conditions:

1.10. Accuracy will be maintained. **Yes** ☐ **No** ☐ **N/A** ☐

1.11. Operating parts will continue to function as intended, **Yes** ☐ **No** ☐ **N/A** ☐

1.12. Adjustments will remain reasonably permanent. **Yes** ☐ **No** ☐ **N/A** ☐

Code Reference: G-S.4. Interchange or Reversal of Parts

If a metering system has parts that may be interchanged or reversed in normal field assembly, the system shall either be constructed so that reversal will not affect the accuracy of the system or the parts must be marked to indicate their proper position. For most metering devices, this applies only to the reversal of connectors of cables to peripheral devices.

If a metering system has any parts that may be interchanged or reversed in normal field assembly, the parts must either be:

1.13. Constructed so that reversal will not affect performance, **Yes** ☐ **No** ☐ **N/A** ☐

1.14. Marked or keyed to indicate their proper positions. **Yes** ☐ **No** ☐ **N/A** ☐

2. Indications, and Recorded Representations

Code Reference: G-S.5.1. Indicating and Recording Elements

Several general requirements facilitate the reading and interpretation of displayed values. Each display for quantity or total price must be appropriate in design and have sufficient capacity for particular applications to be suitable for the application. Metering devices must be capable of indicating the maximum quantity and money values that can normally be expected in a particular application.

2.1. **Minimum quantity value indications.**

2.1.1. Display is capable of 1.0 **Yes** ☐ **No** ☐ **N/A** ☐

2.1.2. Display is capable of 01 **Yes** ☐ **No** ☐ **N/A** ☐

2.1.3. Display is capable of 0.01 **Yes** ☐ **No** ☐ **N/A** ☐

2.1.4. Display is capable of 0.001 **Yes** ☐ **No** ☐ **N/A** ☐

2.1.5. Display is capable of other (fill in blank): **Yes** ☐ **No** ☐ **N/A** ☐

2.2.	**Money value display**	
	2.2.1. Money value is properly displayed	**Yes** ☐ **No** ☐ **N/A** ☐
3.2.	**The indications must be clear, definite, and accurate.**	
	2.2.1. Values must be clear, definite, and accurate	**Yes** ☐ **No** ☐ **N/A** ☐
	2.2.2. Unit of measure is programmable Gallon, Liter, Pound	**Yes** ☐ **No** ☐ **N/A** ☐
	2.2.2. Unit of measure is applied by permanent marking on indicator housing	**Yes** ☐ **No** ☐ **N/A** ☐
2.3.	The indications must be easily read under normal operating conditions.	**Yes** ☐ **No** ☐ **N/A** ☐
2.4.	Symbols for decimal points shall clearly identify the decimal position. (Generally acceptable symbols are dots, small commas, or x.)	**Yes** ☐ **No** ☐ **N/A** ☐
2.5.	**The zero indication must consist of at least the following minimum indications as appropriate:**	
	2.5.1. One digit to the left and all digits to the right of a decimal point.	**Yes** ☐ **No** ☐ **N/A** ☐
	2.5.2. If a decimal point is not used, at least one active decade must be displayed.	**Yes** ☐ **No** ☐ **N/A** ☐
2.6.	Totalizer values must be accurate to the nearest minimum interval with decimal points displayed or subordinate digits adequately differentiated from others, if applicable.	**Yes** ☐ **No** ☐ **N/A** ☐

Code Reference: G-S.5.2.2. Digital Indication and Representation

Basic operating requirements for devices:

2.7.	All digital values of like value in a system shall agree with one another.	**Yes** ☐ **No** ☐ **N/A** ☐
2.8.	A digital value coincides with its associated analog value to the nearest minimum graduation.	**Yes** ☐ **No** ☐ **N/A** ☐
2.9.	Digital values shall round off to the nearest minimum unit that can be indicated or recorded.	**Yes** ☐ **No** ☐ **N/A** ☐
2.10.	When a digital zero display is provided, the zero indication shall consist of at least one digit to the left and all digits to the right of the decimal point.	**Yes** ☐ **No** ☐ **N/A** ☐

Agreement of indications shall be checked for several deliveries. The totalizer shall be checked for accuracy and agreement with individual deliveries and with other totalizers in the system.

2.11.	All digital values of like value in a system agree with one another.	**Yes** ☐ **No** ☐ **N/A** ☐
2.12.	Digital values coincide with associated analog values to the nearest minimum graduation. We do not request to test a digital indicator with an analog register. This sounds like a field enforcement test?	**Yes** ☐ **No** ☐ **N/A** ☐
2.13.	Digital values "round off" to the nearest minimum unit that can be indicated or recorded.	**Yes** ☐ **No** ☐ **N/A** ☐
2.14.	The device totalizer shall agree with the total of the individual deliveries and with other totalizers in the system.	**Yes** ☐ **No** ☐ **N/A** ☐

Code Reference: G-S.5.2.3. Size and Character

Digits used for comparable values must be uniform in size and character, but subordinate values may be displayed in different and less prominent digits than more significant values. The latter more likely occurs on analog devices. In digital indications, the digits are usually of uniform size throughout a particular display. The size of digits may differ for different quantities, for example, the quantity and unit price digits may be smaller than the total price digits.

2.15.		**Yes** ☐ **No** ☐ **N/A** ☐
2.16.	Indications and recorded representations shall be appropriately portrayed or designated.	**Yes** ☐ **No** ☐ **N/A** ☐

Code Reference: G-S.5.2.4. Values Defined

2.17. Values shall be adequately defined by a sufficient number of figures, words, symbols, or combinations, which are uniformly placed so that they do not interfere with the accuracy of the reading. **Yes** ☐ **No** ☐ **N/A** ☐

Code Reference: G-S.5.2.5. Permanence

2.18. Indications, or recorded representations and their defining figures, words, and symbols shall be of such character that they will not tend to easily become obliterated or illegible. **Yes** ☐ **No** ☐ **N/A** ☐

Code Reference: G-S.5.3., G-S.5.3.1. Values of Graduated Intervals or Increments

2.19. Digital indications and recorded representations shall be uniform in size, character, and value throughout any series. Quantity values shall be defined by the specific unit of measure in use. **Yes** ☐ **No** ☐ **N/A** ☐

2.20. Indications shall be uniform throughout any series. **Yes** ☐ **No** ☐ **N/A** ☐

2.21. Quantity values shall be identified by the unit of measure. **Yes** ☐ **No** ☐ **N/A** ☐

Code Reference: G-S.5.4. Repeatability of Indications

The quantity measured by a device shall be repeatable within tolerance for the same indication. One condition that may create a problem is that the value of the quantity division may be large relative to the tolerance. A delivery must be within tolerance wherever the delivery is stopped within the nominal indication of the test draft. Meters that may be at the tolerance limit may be out of tolerance at an extreme limit of the nominal quantity indication.

2.22. When a digital indicator is tested, the delivered quantity shall be within tolerance at any point within the quantity-value division for the test draft. **Yes** ☐ **No** ☐ **N/A** ☐

Code Reference: G-S.5.6. Recorded Representations

2.23. All recorded values shall be digital. (See also G-UR.3.3.) **Yes** ☐ **No** ☐ **N/A** ☐

Code Reference: G-S.5.7. Magnified ~~Graduations and~~ Indications

2.24. Magnified indications shall conform to all requirements for ~~graduations and~~ indications. **Yes** ☐ **No** ☐ **N/A** ☐

Code Reference: G-S.6. Marking, Operational Controls, Indications, and Features

All operational controls, indications, and features shall be clearly and definitely identified. Nonfunctional keys and annunciators shall not be marked because their marking implies that the key or annunciator is functional and should be inspected or tested by the enforcement official. Keys and operator controls that are visible to a customer in a direct sale transaction shall be marked with words or symbols to the extent that they can be understood by the customer and aid in understanding the transaction. Keys that are visible only to the console operator need to be marked only to the extent that a trained operator can understand the function of each key.

2.25. All operational controls, indications, and features including switches, lights, displays, and push buttons shall be clearly and definitely identified. **Yes** ☐ **No** ☐ **N/A** ☐

2.26. All dual function (multi-function) keys or controls shall be marked to clearly identify all functions. **Yes** ☐ **No** ☐ **N/A** ☐

2.27. Non-functional controls and annunciators shall not be marked. **Yes** ☐ **No** ☐ **N/A** ☐

Code Reference: G-S.7. Lettering, Readability

2.28. Required markings and instructions shall be permanent and easily read. **Yes** ☐ **No** ☐ **N/A** ☐

Code Reference: G-S.8. Sealing Electronic Adjustable Components, and Provision for Sealing of Adjustable Components or Audit Trial

2.29.	Electronic adjustable components that affect the performance of a device shall provide for an approved means of security (e.g. data change audit trail) or for physically applying a security seal. These components include the following: (1) mechanical adjustment mechanism for meters, (2) the electronic calibration factor and automatic temperature compensator for electronic meter registers, (3) selection of pressure for density correction capability and correction values, and (4) pulser setting and gallon/liter conversion switches when they may accidentally or intentionally be used to perpetrate fraud.	**Yes** □ **No** □ **N/A** □

The following philosophy and list of sealable parameters applies to provision for sealing all liquid-measuring devices.

An electronic data audit trail is a means of allowing a weights and measures inspector to review how many times any electronic adjustment, which affects the accuracy of a volume measurement has been changed. The information contained in the audit trail shall consist of a cumulative and non-destructible number (even if a power failure occurs) which increments each time any of the adjustments required to be sealed have been changed. The electronic data audit trail information shall be capable of being recalled by the official on the main display of the device.

As a minimum, devices which use an audit trail to provide security for sealable parameters shall satisfy the following criteria and shall use the format set forth in Appendix A of the checklist for Liquid-Measuring Devices.

Philosophy for Sealing

Typical Features to be Sealed

Principles for Determining Features to be Sealed

The need to seal some features depends upon:

- The ease with which the feature or the selection of the feature can be used to facilitate fraud; and
- The likelihood that the use of the feature will result in fraud not being detected.

Features or functions which the operator routinely uses as part of device operation, such as setting the unit prices on dispensers and maintaining unit prices in price look-up codes stored in memory, are not sealable parameters and shall not be sealed.

If a parameter (or set of parameters) selection would result in performance that would be obviously in error, such as the selection of parameters for different countries, then it is not necessary to seal the selection of these features.

If individual device characteristics are selectable from a "menu" or a series of programming steps, then access to the "programming mode" must be sealable. (Note: If an audit trail is the only means of security, then the audit trail shall update only after at least one sealable parameter has been changed; simply accessing the sealable parameters via a menu shall not update the audit trail.)

If a physical act, such as cutting a wire is required to change a parameter setting and physically repairing the cut is required to reactivate the parameter, then this physical repair process would be considered an acceptable way to select parameters without requiring a physical seal or an audit trail.

Typical Features and Parameters to be Sealed

The following provides examples of configuration and calibration parameters that are to be sealed. The examples are provided for guidance and are not intended to cover all possible parameters.

Calibration Parameters: Calibration parameters are those parameters whose values are expected to change as a result of accuracy adjustments. Examples include the following.

1. Measuring element adjustments where linearity corrections are used, e.g., flow rate 1 and meter factor 1, flow rate 2 and meter factor 2, etc.
2. Mass flow meter adjustments for zero adjustments (not simply setting the display to zero) and span settings.

Configuration Parameters: Configuration parameters are those parameters whose values are expected to be entered only once and not changed after all initial installation settings are made. Examples include the following.

1. Octane or other blend setting ratios (optional in Canada at this time)
2. Temperature, pressure, density, and other sensor settings for zero, span, and offset values
3. Measurement units (in Canada, only if not displayed or printed on the primary register)
4. Temperature compensation table, liquid coefficient of expansion, or compressibility factors or tables
5. Liquid density setting (in Canada, only if not displayed or printed on the primary register) and allowable liquid density input range
6. Vapor pressures of liquids if used in calculations to establish the quantity
7. Meter or sensor temperature compensation factors
8. False or missing pulse limits for dual pulse systems (Canada only)
9. On/off status of automatic temperature, pressure, or density correction
10. Automatic or manual data input for sensors
11. Dual pulse checking feature status on or off
12. Flow control settings (optional in Canada)

13. Filtering constants

Liquid-Measuring Device Features and Parameters	
Typical Features or Parameters to be Sealed	**Typical Features or Parameters Not Required to be Sealed**
Measuring element adjustment (both mechanical and electronic)	Analog-to-digital converters
Linearity correction values	Quantity division value (display resolution)
Measurement units (e.g., gallons to liters)	Double pulse counting
Octane blend setting for retail motor-fuel dispensers	Communications
Any tables or settings accessed by the software or manually entered to establish the quantity (e.g., specific gravity, pressure, etc.)	
Density ranges	
Pulsers	
Signal pick-up (magnetic or reluctance)	
Temperature probes and temperature offsets in software	
Pressure and density sensors and transducers	
Flow control settings, e.g., flow rates for slow-flow start, quantity for slow-flow start and stop	
Temperature compensating systems (on/off)	
Differential pressure valves	
As a point of clarification, the flow control settings referenced above are those controls typically incorporated into the installations of large-capacity meters (wholesale meters). The reference does not include the point at which retail motor-fuel dispensers slow product flow during a prepaid transaction to enable the dispenser to stop at the preset amount.	

Note: The above examples of adjustments, parameters, and features to be sealed are to be considered "typical" or "normal." This list may not be all inclusive. Some parameters other than those listed, which affect the metrological performance of the device, must be sealed. If listed parameters or other parameters, which may affect the metrological function of the device, are not sealed, the manufacturer must demonstrate that all settings comply with the most stringent requirements for the application of the device (i.e., the parameter does not affect compliance with Handbook 44).

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. **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):

- 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 though 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. **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.

____

____

Code Reference: G-UR.1.1. Suitability of Equipment

A device must be properly designed and have sufficient capacity to be suitable to use in a particular application. A device must measure the appropriate characteristics of a commodity to accurately determine the quantity, have the necessary components (e.g. vapor eliminator) to eliminate factors that may cause measurement errors during normal use, have sufficient capacity to indicate the quantity measured and the associated total price if it is a computing device. The meter must have the proper flow rate capacity to operate over the actual flow rates for the application, and the device must have a quantity division appropriate for the application. Some specific requirements for device characteristics are given in the specific codes for particular devices.

2.24. The equipment is suitable for its intended application. **Yes** □ **No** □ **N/A** □

2.25.	Equipment shall be suitable for use in the environment in which it will be used. Suitability with respect to environment includes the effects of wind, weather, temperature variations, and radio frequency interference. A device must work and remain accurate under its actual conditions of use.		**Yes** ☐ **No** ☐ **N/A** ☐
2.26.	**Simulator tests: All tests shall have a minimum of 10,000 pulses applied to the device for each test. Test with a minimum of two API/Density settings.**		
Product:		**Meter Factor:**	**K Factor:**
1	Test at a temperature between 55 – 65 degrees F at the manufactures rated maximum frequency/pulse rate.	API Gravity: Temperature:	**Yes** ☐ **No** ☐ **N/A** ☐
2	Test at a temperature between 55 – 65 degrees F at manufactures rated minimum frequency/pulse rate.	API Gravity: Temperature:	**Yes** ☐ **No** ☐ **N/A** ☐
3	Test at a temperature below 35 degrees F at manufactures rated maximum frequency/pulse rate.	API Gravity: Temperature:	**Yes** ☐ **No** ☐ **N/A** ☐
4	Test at a temperature below 35 degrees F at manufactures rated minimum frequency/pulse rate.	API Gravity: Temperature:	**Yes** ☐ **No** ☐ **N/A** ☐
5	Test at a temperature above 100 degrees F at manufactures rated maximum frequency/pulse rate.	API Gravity: Temperature:	**Yes** ☐ **No** ☐ **N/A** ☐
6	Test at a temperature above 100 degrees F at manufactures rated minimum frequency/pulse rate.	API Gravity: Temperature:	**Yes** ☐ **No** ☐ **N/A** ☐
7	Test at a temperature between 55 – 65 degrees F at the manufactures rated maximum frequency/pulse rate.	API Gravity/Density: Temperature:	**Yes** ☐ **No** ☐ **N/A** ☐
8	Test at a temperature between 55 – 65 degrees F at manufactures rated minimum frequency/pulse rate.	API Gravity/Density: Temperature:	**Yes** ☐ **No** ☐ **N/A** ☐
9	Test at a temperature below 35 degrees F at manufactures rated maximum frequency/pulse rate.	API Gravity/Density: Temperature:	**Yes** ☐ **No** ☐ **N/A** ☐
10	Test at a temperature below 35 degrees F at manufactures rated minimum frequency/pulse rate.	API Gravity/Density: Temperature:	**Yes** ☐ **No** ☐ **N/A** ☐
11	Test at a temperature above 100 degrees F at manufactures rated maximum frequency/pulse rate.	API Gravity/Density: Temperature:	**Yes** ☐ **No** ☐ **N/A** ☐
12	Test at a temperature above 100 degrees F at manufactures rated minimum frequency/pulse rate.	API Gravity/Density: Temperature:	**Yes** ☐ **No** ☐ **N/A** ☐
13		API Gravity/Density: Temperature:	**Yes** ☐ **No** ☐ **N/A** ☐
14		API Gravity/Density: Temperature:	**Yes** ☐ **No** ☐ **N/A** ☐

August 27, 2009

Mrs. Tina Butcher
NIST, Weights & Measures Div
100 Bureau Drive, MS 2600
Gaithersburg, MD 20899

Subject: Agenda Item

I used the Canadian Document VO-AP-037, Version 00.02 on Linearization Functions Incorporated in Measuring Instruments as the basis for this item. I did not find any copyright so I hope this is legal. If not, please delete.

I added a paragraph to the Scope. This paragraph would bring electronic output PD meters, turbine meters, etc that do not have a shaft output on equal requirements as other meters that currently incorporate electronics in the measuring device.

1.2 Scope

This procedure applies to pulse processing electronic devices incorporating the linearization of the pulse per unit volume versus pulse frequency. This includes all flow computers, electronic registers, correction devices and supporting software external to the measuring device. The tests verify the proper functioning and accuracy of the linearization schemes.

For pulse processing electronic devices incorporating the linearization of the pulse per unit that is within the measuring device, the results of the device accuracy and endurance tests will verify the complete measuring device capabilities. The linearization electronics of the measuring device must be protected from tampering and fraud utilizing a physical seal. No separate tests on parts of the measuring device are required.

2.1 Equipment Requirements

This needs to be reviewed by the electronic group. When we tested our linearization board in Canada, we had problems because their Duel Channel Pulser off position of the pulse did not go close enough to zero volts. We furnished them a duel channel pulser that goes down to within 0.2 volts in the off part of the pulse and then their counters worked fine.

2.5.1 and 2.5.3

The word "devices" should be "EUT"

2.6.2.1 and 2.6.2.3

Do not limit "meter Factors" to 4 or 5 points. See revised 2.6.2.5 as a method to test all points the device is capable of.

2.6.2.5

Delete Runs #2 through #5 and replace with:

2. Select frequencies that results in flow rates that lie between each pair of points programmed in 2.6.2.3. Test at each frequency.

Change Run number 6 to number 3.

One other area that I would support a change is the limit of 3 to 5 factors. The regulation should be written to cover any number of factors.

Maurice Forkert
Compliance and
Design Engineer

Measurement Canada / Mesures Canada	Approval and Calibration Services Laboratory Technical Manual

APPROVAL PROCEDURE

FOR

LINEARIZATION FUNCTIONS INCORPORATED IN MEASURING INSTRUMENTS

DOCUMENT NUMBER
VO-AP-037

VERSION: 00.02

Filename: VO-AP-037-V00.02 - Linearization functions in Measuring Instruments.wpd

Record of Change

Version	Date	Description
00.01	2005.11.30	Original Release
00.02	2005.12.08	Correct errors, make small improvements to document Add section for Step type linearization scheme.

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1.0 INTRODUCTION

1.1 Purpose

This approval procedure (AP) describes the process to evaluate the linearization functions incorporated in electronic measuring devices in order to determine compliance with applicable requirements, as provided in the *Weights and Measures Act and Regulations.*

1.2 Scope

This procedure applies to pulse processing electronic devices incorporating the linearization of the pulse per unit volume factor versus pulse frequency. This includes all flow computers, electronic registers, correction devices and supporting software external to the device. The tests verify the proper functioning and accuracy of the linearization schemes .

SEE ADDED PARAGRAPH

1.3 Applicable Documents

Document Number	Document Title
	Weights and Measures Act and Regulations Sections SVM-1
GN-LP-003	Vocabulary of Technical and Metrological Terms

1.4 Abbreviations and Symbols

N/A	

2.0 PROCEDURE

2.1 Equipment Requirements

2.1.1 Standards

Standard Number	Description / Performance Requirements
N/A	

2.1.2 *Other Equipment*

Equipment Description	Performance Requirements
Pulse Generator	The maximum frequency must be greater than the maximum input frequency of the electronic device under test. Variable output voltage of 5V with a frequency output of ±0.1% or better.
Universal Counter	The maximum frequency must be greater than the maximum rated input frequency of the electronic device under test.
Dual Channel Pulser	Dual channel, variable phase shift (0°, 90°, 120°, 180°), variable output voltage (5V, 12V, 24V)

?

2.2 Software Requirements

Software Name	Description / Performance Requirements
Microsoft Excel ASL_Linearization.xls	Accepts 4 or 5 values for the meter factor (MF) or the K factor versus flowrates, as provided by the manufacturer. During test runs, the correct factor is calculated by interpolating in between flowrates and used to measure the device's accuracy.

?

2.3 Environmental Requirements

Temperature	N/A
Humidity	N/A
Pressure	N/A

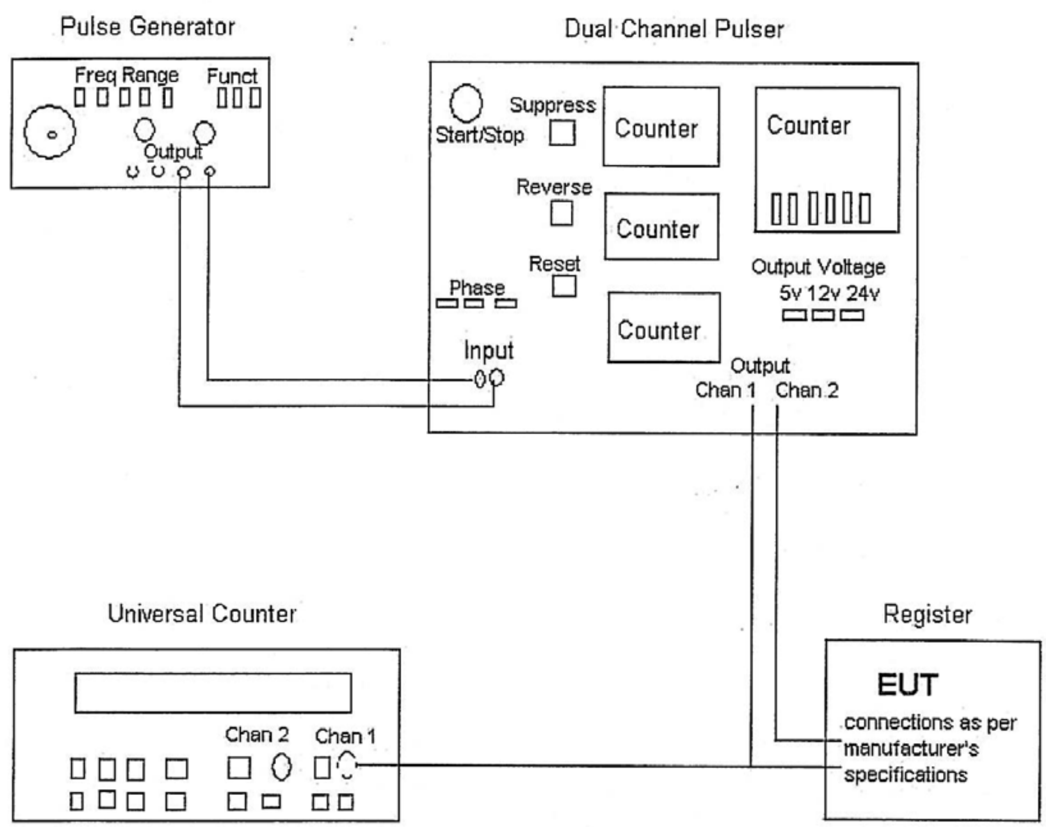
2.4 Safety Requirements

Kindly refer to the applicable Measurement Canada Health and Safety documentation.

2.5 Set-up

Kindly refer to the block diagram below for details of equipment setup and connections.

Linearization test Set-up



2.5.1 Connect the Output of the Pulse Generator to the Input of the Dual Channel Pulser, making sure to connect the positive terminals together and the negative (ground) terminals together. Select a "square wave" function and a frequency in between the maximum and minimum range of the device. ? EUT

2.5.2 On the Dual Channel Pulser select the appropriate phase shift (90°, 120° or 180°) and voltage output for the device (5V, 12V or 24V). Connect the Output of Channel 1 of the Pulser to both the Input Channel 1 of the Universal Counter and to the Input of the device as specified by the manufacturer.

EUT EUT

2.5.3 Connect the Output of Channel 2 of the Dual Channel Pulser to the Input of the device, as specified by the manufacturer.

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2.6 Instructions

2.6.1 Familiarize yourself with the device's measurement adjustment scheme. Applying codes supplied by the manufacturer, program various meter factors or K factors to determine functionality of the adjustment feature. Use Appendix A, section 3.1 to determine the type of linearization applied and to verify that the adjustment complies with established regulations.

2.6.2 Devices using step type linearization scheme

NO

2.6.2.1 In a step type adjustment scheme, a single correction factor is applied over each specific range of flow rates. For this simple and common approach, the correction factors (up to 5) and the corresponding range of flow rates are programmed to the device, as specified by the manufacturer. The calculated corrected meter factor (MF) or corrected K factor remains constant over the specified range of flow rates and only steps to a new value when the flow rate lies within a different range.

2.6.2.2 Determine the minimum and maximum input frequencies, and the maximum flow rate (Q_{max}) for the device under test. These values are required to establish test points across the full operating range of the linearization feature.

NO

2.6.2.3 Confirm the number of meter factors allowed, as specified by the manufacturer (usually 4 or 5). Divide the maximum flow rate by the number of meter factors permitted and program the values below into the device. Take care to program the values in ascending order of flow rates, starting from the minimum value, unless otherwise specified by the manufacturer.

Note: Depending on the design of the device either the error factors, the meter factors or the K factors may be specified and programmed. Select the appropriate column from the tables below to program the device accordingly.

a) If 4 meter factors are permitted:

Test points	(% Qmax) (%)	Error factor (%)	Meter factor	K factor (Pulses/L)
1	25	0.05	0.99950	0.99950 x Base K
2	50	0.24	0.99760	0.99760 x Base K
3	75	0.00	1.00000	1.00000 x Base K
4	100	-0.24	1.00240	1.00240 x Base K

b) If 5 meter factors are permitted:

Test points	(% Qmax) (%)	Error factor (%)	Meter factor	K factor (Pulses/L)
1	20	0.05	0.99950	0.99950 x Base K
2	40	0.24	0.99760	0.99760 x Base K
3	60	0.00	1.00000	1.00000 x Base K

4	80	-0.24	1.00240	1.00240 x Base K
5	100	0.00	1.00000	1.00000 x Base K

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2.6.2.4 The minimum number of pulses required to achieve an error resolution of 0.01% is 10,000. All test runs performed must include at least this number of pulses.

2.6.2.5 Using the test sheet in Appendix B, perform test runs on the device at the recommended flow rates below, ensuring to input at least the minimum number of pulses at each different rate. Select frequencies that will result in flow rates that fall in between the set points for the meter factors entered in section 2.6.2.3. As a minimum, run tests as follows:

Run	Comments
1	Select a frequency that results in a flow rate below the first point programmed in 2.6.2.3
2	Select a frequency that results in a flow rate that lies between the first and second points programmed in 2.6.2.3
3	Select a frequency that results in a flow rate that lies between the second and third points programmed in 2.6.2.3
4	Select a frequency that results in a flow rate that lies between the third and forth points programmed in 2.6.2.3 (if a minimum of 4 factors are used)
5	Select a frequency that results in a flow rate that lies between the forth and fifth points programmed in 2.6.2.3 (if a minimum of 5 factors are used)
6	Select a frequency that results in a flow rate that lies above the last point programmed in 2.6.2.3

2.6.3 Devices using linear interpolation linearization scheme

2.6.3.1 In this scheme, referred to as "linear interpolation" (sometimes also referred to as "point-to-point linearization"), separate and discreet straight lines of the form $Y = mX + b$ are drawn between adjacent predetermined calibration values. The"Y" values (either corrected meter factors (MF) or corrected K factors) are calculated relative to the pulse frequency rate "X". These values are used to correct the raw meter pulse signal and provide an estimate of the true value of flow.

2.6.3.2 Same as 2.6.2.2.

2.6.3.3 Same as 2.6.2.3.

2.6.3.4 Same as 2.6.2.4

2.6.3.5 Same as 2.6.2.5

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2.6.4 *Devices using curve fitting of the form $Y = a + b(1/X) + cX + d(X^2) + e(X^3)$*

2.6.4.1 The third method employs the reduction of calibration data, (meter factor or K factor "Y" vs flow rate "X"), using a preselected modelling equation. One model commonly chosen is a 4th order equation in the form of $Y = a + b(1/X) + c(X) + d(X^2) + e(X^3)$. The data manipulation is usually performed using software external to the flow computer or correction device, and results in a series of coefficients (a, b, c, d, e, etc.) and an estimate of the uncertainty of the curve fit. The equation coefficients are then programmed into the correction device or flow computer. The calculated corrections are then used by the flow computer or correction device to correct the "raw meter pulse signal" and provide an estimate of the true value of flow.

2.6.4.2 Assuming that the model is a 4th order equation, program the following coefficients into the correction device for evaluation purposes:

Coefficient	Value
a	6.5072493
b	-62.267514
c	-0.13650801
d	0.00085092719
e	-5.105311×10^{-7}

2.6.4.3 Using the test sheet in Appendix B, perform test runs on the device at the recommended flow rates below, ensuring to input at least the minimum number of pulses at each different rate. Select frequencies that will result in flow rates that span the full range of the device's capabilities.. As a minimum, run tests as follows:

Run	% Qmax	Comments
1	10	Select a frequency that results in a flow rate that lies between 0% and 20% of the maximum.
2	30	Select a frequency that results in a flow rate that lies between 20% and 40%. maximum.
3	50	Select a frequency that results in a flow rate that lies between 40% and 60% maximum.
4	70	Select a frequency that results in a flow rate that lies between 60% and 80% maximum.
5	90	Select a frequency that results in a flow rate that lies between 80% and 100% maximum.
6	110	Select a frequency that results in a flow rate that lies above 100% of the specified maximum.

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2.7 Calculations

2.7.1 Calculations of K factor or Meter Factor (MF) for a step type linearization method

2.7.1.1 To calculate the K factor or MF during test runs, record the flow rate. From the step graph of the K factor (Y) versus flow rate (X) programmed to the device, move along the X axis to the recorded flow rate. Read the corresponding K factor (Y value)

2.7.1.2 Sample calculation for step type linearization method

Assume that a device can accept 4 K factors that are programmed as per the table presented in section 2.6.2.3(a). Then for any flow rates in between 25% Q_{max} and 50% Q_{max} the K factor is 0.99950 x Base K factor. Also for any flow rates above 100% Qmax the K factor is 1.00240 x Base K factor.

2.7.2 Calculations of K factor or Meter Factor (MF) for the linear interpolation linearization method

2.7.2.1 With this type of linearization scheme, the error factors are calculated by interpolating in between two set data points. To calculate the K factor or MF during test runs, record the flow rate. From the linear graph of the K factor (Y) versus flow rate (X) programmed to the device, move along the X axis to the recorded flow rate. Read the corresponding K factor (Y value), which can be calculated as follows:

$$Y = Y_1 + \frac{(X - X_1)}{(X_2 - X_1)} \times (Y_2 - Y_1)$$

where Y_2 = K factor of next highest set point
X_2 = Flow rate of next highest set point
Y_1 = K factor of next lowest set point
X_1 = Flow rate of next lowest set point
Y = K factor to be calculated
X = Flow rate of current test

2.7.2.2 Sample calculation for linear interpolation type linearization method

Assume that a device can accept 5 MFs that are programmed as per the table presented in section 2.6.2.3(b). Then for a flow rate of 30% Q_{max} the MF is 0.99855, calculated as follows:

$$Y = 0.9995 + \frac{(30 - 20)}{(40 - 20)} \times (0.9976 - 0.9995) = 0.99855$$

2.7.3 Calculations of K factor or Meter Factor (MF) for the curve fitting linearization method

2.7.3.1 With the curve fitting scheme, the error factors are calculated using coefficients for a polynomial specified by the manufacturer, usually of the form of $Y = a + b(1/X) + c(X) + d(X^2) + e(X^3)$. To calculate the K factor or MF during test runs, record the flow rate. From the polynomial graph of the K factor (Y) versus flow rate (X) programmed to the device, move along the X axis to the recorded flow rate. Read the corresponding K factor (Y value), which can also be calculated by substituting the flow rate (X value) into the specified curve.

2.7.3.2 Sample calculation for curve fitting type linearization method

If the coefficients in section 2.6.4.2 above are programmed into the device, then the expected theoretical values for the correction factor and the volume at the flow rates below are:

Test points	Flow rate (L/min)	Expected Meter factor	Expected K factor (Pulses/L)	Expected Volume (L)
1	20	1.00000	1.00000 x Base K	Pulse count ÷ (1.00000 x Base K)
2	50	0.50000	0.50000 x Base K	Pulse count ÷ (0.50000 x Base K)
3	90	0.05000	0.05000 x Base K	Pulse count ÷ (0.05000 x Base K)
4	130	1.54126	1.54126 x Base K	Pulse count ÷ (1.54126 x Base K)
5	180	6.18250	6.18250 x Base K	Pulse count ÷ (6.18250 x Base K)
6	110	13.64210	13.6421 x Base K	Pulse count ÷ (13.6421 x Base K)

Note: For other flow rates calculate the expected correction factor using the recommended coefficients in section 2.6.4.2.

2.7.4 Linearization Error Calculations

2.7.4.1 Regardless of the correction scheme used to determine a true volume, the linearization error is a function of the volume indicated by the device ($V_{indicated}$) and the expected theoretical volume ($V_{expected}$) calculated as follows.

$$\text{Linearization Error (\%)} = \frac{V_{indicated} - V_{expected}}{V_{expected}} \times 100$$

where

$$V_{expected} = \frac{\text{Pulse count}}{\text{Calculated Linearizing K factor}}$$ if the K factor is programmed

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or

$$V_{expected} = \frac{\text{Pulse count x Calculated Linearizing Mf}}{\text{Base K factor}}$$ if Meter Factor is programmed

2.8 Pass/Fail Criteria

Description	Criteria	Reference	Pass–Fail
General Requirements	Kindly refer to Appendix 3.1 "General Requirements Checklist - Linearization function".	SVM-1	
Linearization Error	Must not exceed ±0.02%	???	

Note: The Linearization spreadsheet **ASL_Linearization.xls** is available to help interpolate meter factors and calculate the percentage errors automatically. Kindly use the spreadsheet in conjunction with the test sheet presented in Appendix B to assist you in the evaluation.

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3.0 APPENDICES, WORK SHEETS AND TABLES

3.1 Appendix A: General Requirements Checklist - Linearization function

			Comments
1)	Linearization function characteristics:		
a)	Type of function: G Step G Linear G Function Desc:____________ G Other Decs:____________		
b)	Number of programmable points:____ Resolution:____________		
c)	Adjustment variable: G K factor or G Meter factor		
d)	Sampling frequency:____________		
2)	Is the means of adjustment used for processing pulses in order to vary measurement results sealable and located so as to be inaccessible without the removal of a portion of the exterior housing? SVM1-8	G N/A G NC G C	
3)	If the means of adjustment is accessible without the removal of the exterior housing, then:		
a)	Is the adjustment range less than ± 2% of the volume of liquid delivered? SVM1-9(a)	G N/A G NC G C	
b)	Is the adjustment range sealable? SVM1-9(b)	G N/A G NC G C	
c)	Is the means of adjustment adjustable while the device is operating? SVM1-9(c)	G N/A G NC G C	

Date: ____________________ **Project #:** ____________________

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General Requirements Checklist - Linearization function (continued)

			Comments
4)	If the means of adjustment automatically selects a predetermined correction factor that corresponds to the flow rate in order to linearize the meter accuracy curve, then:		
a)	Is the adjustment range less than ± 0.25% between adjacent factors? SVM1-10(a)	G N/A G NC G C	
b)	Are the correction factors readily verifiable either by means of display or printing of the factors, or by other means? SVM1-10(b)	G N/A G NC G C	

Date: ____________________ Project #: ____________________

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Operator: ____________________ **Device:** ____________________

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3.2 Appendix B

Linearization function test sheet

	A	B	C	D	E	F	G
Run	Pulses	Frequency (Pulses/Sec)	Expected Flow rate [(60 * B) / D] (L/min)	Expected K Factor [Interpolated] (Pulses/L)	Expected Volume [A / D] (L)	Indicated Volume [Device] (L)	% Error [((F-E) / E) * 100)] (%)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Date: ____________________ **Project #:** ____________________

Operator: ____________________ **Device:** ____________________

Appendix G

National Conference on Weights and Measures / National Type Evaluation Program

Measuring Sector Final Attendee List

October 2-3, 2009 / Clearwater Beach, Florida

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National Conference on Weights and Measures / National Type Evaluation Program

Measuring Sector Final Attendee List

October 2-3, 2009 / Clearwater Beach, Florida

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Appendix C

National Type Evaluation Technical Committee
Weighing Sector

August 25-27, 2009, Columbus, Ohio
DRAFT Meeting Summary

Glossary of Acronyms			
AWS	Automatic Weighing Systems	NTETC	National Type Evaluation Technical Committee
CC	NTEP Certificate of Conformance	OIML	International Organization of Legal Metrology
CIM	Coupled-in-Motion (Railway Track Scales)	S&T	NCWM Specifications and Tolerances Committee
CLC	Concentrated Load Capacity	SWMA	Southern Weights and Measures Association
EPO	Examination Procedure Outline	W/LRE	Weighing/Load-receiving Element
GIPSA	Grain Inspection Packers and Stockyards Administration	WG	Work Group
NCWM	National Conference on Weights and Measures	WMD	NIST Weights and Measures Division
NIST	National Institute of Standards and Technology	WWMA	Western Weights and Measures Association
NTEP	National Type Evaluation Program	WS	NTETC Weighing Sector

Unless Otherwise Stated:
- "Handbook 44" (HB 44) means the 2009 Edition of NIST Handbook 44, "Specifications Tolerances, and Other Technical Requirements for Weighing and Measuring Devices."
- "Handbook 130" (HB 130) means the 2009 Edition of NIST Handbook 130, "Uniform Laws and Regulations in the areas of legal metrology and fuel quality."
- "Publication 14" (Pub. 14) means the 2009 Edition of NCWM Publication 14 - Weighing Devices - Technical Policy - Checklists - Test Procedures.

Note: NIST does not imply that these acronyms are used solely to identify these organizations or technical topics.

Load Cell Items

1. Load Cell Creep Recovery

1 (a). Load Cell Creep Recovery (Recommended Changes to Publication 14 Based on Actions at the 2009 NCWM Annual Meeting)

Source: Mr. Steve Cook, NIST Technical Advisor

Background: See the Final Report of the 2009 NCWM S&T Committee (Agenda Item 320-2 for additional background information to amend HB 44 Scales Code paragraph T.N.4.6. Time Dependence (Creep) for Load Cells during Type Evaluation. During the 2009 Annual Meeting, the S&T Committee adopted a proposal to amend HB 44 Scales Code paragraph T.N.4.7. to relax creep recovery tolerances on Class III load cells with more the 4000 division (n_{max} > 4000).

At the 2009 Annual Meeting of the NTETC-WS, the NIST Technical Advisor recommended amendments to Publication 14 – Force Transducers Section: FT Section II-9 as follows for consideration by the WS.

Discussion/Conclusion: The WS reviewed the language adopted by the NCWM and agreed with the NIST Technical Advisor recommendation to amend Publication 14 FT Section 9. This recommendation can be found in Appendix A, Agenda Item 1.(a).

1 (b). Load Cell Creep Recovery (Editorial Suggestions)

Source: Mr. Stephen Patoray, Consultants on Certification

Background: Mr. Patoray noted that the subject of Creep Recovery in Section 12 was inadvertently omitted in previous editions of Publication 14 and proposed a recommendation to amend Publication 14 – Force Transducers Section: FT Section M-12 – Summary Table and Table 6.

Discussion/Conclusion: The WS reviewed and agreed with the recommendation to amend Publication 14 FT Section 12 and Table 6. The WS added additional language to the proposed subsection 12 (f) to include the reference to the times specified for the initial reading in FT Table 5. This recommendation can be found in Appendix A, Agenda Item 1.(b).

Carry-over Items:

2. Recommended Changes to Publication 14 Based on Actions at the 2009 NCWM Annual Meeting

Source: The NIST Technical Advisor, Steve Cook, has provided the Sector with specific recommendations for incorporating test procedures and checklist language based upon actions of the 2009 Annual Meeting of the 94th NCWM. The Sector was asked to briefly discuss each item and, if appropriate, provide general input on the technical aspects of the issues.

Background: See the Final Report of the 2009 NCWM S&T Committee Agenda Item 310-4 for the adopted language and additional background information on the item to amend HB 44 General Code paragraph G-N.3. Verification of Testing Standards. The NCWM agreed to add a new test note and add General Code paragraph G-N.3. and deleted similar language in the 2.2X series of weighing device codes.

Discussion/Conclusion: The WS reviewed the language adopted by the NCWM and agreed with the NIST Technical Advisor recommendation that no further action by the Sector is required since the new paragraph is nearly identical to the 2009 Scales Code paragraph N.2. Verification of Standards, which has not been referenced in NCWM Publication 14.

3. In-Motion Railway Track Scales - Definition.

Source: 2008 NTETC Weighing Sector Meeting Summary – Agenda Item 3

Background: During the 2003 discussion of Agenda Item 3 – the WS reviewed the following proposed definitions for "in-motion weighing device."

1. In-motion weighing device: A complete weighing system, separable indicating element, or controller that follows a predetermined program of automatic processes for objects while in motion without the intervention of an operator on the load-receptor of a complete weighing device or separable weighing/load-receiving element. (*Source: OIML R51 for automatic weighing instruments*)

2. In-motion weighing device: An instrument capable of weighing objects in motion without the intervention of an operator and follow a predetermined program of automatic process characteristics of the instrument. The instrument can be a complete weighing system, a separable controller or a separable weighing/load-receiving element. (*Source: Mettler/Toledo*)

The WS recommended that the versions be presented to the representative of the railroad weighing industry attending the fall meeting of AREMA Committee 34 and the SMA and that this item be placed on the WS's 2009 agenda.

During its Fall 2008 meeting, some members of AREMA Committee 34 reviewed the proposed definitions for Publication 14 and stated no preference for either recommendation. This item was also discussed by the SMA at their fall 2008 meeting where Mr. Darrell Flocken reported on discussions at the NTETC Weighing Sector meeting and that feedback on the In-Motion Railway Track Scales item is being requested. Any suggestions and comments were to be submitted to Mr. Flocken or Mr. Steve Cook by August 2009.

Discussion: The NIST Technical Advisor asked the WS to review the two proposed definitions in the background information from the 2008 NTETC Weighing Sector Summary and recommend which version should be added to Publication 14 DES Section 68.

The WS discussed the word "object" in the proposed language and was concerned that it would include all types of in-motion devices. This item started out for railway track scales and weighing modules that weigh in-motion, where the weighing modules were evaluated statically and if the modules could be used in dynamic weighing applications. Mr. Steve Beitzel of Systems Associates and Chairman of AREMA Committee 34, proposed amending the Mettler-Toledo language to limit the scope of the definition to railcars and delete the added language that described the characteristics of a controller. A couple of the members of the WS asked if the definition is still needed and questioned whether the definition will add value if it is added to Publication 14. The WS agreed that there is little added benefit to add the definition.

Discussion/Conclusion: The Sector concluded that the definition is not required as it adds no benefit to NCWM Publication 14 - DES Section 68.

4. Pub 14 Technical Policy - Hopper Scale Design Parameters

Source: 2008 WS Agenda Item 7

- 2008 WS Summary - http://ts.nist.gov/WeightsAndMeasures/Publications/upload/13-NTEP-AppC-Pub16-FINAL.doc

Background: See the 2008 NTETC Weighing Sector Meeting Summary Agenda Item 7 for additional background information. During the 2008 WS meeting, the NTEP Director reported that there has been little agreement on what constitutes a different type, or what can be considered as a variation of the design, and how many certificates are required. The WS recommended that this item be carried over for the 2009 NTEP lab and NTETC WS meetings to allow for additional work and development of a proposal. The NIST Technical Advisor stated that the NTEP labs did not discuss this item at its 2009 Spring Meeting.

Discussion: The WS reviewed the background information from the 2007 and 2008 WS summaries. The WS also discussed the following issues regarding the existing technical policy in Publication 14 DES Section A.6.1 and A.6.2:

1. What are the allowable variations in the number of load supports for cylindrical and rectangular hopper/tank scales?
2. What are the allowable variations in the design and location of the load supports (hanging, compression, load supports attached to the upper, mid, or lower portion of the hopper or tank)?
3. Should volume of the tank be considered as a parameter along with capacity?
4. Depending on the answers to the above questions, can different "types" be included on one CC?

Mr. Flocken, Mettler-Toledo and Sector Chairman, discussed the history of this item, and asked what parameters define the type. Mr. Patoray, Consultants on Certifications, added that Publication 14 lists the types that had to be tested, but does not include all that could go on a CC. The WS continued to discuss the various parameters and topics including:

Parameter/Topics	Comment
Number of hopper/tank supports.	- If 3 are adequate, then more should be allowed.
Number of load cell.	- If 3 are adequate, then more should be allowed. - Maximum number limited by v_{min}.
Location of hopper/tank supports.	- Supported from the top of tank. - Supports located between top and bottom of tank. - Supported from bottom of tank. - Supported on corners of a weighbridge.
Variations in the shapes of the hopper/tanks.	- Cylindrical. - Square. - Rectangular. - Combination of above.
Past allowed variations in the dimensions of lever systems.	- Some pre-NTEP CCs were issued for a large range of capacities and dimensions based on state approvals and past performance.
Structural integrity of the tank/hopper.	- Deflection of tank/hopper may have impact on the way the load is applied to the load cells. - However, this could be deducted in the proper application and amount of test load.
Application of test weights.	- Safety issue. - Could also cause unwanted deflection in the hopper/tank that is not representative of deflection during normal weighing.
Uncertainty in test methods.	- Excessive number on drafts during a strain test increases uncertainty beyond ⅓ acceptance tolerance.
Include material tests (for automatic systems).	- Has merit since it better simulates actual use with associate equipment (e.g., dust suppression, gates, etc.). - Study may be needed to discover if this is necessary, considering the cost involved with modifying conveyor systems to pre- or post-weigh material.

Mr. Todd Lucas, Ohio NTEP Lab, suggested that a WG be assembled to address the above items. A vote was taken to determine if the WS should establish a hopper scale WG. The result of the vote indicated that there was little support to establish the WG (2 in favor and 6 opposed).

However, the WS did agree that additional guidance is needed in Publication 14 technical policies that address the number of supports that can be allowed based on an evaluation. Several sector members stated that increasing the number of load supports beyond what was tested during type evaluations would strengthen the support structure. Conversely, decreasing the number of supports may weaken the design of the support structure and that additional testing should be required to amend a hopper scale CC to include "type" variations with fewer supports. Mr. Patoray recommended that changes should be allowed retroactively to amend existing active CCs since there are no proposed changes to the current type evaluation test procedures.

Conclusion: The WS agreed to recommend changes to Publication 14 DES Section B.6 (Certificate of Conformance Parameters) for hopper scales by adding "a CC shall apply to all models having number of load supports equal to or greater than the number of supports in the device submitted for evaluation." This recommendation can be found in Appendix A - Agenda Item 4.

The WS also agreed that existing active CCs can be amended to coincide with the proposed changes since there is no difference in test procedures based on the number of load supports. The WS added that other proposals to amend Publication 14 hopper scale technical policies based should be addressed by the WS as separate agenda items.

5. Pub 14 Section 69. - Railway Track Scales

Source: Weighing Sector Carryover Agenda Item 3 (2007) and Item 10 (2008)

- (2007) - http://ts.nist.gov/WeightsAndMeasures/Publications/upload/11-NTEP-AppC-Weighing-08-Annual-FINAL.doc
- (2008) - http://ts.nist.gov/WeightsAndMeasures/Publications/upload/13-NTEP-AppC-Pub16-FINAL.doc

Background: 2008 Weighing Sector Carryover Item 10.

During the 2007 meeting of the Weighing Sector, the WS agreed there is a loophole in the existing policies for RR track scales with a capacity greater than 200 000 lb. The SMA and AREMA Committee 34 volunteered to work on the testing requirements for vehicle and railway track scales with capacities greater than 200 000 lb and provide to the NTEP Director and NIST Technical Advisor an update on developing a proposal for consideration by the Weighing Sector prior to the 2008 NCWM Interim Meeting.

AREMA Committee 34 Adhoc Subcommittee submitted proposed changes to Publication 69. However, the SMA was not able to address this item during their November meeting and therefore this item will be carried over to the 2008 meeting of the Weighing Sector.

At its September 2008 meeting, the WS recommended that this item be carried over until the 2009 meeting of the Sector to await final approval by AREMA Committee 34.

At its October 2008 meeting, the Chairman of Committee 34 stated that Committee 34 could not further develop this item without specific input from the Weighing Sector. Permission to reprint sections of the 2009 AAR Handbook was granted to NTEP.

Recommendation/Conclusion: The language appears to be acceptable to AREMA Committee 34 and has not yet been reviewed by the SMA. The WS reviewed the testing requirements proposed by AREMA Committee 34 and recommends adding the proposed language as amended by the WS.

This recommendation can be found in Appendix A - Agenda Item 5.

6. Correction to Scale Tickets

Source*:* 2008 WS Item 12 - Maryland NTEP Lab

- 2008 WS Summary - http://ts.nist.gov/WeightsAndMeasures/Publications/upload/13-NTEP-AppC-Pub16-FINAL.doc

Background: This item was provided as an update to the 2008 Weighing Sector Carryover Item 12.

At its 2008 NTEP Participating Laboratory meeting, the NTEP labs discussed a proposal from the Maryland NTEP lab to amend Section 35., which is for weigh-in/weigh-out applications.

The proposal recommended amending DES Section 35. to specify the requirements for devices that print scale tickets with corrected weight information. Several of the labs believed that the subject may be more appropriate for Section 13. Recorded Representations and limited to indirect sale applications.

The WS reviewed the item that was submitted to the NTEP labs. There were concerns that the proposal is intended to address the application described in Scales Code UR.3.9. However, other members of the WS supported the intent for weigh-in/weigh-out vehicle scales applications. The WS agreed that clarification of erroneous tickets is needed; however it could not come to a conclusion since the WS did not have a developed recommendation to review. There were also discussions about the appropriate location for the requirements. For example, Section 35. applied to weigh-in/weigh-out applications where the publication states that manual weight entries are not permitted. The WS recommended that a specific recommendation be developed for this item and carried over until the 2009 meeting of the Weighing Sector. At its 2009 Spring Meeting, the NTEP labs did not discuss this item.

Discussion: The NIST Technical Advisor reported that he has not received an update on the development of this item. WS Chairman, Mr. Flocken provided additional background information.

Mr. Ken Jones, California NTEP Lab, stated that the traditional method of correcting tickets in California is typically handled outside the weighing system by the CA Weighmaster Laws and Regulations. The first ticket is: 1) voided by handwriting or printing "VOID" across the ticket; 2) retained for auditing purposes; and 3) a second ticket is manually created with the words "corrected ticket" with a note referencing the original voided ticket.

Mr. Patoray stated that entering manual weights to correct erroneous tickets in the normal weighing mode of operations is impractical for many truck scale (direct sales to the customer) applications since manual weights can only be entered with the scale at zero according to DES Section 17.2. He added that the user is no longer conducting a weigh-in/weigh-out transaction to correct a weigh-in/weigh-out ticket and that corrected tickets may be generated in a different mode of operation.

Mr. Bill Fishman, New York NTEP Lab, expressed his concern that some systems simply use a different program to issue a corrected ticket and the potential for fraud. Mr. Jim Truex responded that Scales Code paragraph "UR.3.9. Use of Manual Weight Entries" still applies to the user and suggested that it may be appropriate to add language to DES section "35. Weigh-In/Weigh-Out Systems" using language from DES section 36.9.7 ("Manual gross weight entries are permitted to correct tickets issued in error provided the following conditions are met:"). Other WS members suggested that a reference to DES Section 17 Manual Weight Entries be added to DES Section.

Conclusion: The WS agreed that a footnote should be added to DES Section 35, referring to DES Section 17 Manual Weight Entries. This recommendation can be found in Appendix A, Agenda Item 6.

7. Update - Minimum Size of Weight and Units Proposals

Source: 2008 Weighing Sector Item 6

- 2009 S&T Committee Interim Report - http://ts.nist.gov/WeightsAndMeasures/Publications/upload/11-ST-09-Pub16-FINAL.doc
- 2008 WS Summary - http://ts.nist.gov/WeightsAndMeasures/Publications/upload/13-NTEP-AppC-Pub16-FINAL.doc

Background: See the 2009 NCWM Specifications and Tolerance Committee Annual Report Developing Item Part 2, Item 1 "S.1.4.6. Height., Definition of Minimum Reading Distance, UR.2.10. Primary Indicating Elements Provided by the User and Definition of Primary Indications," and the 2006 Weighing Sector Summary Item 6 for additional background information.

At its 2008 meeting, the Weighing Sector voted on whether to forward the 2008 NTEP labs' proposal to the S&T Committee. Seven members voted in favor and nine members voted against forwarding the NTEP lab alternate proposal to the S&T Committee. The results of the vote indicated that there is no consensus between the NTEP labs and device manufacturers. The Sector also recommended that the discussion and conclusion be forwarded to the WWMA and NCWM S&T Committees. The Technical Advisor reported that the regional weights and measures associations recommended that this item be withdrawn from the S&T Committee's Developing agenda based on the comments from the 2008 Weighing Sector and the SMA.

Discussion/Conclusion: Mr. Fishman believes that the problem still exists and that evaluators will have to make their best judgment. Mr. Flocken reminded the WS that the OIML R 76 9.5 mm requirement applies to both buyer and seller displays for scales up to 100 kg and that the main objection to the proposal was the requirement that it applies to all applicable devices manufactured after the effective date and that changing production would be cost prohibitive to amend NTEP and other approvals (e.g., FCC, UL, etc.).

The WS believes that no progress can be made on this item and this item be withdrawn from the WS agenda.

8. Update - Automatic Zero-Setting Proposal

Source: 2008 WS Agenda Item 17.

- 2008 WS Summary - http://ts.nist.gov/WeightsAndMeasures/Publications/upload/13-NTEP-AppC-Pub16-FINAL.doc

Background: This item is provided as an update to the 2008 Weighing Sector Carryover Item 17.

During its 2008 meeting, WS discussed the comments that an increasing number of scales submitted for NTEP evaluations include an automatic zero-setting feature, which is not addressed in HB 44. It has been noted that many devices are built for a global marketplace and that the operation of this automatic zero-setting device may be functional on the device when installed in the United States. Currently, HB 44 does not define this function. NCWM Pub 14 has no test to determine if the device submitted for evaluation has such a function, or if it is sealable. The automatic zero-setting mechanism on a scanner/scale submitted to NTEP could be enabled and disabled by means of a bar code read by the scanner.

In the past, several of the NTEP labs, when asked about this feature, have indicated that since it does not meet the definition of automatic zero-tracking mechanism, it is not allowed. Additionally, the WS agreed that HB 44 does not clearly state that this function is not allowed, which may lead to inconsistent interpretations of Section 2.20. Scales paragraphs S.1.1.(c) (Zero Indication – ". . . return to a continuous zero indication") and S.1.1.1.(b) (Digital Indicating Elements – *"a device shall either automatically maintain a "center-of-zero" condition. . . . "* could be interpreted to allow the automatic zero-setting device as described in OIML R 76. That may not be a universal interpretation.

In 2008, the WS concluded that:

1. There is a problem that needs to be solved, based on the current information or lack of information in HB 44.
2. There are no technical reasons why the automatic zero-setting feature, as described in OIML R 76, should not be included in NIST Handbook 44.
3. The feature may not be suitable for all applications (e.g., balancing off a stable partial load) if the feature can function with both positive and negative weight indications.
4. Language will need to be developed for NCWM Publication 14 to either test for the correct function of automatic zero-setting or test to determine that the device does not have automatic zero-setting and it is a sealable parameter.

The WS established a small work group (Mr. Scott Davidson, Mr. Scott Henry, Mr. Steve Cook, and Mr. Patoray) to develop a proposal to be submitted to the NCWM S&T Committee and make a recommendation addressing the suitability of scales with the capability to automatically set a positive weight indication to zero. Additionally, the WS agreed to review the language developed by the work group to confirm its support of the proposed language. (Mr. Lucas and Mr. Truex also contributed to the discussions and subsequent proposal.)

The WG did not have sufficient time to both develop the proposal and ballot the WS prior to the November 1, 2008, cutoff date for submitting new items to the Committee. Therefore, the group agreed to submit the proposal to the Committee and ballot the WS members. The results of the ballot and all comments were summarized and forwarded to the Committee prior to the 2009 NCWM Interim Meeting. Eight WS members responded to the ballot of which six voted in favor of the proposed language. It should be noted that two of the affirmative votes stated that their vote was provisional provided the reference to the 4 % of scale capacity limitation is removed from the proposal. Two members opposed that item, stating that the language should not be rushed through the S&T Committee and that the feature should operate with either negative or positive weight indications.

The NIST technical advisor forwarded the ballot results and comments to the S&T Committee for its consideration at the 2009 NCWM Interim Meeting.

Discussion: The NIST Technical Advisor provided the WS with an update on the status and additional discussions on this item since the 2009 Interim Meeting, and can be reviewed in the 2009 NCWM Annual Report as S&T Committee Item 320-3. The NIST Technical Advisor suggested that the WS develop a consensus position on this item and forward its conclusion to the S&T Committee. The WS discussed the following possible positions to forward to the S&T Committee:

1. Allow feature to operate only when below zero with capacity limit (as shown in 2009 NCWM Annual Report Committee Recommendation).
2. Consider the Spring 2009 SMA position to allow the feature to operate in either direction with no capacity limit.
3. Consider HB 44 language to prohibit the feature.
4. No changes to HB 44.

The NIST Technical Advisor also developed language for Publication14 for additional development that:

1. Defines the feature.
2. Tests that could be used to detect the feature.
3. Procedures or actions if the feature is encountered (e.g., "feature shall be disabled for commercial applications and the switch that enables or disables the feature can not be changed without breaking a security seal or other means of providing security").
4. Amend Pub 14 by adding "automatic zero-setting mechanism" to the Table of Scale Features and Parameters as a sealable parameter.

Representatives from Measurement Canada stated that Canada allows the feature for direct sale and that it only automatically rezeros the scale when indicating negative gross weigh values. Mr. Flocken asked if the WS should consider making a recommendation to the S&T Committee to consider differences in operations for direct versus indirect sale applications. Mr. Nigel Mills and Mr. Paul Lewis supported the fourth option and added that existing Scales Code paragraph UR.4.1. Balance condition is sufficient. Mr. Richard Harshman stated his support for the third option.

Mr. Flocken commented that one justification for the feature citing actual examples where coupons are scanned and placed one at a time on a scanner/scale resulting in the individual coupons be zero off using the automatic zero-tracking feature. All the coupons would then be removed from the scale in one action placing a scale in a below zero condition beyond the zero-tracking range. Without the automatic zero-setting feature, the store will be giving away product until the operator takes deliberate action to rezero that scale. Mr. Henry from NCR was unable to attend the meeting. However, he did provide the following in an email that was presented to the WS supporting that the item with OIML language.

August 5, 2009

Hi All,

Although I will not be able to attend the upcoming Weighing Sector Meeting, I would like to provide some input to the AZSM issue.
As for bench counter scales I foresee problems allowing for Zeroing (outside of normal Zero Tracking Range) in the positive direction.

Here is a prime example:

Cashier leaves pen on scale top plate... (AZSM) scale zeros the weight of the pen... cashier places item to be weighed on scale top plate then realizes that the pen is on the top plate and removes the pen.... now the item will be short weighed.

This is one of many examples, cashiers are always using the scale top plate as desk space (typically due to limited counter space).

Items typically left on scale for an extended period of time include coupons, money, sales adds, PLU sheets, and even shelf items (either not wanted by customer or waiting to be bagged).

> Given the numerous chances that the POSITIVE side AZSM would have to zero unintentional items left on the scale would lead to numerous errors.
>
> NCR would like to use the AZSM as stated in OIML 4.5.6:
> Operate only when the equilibrium is stable and the indication has remained stable below zero for at least 5 seconds.
>
> If the positive direction of AZSM can be harmlessly used by other classes of scales then maybe the Weighing Sector can propose adding AZSM Negative only for Bench Counter Scales and in both directions for other classes of scales.
>
> Please keep me in the loop and Best Regards,
>
> Scott Henry
> Compliance Engineering (W&M)
> NCR Corporation
> phone:770-623-7543
> scott.henry@ncr.com | www.ncr.com

The NIST Technical Advisor suggested a compromise position to limit the feature to point-of-sale systems interfaced with scales.

Mr. Truex added that there are already devices that are tagged for this feature. Mr. Patoray believes that doing nothing according to the fourth option would but may present enforcement problems due to the inconsistent interpretations when citing HB 44 paragraph G-S.2. Facilitation of Fraud. He added that most scales are designed for the international marketplace with features that can be enabled or disabled. In this option, there is very little in HB 44 to guide field officials.

Mr. Flocken and Mr. Patoray stated the incident that prompted the issue before the WS. A field official was performing an inspection on a point-of-sale scanner/scale. A test weight was place and left undisturbed on the scale for 20 seconds when the inspector noticed that the scale automatically reset to rezeroed. Further investigation indicated that the weight display would automatically rezero with either positive or negative weight indication. Additionally, configuration of the feature could be changed by passing a specific barcode across the scanner portion of the scanner/scale without breaking a security seal or updating audit trail information. Additionally, this created competitive disadvantage to at least one other manufacturer that was told that the feature was not allowed.

Additional comments addressed properly trained operators, potential benefits or harm to the buyer and seller, minimum positive weight indications, negative net weight indication, and confusion regarding the differences between automatic zero-tracking and automatic zero-setting.

Conclusion: The Sector discussed this in great detail and reached a consensus among the attendees that this feature does not have any value and at times will facilitate inaccurate weight determinations either agains the buyer or seller. The NIST Technical Advisor will forward the sector discussions (above) to the S&T Committee.

9. Update - New and Amended HB 44 Tare Proposals

Source: 2008 WS Agenda Item 5.

Background: This item is provided as an update to the 2008 Weighing Sector Carryover Item 5.

See the 2009 Interim Report of the 2009 NCWM S&T Committee agenda Item 320-1 and the Final Summary for the 2008 Meeting of the Weighing Sector Agenda Item 5 for additional background information.

- 2009 Interim Report - http://ts.nist.gov/WeightsAndMeasures/Publications/upload/11-ST-09-Pub16-FINAL.doc.
- 2008 WS Summary - http://ts.nist.gov/WeightsAndMeasures/Publications/upload/13-NTEP-AppC-Pub16-FINAL.doc

Discussion: The NIST Technical Advisor provided the WS with following update on the status and additional discussions on this item since the 2009 Interim Meeting. This information can be found in the 2009 Annual Report of the 94th NCWM S&T Committee Final Report.

The NIST Technical Advisor also reported that the S&T Committee asked the WS for its position on the remaining informational agenda items for the Scales and Automatic Weighing Systems codes on Tare.

Mr. Steve Cook, NIST Technical Advisor, believes that much of the background information reviewed and developed by the Tare Work Group is not easily accessible by NTEP evaluators and NTEP applicants. As a result of the SMA comments that the proposals for HB 44 are adequately verified during type evaluation. Steve requested that the WS or Tare Work Group review the information developed during this discussion on tare and determine if any evaluation criteria or technical policies can be recommended for Publication 14. For example, the sections on "Tare" could be grouped together and the 1980 NCWM S&T discussion on "Tare" could be updated and included as an appendix in Publication 14 (similar DES Section 73 – Appendix for the Audit Trail).

The WS also reviewed Publication 14 list of acceptable indications and recorded representations to verify that "PT" is an acceptable abbreviation for keyboard and stored tare.

Conclusions:

1. **The WS agreed that there may be some merit to Mr. Cook's recommendation to include language from the 1980 NCWM S&T discussion on "Tare" and recommended that a developed recommendation be submitted to the next meeting of the WS in 2010.**

2. **The WS also agreed that the remaining Informational tare items should be withdrawn from the S&T Committee Agenda.**

3. **The Sector also agreed to include the PT for preset tares since PT has been accepted by some of the NTEP labs. This recommendation can be found in Appendix A - Agenda Item 9.**

New Items:

10. Pub 14 - Maximum Platform Width Parameter Sections 8.1., 8.2., and 8.3.

Source: Mr. Stephen Langford, Cardinal Scale Mfg Co.

Background: Current NTEP policy as described in Publication 14, sections 8.1, 8.2, and 8.3 regarding acceptable range of platform widths on vehicle scales to be included on the CC is apparently unclear and may not be uniformly applied.

- Part c of 8.1 states that widths up to 120 % of the device evaluated can be listed on the CC for vehicle scales up to 200 000 pounds of capacity. [3]
- Part c of 8.2 states that widths no greater than that of the device evaluated can be listed on the CC for vehicle scales with capacities greater than 200 000 pounds. [3]
- Part e of 8.3.2 for modular vehicle scales states that widths up to 120 % of the device evaluated can be listed on the CC regardless of scale capacity. [5]

[3&5] For scales with widths greater than 12 feet, this policy on range of widths may not be applied retroactively. Additional testing is required for devices with widths greater than 12 feet. Test procedures for scales wider than 12 feet will be addressed by NTEP management and the NTEP laboratories on a case-by-case basis.

Currently, it appears that the CC lists only the width of the device evaluated for modular vehicle scales of widths of 14 feet or more. Evaluations of 10 ft wide models allow 120 % or 12 feet-wide models to be listed on the NTEP CC. This practice is not in compliance with the current NTEP policy as written and needs to be clarified.

The submitter recommends amending section 8.2 part c of Publication 14 to read;

c. **widths ~~no greater than~~ up to 120 %** of the **width of the** platform tested;[3]

The submitter also included the following justification:

The following table summarizes the current restrictions on the maximum platform width that can be placed on the NTEP CC and highlights the difference criteria in 8.2.c for width parameters to be included on the CC.

Section	Device Type	CC Platform Width
8.1.c	Vehicle, Railway, Combination Vehicle/Railway and others over 30 000 and up to and including 200 000 lb	Up to 120 % of the width of the platform tested
8.2.c	Vehicle, Railway, Combination Vehicle/Railway and others greater than 200 000 lb[3]	No greater than the width of the platform tested
8.3.2.e	Modular Load-Cell Vehicle, Livestock or Railroad Track Scales[5]	Up to 120 % of the width of the platform tested

In each section, the "12 feet" footnote adds the following information:

For scales with widths greater than 12 feet;

1. the policies on range of widths may not be applied retroactively,
2. additional testing is required, and
3. NTEP management and the NTEP laboratories will address the test procedures on a case-by-case basis.

Based on this information, it is permissible to apply the 120 % (width) multiplier to modular scales (in 8.3.2.c) and to other vehicle scales of not more than 200 000 pounds in capacity (in 8.1.c). There is no reason known to exclude vehicle scales of more than 200 000 pounds in capacity from being allowed to have widths up to 120 percent of the width of the device evaluated. Therefore, part c of section 8.2 should be revised to reflect the same limits on platform width as listed in section 8.1.

There seems to be reluctance on the part of some examiners to allow platform widths of 120 % of the platform width of the device evaluated for widths greater than 12 feet. This practice is against existing NTEP policy. The test protocol is the same for scales with platform widths greater than 12 feet and includes applying loads both down both sides of the platform and in the center. Because the test protocol used in the examination of platforms of more than 12 feet in width is the same regardless of whether the platform is 14, 15, or 16 feet in width, the existing policy is correct. The WS is urged to endorse the practice of allowing up to 120 % of the width of the device evaluated for both modular and non-modular vehicle scales as is currently described in Publication 14.

For example, a 14-foot wide scale could be submitted and certified with the test procedures in DES Section 66 for extra wide and double wide vehicles scales (i.e., extra tests along the sides of the scale, etc.). Mr. Langford states that a 17-foot wide scale could be included on the CC without additional testing. (120 % * 14 = 16.8 and rounded to 17) since the "additional testing" was conducted and verified on the 14-foot wide scale. This should also apply to scales greater than 200 000 lb in DES Section 8.2.c.

Discussion: The WS reviewed and discussed the proposal and background information. Mr. Lou Straub asked if this proposed technical policy change be allowed retroactively on active CCs for devices that were tested with the wide test procedures. Mr. Langford believes that this should be allowed retroactively since the testing for scales wider that 12 feet is more stringent since it includes applying test load between pairs of load supports and other locations that simulate actual usage for both highway and extra wide vehicles. Mr. Truex expressed concerns about deflections of the load-receiving element when the widths of the platform load bearing points are changed. Mr. Flocken replied that manufacturers typically (proportionally) increase the distance between the load supports for wider scales and believes that the existing 20 % allowable width increase for scales 12 foot wide or less adequately limits increasing the width of scales greater than 12 feet. For example, a 14 foot wide scale submitted and tested for evaluation under the criteria in DES 66 b or 66 c may have additional widths listed on the CC up to and including 17 foot without additional testing.

There was support from the other manufactures attending the WS meeting and no additional comments from the NTEP labs. Note that there was no recommendation to change the footnote statement that test procedures for scales wider than 12 feet will be addressed by NTEP management and the NTEP laboratories on a case-by-case basis.

Conclusion: The Sector agreed to amend the criteria in DES Technical Policy 8.2.c[3] to be consistent with 8.3.2.e[5]. This recommendation can be found in Appendix A, Agenda Item 10.

11. Pub 14 - Minimum Platform Area (Section Lengths) Parameter Sections 8.1., 8.2., and 8.3.

Source: Mr. Ed Luthey, Brechbuhler Scales

Background: Brechbuler Scales is questioning why the minimum platform area on a vehicle scale is limited to 50 % of the device that was tested. For example, a 70' x 10', 3-section vehicle scale was evaluated and passes type evaluation. The CC would then list the minimum platform size as 350 ft^2 or list the minimum L x W scales that would comply with the Pub 14 criteria. Under the Pub 14 language, the applicant would have to submit a smaller second scale if they wanted 10' x 10', 2-section scale listed on the CC.

The submitter of the item believes that there is no technical justification for the limitation. Brechbuhler Scales submitted a proposal to eliminate the 50 % minimum platform area restriction as shown in the recommendation below:

8.1. Additional criteria for vehicle scales, railway track scales, combination vehicle/railway track scales, and other platform scales over 30 000 lb and up to and including 200 000 lb.

A CC will apply to all models having:

a. **nominal capacities** up to 135 % of evaluated capacity;
~~**b. a platform area for any two section portion no less than 50 percent of smallest two section portion incorporated in the device evaluated.**~~
c. **widths** up to 120 % of the width of the platform tested;
d. **lengths** 150 % of the length of the platform tested;
e. a **span** between sections is not more than 20 % greater than the equipment evaluated;

Discussion: Mr. Steve Cook, NIST Technical Advisor, reported on past Publication 14 language and WS discussions on this item. Mr. Cook noted that the above referenced language has been in Publication 14 since its earliest publication. Additionally, he found references to the current language as far back as 1983 in the notes of the National Type Approval work group. The National Type Evaluation work group included NIST, Weights and Measures Officials, scale manufacturers, and load cell manufactures. Mr. Cook contacted some of the work group participants (Richard Suiter and Henry Oppermann) to inquire if they recall the justification for the accepted language and report any additional information during the WS meeting. They recalled that it was agreed that a lower limit was needed and that the selections of the 50 % lower limit was not based on any technical justifications. Mr. Truex was concerned that completely eliminating the lower limit for platform area may result in variations in sizes that may be used in unsuitable applications (e.g., a small Class III L vehicle scale used in a Class III platform scale application.). The WS agreed with Mr. Langford's suggestion of 7 foot minimum length.

Conclusion: The Sector agreed to amend the criteria in DES Technical Policy 8.1.b and c by deleting 8.1.b. and adding "lengths <u>no shorter than 7"</u> . . ." to 8.1.c. since the <u>platform area</u> is deleted. This recommendation can be found in Appendix A - Agenda Item 11.

12. Auxiliary Reading Means when $e \neq d$.

Source: Mr. Steven Cook, NIST Technical Advisor

Background: WMD recently received an inquiry from the Ohio NTEP lab regarding an interpretation on Scales Code paragraph S.1.2.2.1. that may, in some circumstances, conflict with the Table 3 footnote 1. ***(Technical Advisor Note:*** *There appears to be only two references to≠ed in Publication 14, pages DES 17 for marking requirements and DES-19 in Table 3. Additionally, a checklist item that verifies compliance to S.1.2.2.1. was unable to be located.)*

Table 3. Parameters for Accuracy Classes – Footnote

[1] For Class I and II devices equipped with auxiliary reading means (i.e., a rider, a vernier, or a least significant decimal differentiated by size, shape, or color), the value of the verification scale division "e" is the value of the scale division immediately preceding the auxiliary means.

S.1.2.2.1. Class I and II Scales and Dynamic Monorail Scales. If e ≠ d, the verification scale interval "e" shall be determined by the expression:

$$d < e < 10\ d$$

If the displayed division (d) is less than the verification division (e), then the verification division shall be less than or equal to 10 times the displayed division.

The value of e must satisfy the relationship, $e = 10^k$ of the unit of measure, where k is a positive or negative whole number or zero.

This requirement does not apply to a Class I device with d < 1 mg where e = 1 mg. If e ≠ d, the value of "d" shall be a decimal submultiple of "e," and the ratio shall not be more than 10:1.

If e ≠ d, and both "e" and "d" are continuously displayed during normal operation, then "d" shall be differentiated from "e" by size, shape, color, etc. throughout the range of weights displayed as "d."
(Added 1999)

The initial question was could the value of e be something other than 10 d. WMD believes that the answer is yes and demonstrated in the following table (copied from R 76).

The values of e, calculated following the d < e < 10 d rule			
d =	0.1 g	0.2 g	0.5 g
e =	1 g	1 g	1 g
e =	10 d	5 d	2 d

Typically, NTEP applicants submit Class II devices where e = 10 d. However, an applicant has submitted a device with e = 5 d. The lab asked how are d and e going to be displayed when e = 5 and d = 0.1e or 0.2e. One possible solution is shown in the following example.

Max: 12 kg $\quad$ n_{max}: 12 000
e: 0.5 g d: 0.1 g $\quad$ Class II

Example of possible indications?

3.0000 kg e is displayed normally
3.0001 kg d is differentiated
3.0002 kg d is differentiated
3.0003 kg d is differentiated
3.0004 kg d is differentiated
3.0005 kg e is displayed normally
3.0006 kg d is differentiated

As shown, d would occupy the same location in the display as e therefore; both e and d can't be continuously displayed in S.1.2.2.1. Additionally, Table 3 footnote one states that "e" precedes the auxiliary means.

The language in S.1.2.2.1. states that d shall be differentiated from "e" by size, shape, color, etc. throughout the range of weights displayed as d if both e and d are continuously displayed. However, HB 44 Table 3 footnote 1 states that the value of the verification scale division "e" is the value of the scale division immediately preceding the auxiliary means (to display d). (Note that there is a slight difference in the way "differentiation" is described between Table 3 and S.1.2.2.1. Language in Table 3 states "differentiated by size, shape, or color," whereas S.1.2.2.1. states "differentiated from "e" by size, shape, color, etc.")

The NIST Technical Advisor reviewed the discussion on the adoption of S.1.2.2.1. in 1999 NCWM Annual Report. There were two items on the Committee's agenda that year regarding S.1.2.2.1. and words "continuously displayed" was added as part of the proposal to include dynamic monorail scales.

> "If e ≠ d, and both e and d are continuously displayed during normal operation then "d" shall be differentiated from "e" by size, color, etc. throughout the range of weights displayed as "d."

Additionally, the discussion paragraphs of each item did not provide guidance on examples where e = 2d or 5d.

The NIST Technical Advisor also reviewed equivalent terminology, definitions and language in R 76 for Nonautomatic Weighing Instruments (http://oiml.org/publications/R/R076-1-e06.pdf). R 76 includes the following subtypes of auxiliary displaying devices in Terminology Clause T.2.5:

- verniers,
- complementary displaying devices (estimated values corresponding to the distance between graduations), and
- indicators with differentiated scale divisions.

Clause T.2.6. describes extended displaying indicators as a device for temporarily changing the displayed interval "d" to a value less than "e."

In R 76, Clause 4.4.3, an extended indicating device shall not be used on an instrument with a differentiated scale division.

Additionally, a scale fitted with an extended indicating device can only provide an indication with a scale interval smaller than e:

- while pressing a key, or
- for a period not exceeding 5 seconds after a manual command.

In all cases, printing shall not be possible while the extended indicating device is in operation.

The NIST Technical Advisor has not developed a proposal for this item and asks the WS to review the background information and discuss possible solutions (e.g., amending HB 44 S.1.2.2.1. by changing the language to read ". . . then the verification division shall be ~~**less than or**~~ equal to 10 times the displayed division"). Or, recognizing the extended indicating device as described in R 76.

Discussion/Conclusion: The WS reviewed the background information and agreed that *the example in the background information is unacceptable since both "e" and "d" are not continuously displayed and "e" does not precede the auxiliary means.* The WS also agreed that in nearly all cases, e =10 d. However, there are combinations of e < 10 d that are acceptable when the "e" value and "d" value would be displayed in separate columns on the display as shown below as shown in the following example, or if there is a separate display for "d". The WS believes that there is no further action is needed for this item.

Max: 12 kg **n_{max}: 12 000**
e: 1 g d: 0.2 g **Class II**

Example of possible indications

3.001$_0$ kg	**d is differentiated by size and shading**
3.001$_2$ kg	**d is differentiated by size and shading**
3.001$_4$ kg	**d is differentiated by size and shading**
3.001$_6$ kg	**d is differentiated by size and shading**
3.001$_8$ kg	**d is differentiated by size and shading**

13. Method of Sealing – G-S.8. Provisions for Sealing Adjustable Components

Source: NCWM S&T Committee

Background: During the open hearings at the July 2009 Annual Meeting, the S&T Committee received comments on its agenda Item 310-1, G-S.8. Provisions for Sealing Adjustable Components, suggesting that no action may be needed and that the existing language in HB 44 is sufficient. Additional comments indicated that other proposals in the Committee's Interim Report (Publication 16) are overly complex. Oregon and Maryland believe that amended requirements for sealing are needed by the NTEP labs and field staff in order to consistently interpret and apply sealing requirements. The SMA amended its position at the spring 2009 SMA Meeting and submitted the revised proposal to the Committee.

The Committee believes that all parties agree with the intent of the proposal. Both WMD and SMA submitted similar proposals that retain the existing language in G-S.8. WMD essentially reformatted G-S.8. for clarification and including new requirements for providing indications when a device is in adjustment mode. WMD included and additional proposal to address devices that may have more than one method of sealing.

The Committee suggests that the WS and other interested parties consider breaking the proposal into two or three separate agenda items for consideration by the Conference.

Additional information on the past S&T Committee discussion on the item can be found at:

- **2008 Final Report -** http://ts.nist.gov/WeightsAndMeasures/Publications/upload/09-ST-08-Annual-FINAL.doc

- **2009 Interim Report -** http://ts.nist.gov/WeightsAndMeasures/Publications/upload/11-ST-09-Pub16-FINAL.doc

Discussion/Conclusion: The WS reviewed the comments from the S&T Committee, the background information in the NCWM 2008 Annual and 2009 Interim Reports, and the summary of proposals provided by the NIST Technical Advisor. The WS believes that existing language in HB 44 is sufficient and that the sectors review existing type evaluation criteria to verify that devices shall be designed with:

1. **provision(s) for applying a physical security seal that must be broken before any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism, or**

2. **other approved means of providing security to document any change that detrimentally affects the metrological integrity of the device can be made to any electronic mechanism (e.g., data change audit trail available at the time of inspection.**

The NIST Technical Advisor will forward the WS recommendation on the proposal to amend General Code paragraph G-S.8. Provisions for Sealing Adjustable Components the 2010 S&T Committee.

14. Publication 14 – Editorial Suggestions

Source: Mr. Patoray, Consultants on Certification

Background: Mr. Patoray submitted six (6) items that have been submitted to the NTEP Administrator and NIST Technical Advisor. The WS was asked to review these items and provide a recommendation to NTEP that these suggestions be considered editorial corrections to Publication 14.

14 (a). Publication 14 DES Section 58.

Discussion/Conclusion: It was noted that the way 58.1 is worded seems to be opposite of the way paragraph T.N.4.5.1. (a) is worded in HB 44, and code references are needed. The WS supports the recommended changes as shown in Appendix A - Agenda Item 14 (a).

14 (b). Publication 14 DES Section 40.

Discussion/Conclusion: Mr. Patoray recommended changing the title in Section 40 from Zero Load Adjustment to Zero Setting Mechanisms to match the terminology and definitions in HB 44. The WS suggested some minor changes and supports the recommended changes as shown in Appendix A - Agenda Item 14 (b).

14 (c). Publication 14 DES Section 43.

Discussion/Conclusion: Mr. Patoray recommended changing the title in Section 43 from Automatic Zero-Setting Mechanism to Zero-Tracking Mechanism. No Actions is required since the recommended changes were incorporated into the 2009 Edition of Publication 14.

14 (d). Publication 14 DES Section 15.1.

Discussion/Conclusion: Mr. Patoray noted that the Table is Section 15.1 has an error, the word should be "net" not "tare." The WS supports the recommended changes as shown in Appendix A - Agenda Item 14 (d).

14 (e). Publication 14 FT Table 1.

Discussion/Conclusion: Mr. Patoray noted that Table 1 in Pub 14 FT needs corrected to show the correct loading capabilities of the CANTEP lab. The WS supports the recommended changes as shown in Appendix A - Agenda Item 14 (e).

14 (f). Publication 14 FT Section I-10.

Discussion/Conclusion: Mr. Patoray noted that there seems to be a word missing at the end of FT Section I step 10 in the test conditions and it appears that the number "1" was inadvertently deleted between the 2000 and 2002 editions of Publication 14. The WS supports the recommended changes as shown in Appendix A - Agenda Item 14 (f).

15. Delete DES Section 66 (c).

Source*:* Mr. Ed Luthy, Brechbuhler.

Background: Mr. Luthy requested the WS to consider deleting DES Section 66 (c). Performance and Permanence Tests for "Side-by-Side" Modular and Non-Modular Vehicle Scales, stating that the time and expense is too large for the value added to having the option listed on an NTEP CC.

Discussion/Conclusion. The NIST Technical Advisor stated that the WS worked on the development of the type evaluation procedures in DES Sections 66 (b) and 66 (c) for Extra Wide and Double-wide scales in 1998, (WS Agenda Item 2), 2000 (WS Agenda Item1), and 2001 (WS Agenda Item2).

The Sector is not in favor of removing the section. The goal of the proposal is to reduce the expense of type evaluation on these devices. The scale manufacturers in attendance volunteered to form a small work group to review the existing procedures and develop proposals to amend existing language for a possible abbreviated test procedure.

This item will be carried over until the 2010 WS meeting.

16. Creep Recovery for Complete Scales.

Source: NTETC Weighing Sector

Background: During the discussion of WS Agenda Item 1, Creep recovery for load cells, the WS reviewed the report of the S&T Committee and the language adopted by the NCWM. There was support for the proposal to amend Publication 14 to agree with the adopted language in HB 44.

Discussion: The WS noted that the S&T Committee discussion included comments pertaining to a relationship between load creep recovery and a scales ability to return to a zero-balance condition after a load had been on the load-receiving element over a period of time, and that the WS should review the zero-tracking requirements and creep recovery tolerances for scales. Mr. Patoray stated that the adopted language may impact a scales ability to comply with Scales Code paragraph "N.1.9 Zero Balance Change" if the value of creep recovery in field applications exceeds the zero-tracking requirements in S.2.3.1.2. A zero balance change, greater than 0.5 d, will not be set to zero by the zero-tracking mechanism after a load has been resting on a scale for an extended period of time. However, because near capacity loads are rarely left on scales for 30 minutes in actual use, it is unlikely that there will be problems in the field.

Conclusion: The WS stated it believes that:

1. **There will be little impact on zero-tracking requirements due to manufacturers designing scales and separable weighing/load-receiving elements with load cell capacities that are typically larger than the scale capacities, and that loading a scale to 90 % capacity for 30-minutes (a test conducted during type evaluation) rarely occurs in most Class III applications.**

2. **HB 44 Scales Code paragraph T.N.4.1. should be amended to coincide with the changes to T.N.4.6.**

Mr. Nigel Mills, Hobart submitted a proposal to amend creep recovery requirements for scales to coincide with the creep recovery tolerance adopted for load cells. The WS agreed with the proposed language. Mr. Cook (NIST) and Mr. Scott Davidson (Mettler-Toledo) volunteered to further develop the proposal as shown below and submit the Form 15 to the NCWM S&T Committee and to fall regional weights and measures association meetings.

T.N.4.5.1. Time Dependence: Class II, III, and IIII Non-automatic Weighing Instruments. – A non-automatic weighing instrument of Classes II, III, and IIII shall meet the following requirements at constant test conditions. During type evaluation, this test shall be conducted at 20 °C ± 2 °C (68 °F ± 4 °F):

(a) When any load is kept on an instrument, the difference between the indication obtained immediately after placing the load and the indication observed during the following 30 minutes shall not exceed 0.5 e. However, the difference between the indication obtained at 15 minutes and the indication obtained at 30 minutes shall not exceed 0.2 e.

(b) If the conditions in (a) are not met, the difference between the indication obtained immediately after placing the load on the instrument and the indication observed during the following 4 hours shall not exceed the absolute value of the maximum permissible error at the load applied.

~~**(c) The deviation on returning to zero as soon as the indication has stabilized, after the removal of any load which has remained on the instrument for 30 minutes, shall not exceed 0.5 e.**~~

~~**For a multi-interval instrument, the deviation shall not exceed 0.5 e_1 (where e_1 is the interval of the first partial weighing range or segment of the scale).**~~

~~**On a multiple range instrument, the deviation on returning to zero from Max_i (load in the applicable weighing range) shall not exceed 0.5 e_i (interval of the weighing segment). Furthermore, after returning to zero from any load greater than Max_1 (capacity of the first weighing range) and immediately after switching to the lowest weighing range, the indication near zero shall not vary by more than e_1 (interval of the first weighing range) during the following 5 minutes.**~~

(Added 2005) (Amended 2006 **and 2010**)

T.N.4.5.2. Time Dependence: Class III L Non-automatic Weighing Instruments. – A non-automatic weighing instrument of Class III L shall meet the following requirements:

(a) When any load is kept on an instrument, the difference between the indication obtained immediately after placing the load and the indication observed during the following 30 minutes shall not exceed 1.5 e. However, the difference between the indication obtained at 15 minutes and the indication obtained at 30 minutes shall not exceed 0.6 e.

(b) If the conditions in (a) are not met, the difference between the indication obtained immediately after placing the load on the instrument and the indication observed during the following 4 hours shall not exceed the absolute value of the maximum permissible error at the load applied.

~~**(c) The deviation on returning to zero as soon as the indication has stabilized, after the removal of any load which has remained on the instrument for 30 minutes, shall not exceed one-half of the absolute value of the applicable tolerance for the applied load for Class III L devices.**~~

(Added 2005) **(Amended 2010)**

T.N.4.5.3. Zero Load Return: Non-automatic Weighing Instruments. – A non-automatic weighing instrument shall meet the following requirements at constant test conditions. During type evaluation, this test shall be conducted at 20 °C ± 2 °C (68 °F ± 4 °F). The deviation on returning to zero as soon as the indication has stabilized, after the removal of any load which has remained on the instrument for 30 minutes shall not exceed:

(a) 0.5 e for Class I, II, and IIII devices,

(b) 0.5 e for Class III devices with 4000 or fewer divisions,

(c) 0.83 e for Class III devices with more than 4000 divisions, or

(d) one-half of the absolute value of the applicable tolerance for the applied load for Class III L devices.

For a multi-interval instrument, the deviation shall not exceed 0.83 e_1 (where e_1 is the interval of the first partial weighing range or segment of the scale).

On a multiple range instrument, the deviation on returning to zero from Max_i (load in the applicable weighing range) shall not exceed 0.83 e_i (interval of the weighing segment). Furthermore, after returning to zero from any load greater than Max_1 (capacity of the first weighing range) and immediately after switching to the lowest weighing range, the indication near zero shall not vary by more than e_1 (interval of the first weighing range) during the following 5 minutes.

(Added 20XX)

Next Sector Meeting:

Discussion: Next in the rotation for lab and WS meetings is Sacramento, California for 2010. The WS believes that late August (24 -27) 2010, is acceptable. The WS second choice is the Ohio NTEP Lab.

Conclusion: The NCWM Board members reviewed and discussed the WS discussion and recommendations. The Board considered a number of other of other factors and agreed that the next WS meeting is scheduled for August 31 – September 2, 2010, in Columbus, Ohio.

Appendix A - Recommendations for Amendments to Publication 14[1]

Agenda Item 1.(a).

9. Permissible Variations of Reading for Creep Recovery

a. The difference between the initial reading of the minimum load of the measuring range (D_{min}) and the reading after returning to minimum load subsequent to the maximum load (D_{max}) having been applied for 30 minutes shall not exceed:

(1) 0.5 times the value of the load cell verification interval (0.5 v) for Class I, II, ~~III~~, and IIII load cells, ~~or~~

(2) 0.5 times the value of the load cell verification interval (0.5 v) for Class III load cells with 4000 or fewer divisions,

(3) 0.83 times the value of the load cell verification interval (0.83 v) for Class III load cells with more than 4000 divisions, or

(4) 1.5 times the value of the load cell verification interval (1.5 v) for Class III L load cells.

Agenda Item 1.(b).

12. Summary Table

A three-column table of the following critical test results, the corresponding limiting values of each quantity, and the ratio of each critical test result to the correspondence limiting value shall be provided. An example is given in Table 6.

a. **Force transducer (load cell) error** - The combined error due to non- linearity, hysteresis, and temperature effect on sensitivity.

b. **Repeatability error** - The greatest absolute value of non-repeatability in relation to the tolerance value for that test load.

c. **Temperature effect on minimum dead load output** - The greatest value of this effect for consecutive test temperatures.

d. **Creep** - The greatest differences between the initial reference output (~~**at 20 seconds**~~ **at the time specified in Table 5**) and any output recorded during the remaining period of the test.

e. Change in indications from 20 to 30 minutes – (per HB 44 T.N.4.6.)

f. Creep Recovery - The difference between the initial reading of the minimum load of the measuring range (D_{min}) and the reading after returning to minimum load subsequent to the maximum load (D_{max}) (at the time specified for initial reading in Table 5).

g. **Barometric pressure sensitivity**.

[1] Recommended changes to Publication 14 are indicated in shaded, ~~strike out~~, and underlined text.

Table 6.
Example of a Summary Table for a Class III 3000 Single Load Cell

Summary Table
(As requested in Item 12 of the force transducer (load cell) data format paper)

		Critical Result[1]	Tolerance[2]	Result/Tolerance
(a)	Force transducer (load cell) Error	0.68 v	0.7 v	0.97
(b)	Repeatability Error	0.19 v	0.35 v	0.55
(c)	Temperature Effect on MDLO	0.57 v_{min}/5 °C	0.7 v_{min}/5 °C	0.82
(d)	Creep (Time dependence)	0.98 v	1.5 v	0.65
(e)	**Δ Creep = $I_{20\ min}$ - $I_{30\ min}$**	**0.09 v**	**0.15 x |mpe| = 0.225v**	**0.40**
(f)	**Creep Recovery**	**0.17 v**	**0.5 v**	**0.34**
(g)	Effect of Barometric Pressure	0.185 v_{min}/kPa	1.0 v_{min}/kPa	0.15

[1] The critical test result is the test result that gives the greatest ratio of result to tolerance. There may be other errors of greater absolute value but that give smaller ratios of result to tolerance.
[2] The tolerance is the value from the tolerance table of the NTEP procedure that corresponds to the critical test result.

Agenda Item 4.

B. Certificate of Conformance Parameters

6. Weighing Systems Using a Tank or Hopper Load-receiving Element

6.1. For a cylindrical cone bottom tank or hopper, a CC will apply to all models having:

a. weighing capacities from 20 % to 125 % (approximately a 6:1 ratio) of the evaluated capacity;

b. tank or hopper height from 50 % to 125 % of the height of the evaluated device;

c. tank or hopper diameter from 50 % to 110 % of the diameter of the evaluated device;

d. tank or hopper construction and materials similar to that of the equipment evaluated; (see also section titled "Platform Material" below);

e. scale division values equal to or greater than the value of the scale division used in the scale evaluated;

f. n_{max} equal to or less than the value of the n_{max} used in the scale evaluated

g. **number of load supports equal to or greater than the number of supports in the device submitted for evaluation.**

6.2. For a rectangular tank or hopper a CC will apply to all models having:

a. weighing capacities from 20 % to 125 % (approximately a 6:1 ratio) of the evaluated capacity;

b. tank or hopper height from 50 % to 125 % of the height of the evaluated device;

c. tank or hopper length from 50 % to 110 % of the length of the evaluated device;

d. tank or hopper width from 50 % to 110 % of the width of the evaluated device;

e. tank or hopper construction and materials similar to that of the equipment evaluated;

f. scale division values equal to or greater than the value of the scale division used in the scale evaluated;

g. n_{max} equal to or less than the value of the n_{max} used in the scale evaluated.

h. number of load supports equal to or greater than the number of supports in the device submitted for evaluation.

Agenda Item 5.

69. Performance and Permanence Tests for Railway Track Scales Used to Weigh Statically

*(**NOTE:** For combination vehicle/railway track scales, see also additional test considerations under "Test Considerations for Other Scales" in the application.)*

It is desirable, but not required that a new installation should be calibrated by a railroad test car after a representative of the railroad has inspected the installation for compliance with railroad design and construction specifications.

The Performance Test (69.1 thru 69.6) is conducted to determine compliance with the tolerances and, in the case of nonautomatic indicating scales, the sensitivity requirements specified in NIST Handbook 44. The tests described here apply primarily to the weighing/load-receiving element. It is assumed that the indicating element used during the test has already been examined and found to comply with applicable requirements. If the design and performance of the indicating element is to be determined during the same test, the applicable requirements for weighbeams, poses, dials, electronic digital indications, etc., must also be referenced. A 100 000 lb field standard weight cart, or a combination of field standard weights **safely** added to a field standard weight cart in 10 000 lb increments for a total of 100 000 lb will be used to conduct the Performance test.

The Permanence Test (69.7) shall not be conducted sooner than thirty (30) days after the Performance Test. If a 100 000 lb field standard weight cart, or a combination of field standard weights **safely** added to a field standard weight cart for a total of 100 000 lb, is not available for the Permanence Test a 100 000 lb "Test Weight Railcar" or "Test Weight Railcart" may be used.

***NOTE:** A field standard Test Weight Railcar and Test Weight Railcart shall have a footprint no greater than 7'. The Association of American Railroads, AAR Scale Handbook Section 1.5 "Specifications for Railway Track Scale Test Weight Loads" defines the requirements for test weight loads including "Test Weight Railcarts" and "Test Weight Railcars." A "Standard Rail Car," as described in AAR Scale Handbook Section 1.5.7, is not suitable for use during NTEP evaluations.*

The following definitions from the AAR Safety and Operations Scale Handbook ©2009 Edition Section 1.5 Specifications for Railway Track Scale Test Weigh Cars and have been reprinted with the permission of the AAR.

1.5.5. TEST WEIGHT RAILCAR

Test weight load designed as a certified mass standard supported by two-axle trucks, built for AAR interchange service, with the following design characteristics:

a. All metal construction except ballast. Ballast material must be stable.
b. Loading points must not exceed 7ft (2.2 m) and have uniform load distribution.
c. No unnecessary equipment.
d. A minimum of ledges, cavities, or projections that hold dirt, water, or other foreign matter.

e. The calibration cavities, capable if holding at least 1,000 lb (500 kg), must be waterproof and sealable.
f. Operational controls functional from both sides of the railcar.
g. Drive system, when used, shall be adequate to propel the railcar on a 3% grade.
h. Smooth and sloped top to ensure drainage.
i. Accessibility of all parts for inspection.
j. Ruggedness and durability in order to minimize repairs,
k. Overall truck centers shall not exceed 50 ft (15 m).
l. Side-mounted hand brake accessible from the ground.
m. Fuel tank, when used, must be attached and not exceed 16 lb (7 kg) capacity or 2 gal (8 L).
n. Lifting system must be adequate to lift all wheels a minimum of 2 in. (5 cm) above the rail.
o. Hydraulic oil tank, when used, must be equipped with a sight gauge or other means to indicate proper amount of oil to maintain calibration.

1.5.6. TEST WEIGHT RAILCART

Test weight load designed as a certified mass standard supported by two-axles on steel wheels, with the following design characteristics:

a. All metal construction.
b. Loading points must not exceed 7ft (2.2 m) and have uniform load distribution.
c. No unnecessary equipment.
d. A minimum of ledges, cavities, or projections that hold dirt, water, or other foreign matter.
e. The calibration cavities, capable if holding at least 1,000 lb (500 kg), must be waterproof and sealable.
f. Minimum surface area with smooth and sloped top to ensure drainage.
g. Accessibility of all parts for inspection.
h. Ruggedness and durability in order to minimize repairs,
i. Fuel tank, when used, must be attached and not exceed 16 lb (7 kg) capacity or 2 gal (8 L).
j. Hydraulic oil tank, when used, must be equipped with a sight gauge or other means to indicate the proper amount of oil to maintain calibration.
k. The weight cart, as well as the separable weights, must be traceable.

69.1. Influence Factors

If tests are necessary to determine compliance with influence factors, individual main elements and components tests must be conducted according to NTEP Policy that is outlined in NCWM Publication 14, Section B.1. Influence Factor Requirements.

69.2. Test Standards

A 100 000 lb field standard weight cart or a 100 000 lb combination of field standard weights safely added to a field standard weight cart shall be used for the Performance test. Weights must be incremented by 10 000 lb from 30 000 lb to 100 000 lb. A test weight railcar shall not be used for the Performance Test.

69.3. Sensitivity and Discrimination Tests

69.3.1. Weighbeams

The sensitivity test is conducted at zero load and at maximum test load for mechanical railway track scales with non-automatic indicating elements. The sensitivity test is conducted by determining the actual test weight value necessary to bring the beam from a rest point at the center of the trig loop to rest points at the top and bottom of the trig loop. The maximum load at which the sensitivity test is conducted need not be comprised of known test weight.

69.3.2. Automatic Digital Indicating Elements

The discrimination test is conducted at zero load and at maximum load for railway track scales with indicating elements (e.g., electronic digital indicating elements, mechanical dials). See also DES Section 54 regarding the specific procedures for the discrimination test.

69.4. Digital Indications

Width-of-zero, zone of uncertainty and, if so equipped, automatic zero-tracking mechanism tests shall be conducted as specified in other sections of NCWM Publication 14.

69.5. Increasing Load/Shift Tests

69.5.1. Conduct increasing load tests in 10 000 lb load increments up to 100 000 lb. Conduct shift tests over each section at 50 000 lb and 100 000 lb, testing all sections and midspans between sections in both directions with each load. The scale shall be capable of returning to a no-load indication within prescribed limits [3 d per 5 °C change in temperature] and within 15 minutes after increasing or shift test load is removed. Zero balance change is limited to acceptance tolerance (1/2 d). The indication may be re-zeroed before the start of any increasing load or shift test, but not during any sequence.

(a) Begin increasing-load test by placing 30 000 lb on one end section. Record error

(b) Remove test load and record balance change. Do not reset zero.

(c) Increase to 40 000 lb on end section and record error.

(d) Remove test load and record balance change. Do not reset zero.

(e) Repeat this process, incrementing to 50 000 lb.

(f) After 50 000 lb is removed and balance change is recorded, reset zero.

(g) Begin the shift test by loading one end section with 50 000 lb and record the error.

(h) Move the test load to the midspan and to the left and right of each section so that one set of the test cart wheels are spotted over the load cell or lever bearing points. Record errors at each test position. .

(i) Remove load from opposite end of scale. Record balance change and reset zero.

(j) Repeat shift test in opposite direction according to steps (g) through (i).

(k) Continue with increasing load test following the procedures in steps (a) through (e) for test loads from 60 000 lb to 100 000 lb.

(l) After 100 000 lb is removed and balance change is recorded, reset zero.

(m) Conduct shift test in each direction using 100 000 lb following the procedures in steps (g) through (j).

69.5.2. Results shall be within acceptance tolerance as specified in Handbook 44, Section 2.20. Scales Code, T.N.4.4.

69.6. Strain Load Tests

69.6.1. The minimum test for a strain load test for single-load receiving element scales greater than 35 feet and for multiple load receiving element scale systems designed to weigh railroad cars in a single draft is 200 000 lb, or if practicable, at least 80% of scale capacity.

(a) Load one end of the scale with a strain load.

(b) Record the “reference point” for the start of the strain load test.

(c) Add 100 000 lb of test weight to the opposite end of the scale. The target strain load is the sum of the unknown weight and the test weights.

(d) Record the indicated strain-load value after the maximum amount of test weights have been added and calculate the strain load test error. The scale shall perform within prescribed tolerances based upon tolerance for the known test weights.

(e) Remove the test weights from the end of the scale without conducting a decreasing load test.

(f) If a higher strain load value is desired, increase the strain load at this time before proceeding with next step.

(g) Record the new strain load reference value and reapply the test weights.

(h) Record the indicated strain load value and calculate the strain load test error. The scale shall perform within prescribed tolerances based upon the known test weights.

(i) Evaluate repeatability of results in test weight values obtained in step (d) and step (g) to agree within the absolute value of maintenance tolerances.

(j) Remove the strain load (railcar or material of unknown weight) from the scale, decreasing to 100 000 lb of known test weights.

(k) Record error based on a decreasing load test to 100 000 lb.

(l) Remove weights from scale.

(m) Record zero balance change.

69.6.2. The results of all observations shall be within acceptance tolerance.

69.7. Permanence Test

69.7.1. Minimum Use Requirements for the Field Permanence Test

69.7.1.1. There must be at least 300 weighing operations executed over the scale prior to conducting the type evaluation Permanence Test. The entire NTEP evaluation should be performed at a customer location to facilitate "normal" use during the permanence period.

69.7.1.2. There must be at least 30 days between the Performance Test and the Permanence Test. If the prescribed weighments have not been completed, the time between tests shall be extended. Acceptance tolerances apply regardless of the time between Performance Test and the Permanence Test.

69.7.1.3. Only loads, which reflect "normal" use, will be counted during the permanence-testing period.

- 100 percent of the loads must be above 20 percent of scale capacity; and
- 50 percent of the loads must be above 50 percent of scale capacity.

The scale may be used to weigh other loads, but only the loads specified above are counted as part of the Permanence Test.

69.7.2. Subsequent Type Evaluation (Field) Permanence Test

69.7.2.1. It is recommended that the Performance Test procedure as described above be repeated for the Permanence Test. However, if the original test equipment is not available, the test may be conducted to the extent possible with a "Test Weight Railcar" or " Test Weight Railcart" with at least a 100 000 lb capacity and a suitable and current calibration report.

69.7.2.2. Repeat width-of-zero, zone of uncertainty, sensitivity, and discrimination tests near zero (outside the range of the AZSM) and at or near capacity on the subsequent tests.

The results of these tests must be within acceptance tolerance. If the device does not meet these tolerance limits the scale will be rejected and the entire test must be repeated, including successful performance testing and a subsequent test after a minimum of 30 days.

Agenda Item 6.

35. Weigh-In/Weigh-Out Systems

A weigh-in/weigh-out system is typically used in vehicle scale and other applications that involve two weight determinations. The larger of the two weights is printed as the gross weight. The other weight is printed as the tare weight and the difference computed as the net weight. Weights, recalled weight values, and gross, tare, and net weights must be identified to clearly document the transaction. The storage, recalling, and printing actions are limited so they do not facilitate fraud.

NOTE: Manual weight entries are only permitted to correct erroneous tickets printed in error provided the conditions in DES Section "17. Manual Weight Entries" are met.

S. Cook: During the drafting of the summary for this item, the NIST Technical Advisor suggests that the NTEP Committee include a checklist item for DES Section 35 to document if "manual weight" capability was verified as not applicable or complied with applicable requirements as shown below:

35.10.	The data processing system performing the weigh-in/weigh-out operation will only accept weight values when the scale indicator is in the gross mode or give an error signal.	Yes ☐ No ☐ N/A ☐
35.11.	**Manual weight entries are only permitted to correct erroneous tickets printed in error provided the conditions in DES Section "17. Manual Weight Entries" are met.**	**Yes ☐ No ☐ N/A ☐**

Agenda Item 9.

Device Application	Term	Acceptable	Not Acceptable
General:			
	Semiautomatic (pushbutton) tare	tare, T, TA	
	Keyboard, programmable, and stored tare	**tare, T, TA, or PT**	
	net	net, N, NT	

Agenda Item 10.

8.2c Widths up to 120 % of the width of the platform tested ~~no greater than~~ that of the device tested; [3]

[3&5] For scales with widths greater than 12 feet, this policy on range of widths may not be applied retroactively **unless the criteria in DES 66 b or 66 c have been performed.** ~~**Additional testing is required for devices with widths greater than 12 feet.**~~ Test procedures for scales wider than 12 feet will be addressed by NTEP management and the NTEP laboratories on a case-by-case basis.

Agenda Item 11.

8.1. Additional criteria for vehicle scales, railway track scales, combination vehicle/railway track scales, and other platform scales over 30 000 lb and up to and including 200 000 lb.

A CC will apply to all models having:

a. **nominal capacities** up to 135 % of evaluated capacity;
~~**b.**~~ ~~**a platform area for any two section portion no less than 50 percent of smallest two section portion incorporated in the device evaluated**~~**.**
b~~e~~. **widths** up to 120 % of the width of the platform tested**;**
c~~d~~. **lengths no shorter than 7' and up to** 150 % of the length of the platform tested**;**
d~~e~~. a **span** between sections is not more than 20 % greater than the equipment evaluated;

Agenda Item 14 (a).

Publication 14 DES Section 58.

Publication 14

Time Dependence Test T.N.4.5., T.N.4.5.1.
58.1 ~~**Load the instrument close to Max. Take one reading as soon as the indication has stabilized and then note the indication in one hour intervals while the load remains on the instrument for a period of four hours. During this test the temperature should not vary more than 2 °C.**~~

~~**The test may be terminated after 30 minutes if the indication differs less than 0.5 e during the first 30 minutes and the difference between 15 and 30 minutes is less than 0.2 e.**~~

When any load is kept on an instrument, the difference between the indication obtained immediately after

placing the load and the indication observed during the following 30 minutes shall not exceed 0.5 e. However, the difference between the indication obtained at 15 minutes and the indication obtained at 30 minutes shall not exceed 0.2 e.

If these conditions are not met, the difference between the indication obtained immediately after placing a load on the instrument and the indication observed during the following four hours shall not exceed the absolute value of the maximum permissible error at the load applied.

58.2. ~~The deviation in the zero indication before and after a period of loading with a load close to Max for half an hour, shall be determined. The reading shall be taken as soon as the indication has stabilized.~~

The deviation on returning to zero as soon as the indication has stabilized, after the removal of any load which has remained on the instrument for 30 minutes, shall not exceed 0.5 e.

Agenda Item 14 (b).

40. ~~Zero-Load Adjustment (~~Zero-Setting Mechanisms~~)~~ - General
Code References: S.2.1.1. and S.2.1.2.

To prevent fraudulent or inappropriate adjustments of the zero setting mechanism . . .
-
-
Indicate the zero load adjustment method provided.

- ☐ ~~**Tool operated zero-load adjustment.**~~ ~~(~~Manual zero-setting mechanism~~)~~
- ☐ Semi-automatic zero-~~**load adjustment.**~~ ~~**(Semi-automatic zero-**~~setting mechanism~~)~~
- ☐ Power switch zero-load adjustment.

Agenda Item 14 (d).

15.1. Test Method 1 — Yes ☐ No ☐ N/A ☐

Use this method when tare is taken to the internal resolution and the scale prints gross, tare, and net weight.

a.
b.
c.

Example of possible noncompliance: Capacity 120 000 x 20 lb	
Load perceived by the scale to the internal resolution	Recorded Value
45011 lb gross 20009 lb tare 25002 lb ~~**tare**~~ **net**	45020 LB G 20000 LB T 25000 LB N

Agenda Item 14 (e).

Table 1.
NTEP Participating Laboratory
Force transducer (load cell) Test Capabilities

Participating Laboratory	Test Range	Minimum Dead Load	Test Machine Capacity	Direction of Loading
NIST Force Group	200 - 555 lbf	10 lbf	500 lbf	Tension Compression
	4000 - 28 000 lbf	400 lbf	25 000 lbf	Tension Compression
	28 000 - 120 000 lbf	3000 lbf	112 000 lbf	Compression
California DMS	Less than 20 kg	0.5 kg	20 kg	Tension **Compression**
	20 - 110 kg	5 kg	110 kg	Tension **Compression**
	500 - 1000 lbf	*	*	*

* In special cases, force transducers (load cells) from 500 to 1000 lbf can be tested in a walk-in test chamber with special loading hardware provided by the manufacturer.

Agenda Item 14 (f).

Amend Publication 14 FT Section I-10 to read as follows:

10. Stability - Use an indicating instrument and a loading means which provide sufficient stability to permit readings within the limits specified in ~~**point**~~ **FT Section I point 1**.

Appendix B

National Conference on Weights and Measures / National Type Evaluation Program

Weighing Sector Final Attendee List

August 25-27, 2009 / Columbus, Ohio

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National Conference on Weights and Measures / National Type Evaluation Program

Weighing Sector Final Attendee List

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Appendix D
National Type Evaluation Technical Committee (NTETC)
Software Sector

Annual Meeting Summary
March 11 - 12, 2009, Reynoldsburg, Ohio

Carry-over Items:

1. Issuing Certificates of Conformance (CC) for Software

Source: National Conference on Weights and Measures (NCWM) Reports

Background: Excerpts of reports from the 1995 - 1998 Executive Committees were provided to National Type Evaluation Technical Committee (NTETC) Software Sector members at their April 2006 meeting. The chair asked the sector to review the following National Type Evaluation Program (NTEP) policy decision adopted by the NCWM in 1998 relative to the issuance of a separate Certificate of Conformance (CC) for software. During the 1998 NCWM Annual Meeting, the following recommendation was adopted as NTEP policy:

- "Software, regardless of its form, shall not be subject to evaluation for the purpose of receiving a separate, software CC Conformance from the NTEP."

- "Remove all of the software categories from the index of NCWM Publication 5, NTEP Index of Device Evaluations."

- "Reclassify all existing software CCs according to their applicable device categories."

Also relevant, from Section C of NCWM Publication 14: "In general, type evaluations will be conducted on all equipment that affect the measurement process or the validity of the transaction (e.g., electronic cash registers interfaced with scales and service station consoles interfaced with retail fuel dispensers); and all equipment to the point of the first indicated or recorded representation of the final quantity on which the transaction will be based."

Recommendation: The Sector recommended the following language to be submitted to the NTEP Committee as a policy change, and requested that the NTEP Committee place this issue on their agenda:

> **Software Requiring a Separate CC:** Software, which is implemented as an add-on to other NTEP Certified main elements to create a weighing or measuring system and its metrological functions, are significant in determining the first indication of the final quantity. Such software is considered a main element of the system requiring traceability to an NTEP CC.
>
> **NOTE:** OEM software ***may*** be added to an existing CC or have a stand-alone CC with applicable applications (e.g., a manufacturer adding a software upgrade to their ECR or point-of-sale system, vehicle scale weigh-in/weigh-out software added as a feature to an indicating element, automatic bulk weighing, liquid-measuring device loading racks, etc.) and minimum system requirements for "type P" devices (see proposed software definition below). It may be possible for a manufacturer to submit a single application for both hardware and software contained in the same device. A single CC would be issued.
>
> In this instance, OEM refers to a 3rd party. The request to add software could be made by the original CC holder on behalf of the 3rd party. Alternatively, a new CC could be created that refers to the original CC and simply lists the new portions that were examined.

The NTEP committee included this item in their agenda (*NTEP Committee 2009 Interim Agenda Item 8*). There was no discussion during the open hearing, and it was determined that this item be given voting status for the 2009 Annual Meeting Agenda.

Discussion: Dr. Ambler Thompson observed that in reality, this type of software represents only a small portion of type evaluations; the vast majority of them are not standalone software. Ms. Cassie Eigenmann indicated that this item as written might not clearly state the intention, which is to simply allow the labs to call standalone software packages that are type approved to be categorized as 'software.' It is an administrative change, not a regulatory change. The labs will not be doing anything differently at type approval time.

Mr. Dennis Beattie made the statement that if you follow the concept of 'first final,' then you have to address every step of the process, and if that is done with software, then the requirement to address software is obvious. Mr. David Vande Berg explained that it is not always black/white (i.e., external software for tare/net calculations is sometimes not judged subject to type approval.) It was suggested by Mr. Norm Ingram to define what is meant by 'software requiring a separate CC;' Ms. Cassie Eigenmann recommended using specific examples.

Mr. Steve Patoray listed some goals he felt were important the Sector accomplish:

- Answer the question, "What is this item that is up for vote going to change in practice?"
- Address Scale Manufacturers Association's (SMA) concerns on the S&T agenda Items 310-2 and 310-3.

Dr. Ambler Thompson agreed, further suggesting that the Sector needs to 'sell' the concepts we have realized, and it was mentioned that the Regional meetings might be an opportunity to approach the states.

Mr. Jim Truex, NTEP Administrator, felt that the upcoming vote will be a technical vote, requiring at least 27 states to vote in the affirmative to pass. He also indicated that this will not change the way the labs operate – it is merely the ability for the labs to label evaluated standalone software as such, and not be forced to categorize it as some type of device, such as 'weigh-in-weigh-out-system'. Mr. Patoray also suggested that this is an important vote for the Sector; and asked that if the states continue to avoid dealing with software what is the future of the Sector?

Conclusions:

- **The Sector feels that this item is important and that there exists the possibility of misinterpretation of the scope/intent of this item by other interested parties, hence the Sector agreed to the following actions:**
    - Generate Problem Statement and specify benefits addressed by change (Done)
    - Feedback from labs/inspectors (Lucas, Frailer, Ingram?)
    - 'Sales flyer'/Newsletter article (Bliss et al.)
    - Request added as Agenda item at CWMA/NEWMA? (Pettinato/Ingram)
    - Attend CWMA/NEWMA regional meetings? (?)

NCWM was contacted and the staff indicated that if it is desired to include an article in the newsletter, a final draft must be submitted by April 15th. The Sector work group should have a draft circulating by April 3, 2009, so comments can be gathered by April 10, 2009, for consideration prior to the final draft.

Mr. Doug Bliss provided a draft 'slide show' format presentation as a starting point for clearly presenting the ideas put forth by the Sector, and started on a draft article for the newsletter. Further work has progressed since the meeting *(see Appendices B & C).*

2. Definitions for Software-Based Devices (2009 Interim Agenda Item 310-2)

Source: NTETC Software Sector

Background: Discussed was marking and G-S.1.1. It was initially suggested that "not built-for-purpose" be removed from the wording in NIST HB 44 G-S.1.1. However, after further discussion, this may not be the correct or final decision. There is no definition for a 'not built-for-purpose device' in HB 44. The current HB 44 definition for a built-for-purpose device reads:

> *Built-for-purpose device.* Any main device or element, which was manufactured with the intent that it be used as, or part of, a weighing or measuring device or system. [1.10] (Added 2003)

The Sector recommended the following definitions be submitted to the S&T Committee as an item and be considered for inclusion in Appendix D of NIST Handbook 44 to replace the current definition of 'build-for-purpose device':

> **Electronic devices, software-based. Weighing and measuring devices or systems that use metrological software to facilitate compliance with Handbook 44. This includes:**
>
> **(a) Embedded software devices (Type P), aka built-for-purpose. A device or element with software used in a fixed hardware and software environment that cannot be modified or uploaded via any interface without breaking a security seal or other approved means for providing security and will be called a "P," or**
>
> **(b) Programmable or loadable metrological software devices (Type U), aka not-built-for-purpose. A personal computer or other device and/or element with PC components with programmable or loadable metrological software and will be called "U." A "U" is assumed if the conditions for embedded software devices are not met.**
>
> **Software-based devices – See Electronic devices, software-based.**

At the 2009 NCWM Interim Meeting, the Committee received comments from the SMA stating that it now opposes this item since there is no technological justification for making a distinction in software-based device types. Mr. Darrell Flocken added that the SMA can only provide limited responses. SMA continues to support the efforts of the Software Sector and the SMA response is based on the concern that the proposed definitions in this recommendation and the marking requirements proposed in agenda Item 310-3 will require weighing devices be more complex than those currently produced.

The Meter Manufacturers Association indicated that it supports the item as written in the recommendation.

Mr. Will Wotthlie, Maryland, did not agree with the SMA position that there are no technological difference between the types of software-based devices. He added that Type P devices and separable elements have limited flexibility in changing software and indications and frequently include the sensing elements necessary for the measurement (e.g., load cells, meters, etc.). Whereas, Type U devices and separable elements are typically devices that do not contain measuring elements; can be replaced with compatible equipment and display devices purchased from any number of sources; and only process metrological information received from measuring and other sensing elements.

Mr. Stephen Patoray, Consultants in Certification, agrees with the SMA that there are few differences between Type P and U software-based devices. However, there are significant differences between Type P and U devices in that a Type P device is defined as an instrument that requires a security means since the instrument has fixed hardware (including sensing components) where the metrological software is ***embedded*** into the instrument. Type U devices do not include fixed components and metrological software cannot be sealed using physical security seals or the minimum form of an audit trail (i.e., two event counters).

Software Sector Co-Chair, Jim Pettinato,FMC Technologies, added that international recommendations recognize the differences between embedded software and programmable/loadable software. Additionally, the Software Sector recommends that this item remain informational to allow conference members to further study that proposed definitions.

The S&T Committee agreed with the comments received during the open hearing and the request from the co-chairman of the software sector and agreed that this item should remain an Informational item for further review.

Additional background information on this item can be reviewed in the 2009 Interim Agenda (NCWM Pub. 15).

Discussion: It was reiterated by several individuals that again it seems that resistance to this item stems not from a disagreement with the intention, but from either a misunderstanding of the applicability or unrelated concerns over marking requirements.

Further discussion was related to how to best present the opinion/goals of the Sector to the interested external parties, such as the NCWM standing committees and the individual states. Some discussion on the wording of the definitions took place as well, with the slightly modified version being proposed:

Electronic devices, software-based. Weighing and measuring devices or systems that use metrological software to facilitate compliance with Handbook 44. This includes:

(a) Type 'P' (aka built-for-purpose) software-based electronic devices. A device or element with software used in a fixed hardware and software environment that cannot be modified or uploaded via any interface without breaking a security seal or other approved means for providing security; or

(b) Type 'U' (aka not-built-for-purpose) software-based electronic devices. All metrological software-based devices not meeting the conditions of a Type 'P' device. Example: a personal computer or other device and/or element with PC components with programmable or loadable metrological software.

Software-based devices – See Electronic devices, software-based.

Conclusion: No consensus was reached on any language change. The Sector did agree that including the reason(s) for proposing these definitions as part of the effort to educate/promote external parties would be

beneficial; and that we would attempt to explain the reasoning/intent of the proposed definitions together with/as part of the action items for Item 1.

3. Marking of Software Identification – G-S.1. (2009 Interim Agenda Item 310-3)

Source: 2008 Carryover Item

Background: Starting at the October 2007 meeting, the Software Sector has discussed the value and merits of required markings for software. After several iterations, the Sector developed a table to reflect their positions:

Method	NTEP CC No.	Make/Model/Serial No.	Software Version/Revision~~1~~
TYPE P electronic devices shall meet at least one of the methods in each column:			
Hard-Marked	X	X	Not Acceptable[1]
Continuously Displayed	X	X	X
By command or operator action	Not Acceptable	Not Acceptable	X[2]
[1] If the manufacturer declares that the primary **<u>sensing</u>** element "software" is integral, has no end user interface and no print capability, ~~**the element may be considered exempt from the marking requirement for version/revision.**~~ **<u>the version/revision shall be hard marked on the device.</u>** Example: Primary sensing element may be Positive Displacement (P.D.) meter with integral correction, digital load cell (only for reference, not limiting). [2] Information on how to obtain the Version/Revision shall be included on the NTEP CC. **<u>Metrologically significant software shall be clearly identified with the software version. The identification may consist of more than one part but one part shall be only dedicated for the metrologically significant portion.</u>**			
Method	**NTEP CC No.**	**Make/Model/~~Serial No.~~**	**Software Version/Revision**
TYPE U electronic devices shall meet at least one of the methods in each column:			
Hard-Marked	X[3]	X	Not Acceptable
Continuously Displayed	X	X	X
Via Menu (display) or Print Option	Not Acceptable	X[4]	X[4]
[3] Only if no means of displaying this information is available. [4] Information on how to obtain Make/Model, Version/Revision shall be included on the NTEP CC. Metrologically significant software shall be clearly identified with the software version. The identification may consist of more than one part but one part shall be only dedicated for the metrologically significant portion.			

This table was submitted to NCWM S&T Committee and was assigned Developing status in 2008.

Prior to the 2009 Interim NIST Weights/Measures Division commented on this item and presented an alternate proposal with significant modifications, which were included in the Interim Meeting Agenda background for the item (See 2009 Pub 15 for more details).

This item was assigned Informational status for the NCWM 2009 Annual Meeting.

Discussion: It was noted by several Sector members that the perceived scope of the original proposal has been extended by the modifications made by WMD and now appears to exceed both the purview and the intent of the Sector, and it has become difficult to discern what our intentions were. Based on the fact that the table seems to have actually made the Sector's intent less clear, it was proposed by the chair to revisit this item in relation to the current text of G-S.1. to clarify exactly what real changes to Handbook 44 would be required to achieve the intent of the Sector. It was also noted that there was some validity to the SMA argument that there is no justification for differentiation of marking requirements based on device type (P or U). After additional lengthy discussions, the following modified versions of G-S.1./G-S.1.1. were drafted:

G-S.1. Identification. – All equipment, except weights and separate parts necessary to the measurement process but not having any metrological effect **<u>and manufactured ~~prior to~~after January 1, 201X</u>**, 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 that is not part of a Type P (built-for-purpose) device.****;*
[Nonretroactive as of January 1, 1968]

(Amended 2003 **and 201X**)

(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 electronic*** *devices;*
[Nonretroactive as of January 1, 2004]

(Added 2003) **(Amended 201X)**

(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)

(e) an NTEP CC number or a corresponding CC Addendum Number for devices that have a CC. 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 201X**)

*G-S.1.1. ~~Location~~ **Method** of Marking Information for ~~Not-Built-For-Purpose~~ all Software-Based Devices. –* ***For*** *~~not-built-for-purpose, software-based~~* ***devices*** *manufactured ~~prior to~~***after** *January 1, 201X,* ***either****:*

(a) The required information in G-S.1. Identification. ~~(a), (b), (d), and (e)~~ shall be permanently marked or continuously displayed on the device; or

(b) The CC Number shall be:

(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."

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.*

[Nonretroactive as of January 1, 2004]

(Added 2003) (Amended 2006 **and 201X**)

It was noted that though currently it is allowable to display the CC number via a menu, there has been some challenges locating this information in the field due to the vagueness of the term 'easily recognized.' Hence, since it is left to the interpretation of the NTEP laboratory to ascertain whether a device's method for displaying the CC number meets the requirements, this vagueness has not been addressed in this new recommendation.

Mr. John Roach, California NTEP Lab, indicated that if the proposed table (or some version thereof) is not eventually included as part of G-S.1. that it may be useful to incorporate a suitable table into Pub 14.

Conclusion: The Sector wishes to address concerns related specifically to software and does not wish to debate the merits of general marking requirements beyond that related to software identification. We feel the above proposed changes better reflect the Sector position. If WMD and NCWM S&T feel a table outlining general marking requirements would clarify the intent of G-S.1., then the Sector suggests that following simplified version may better suit the purpose.

Table G-S.1.~~a~~ Identification for Devices Manufactured on or after January 1, 201X		
Required Marking	**Full Mechanical Devices and Separable Mechanical Elements**	**Electronic Devices, Software Based**
Manufacturer or CC holder ID	**Hard Marked**	**Hard Marked, Continuously Displayed, or Via Menu (display) or by command or operator action**
Model identification	**Hard Marked**	**Hard Marked, Continuously Displayed, or Via Menu (display) or by command (operator action)**
Serial number	**Hard Marked**	**Hard Marked, Continuously Displayed** [1]
Metrologically Significant significant Software software version	**Not Applicable**	**Continuously Displayed, Via Menu (display) or by command (operator action)** [2]
Certificate of ConformanceCC number	**Hard Marked**	**Hard Marked or Continuously Displayed, or Via Menu (display) or by command (operator action)**[3]

[1]Type 'U' devices need not have a non-repetitive serial number.

[2]If the manufacturer declares that the primary sensing element "software" is integral, has no end user interface and no print capability, the version/revision shall be hard marked on the device. Example: Primary sensing element may be Positive Displacement (P.D.) meter with integral correction, digital load cell (only for reference, not limiting).

[3]If the Certificate of ConformanceCC number is to be displayed via menu and/or submenu, the means of access must be easily recognizable. In addition, instructions on how to obtain the remaining required information not hard-marked or continuously displayed shall be included on the NTEP CC.

(Added 201X)

Note that this new version of the table reflects the aforementioned changes proposed for the G-S.1. text as well as homogenizing Type P and Type U requirements, with the exception of the serial number requirement being waived for standalone software. It was also noted that much of the information previously included in the separate proposed Table G-S.1.b was redundant as it is already stated verbatim in the text of G-S.1.; hence the Sector questions the benefit of the WMD - proposed separate Table G-S.1.b.

4. Identification of Certified Software

Source: NTETC 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:

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:

Example from DSW 2 CD (now 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 W&M inspector information that something has changed? (Yes, the Category III audit trail or other means of sealing). How can the W&M inspector identify an NTEP Certified version? (They cannot, without adding additional requirements like what is described here, in conjunction with including the identifier on the CoC).

Recommendation: The Sector believes that it should work towards language that would include a requirement similar to the OIML requirement in HB 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)

Initial draft proposed language: (G-S.1.1.?)

<u>Identification of Certified Software:</u>

<u>Software-based electronic devices shall be designed such that the metrologically significant software is clearly identified. The identification of the software shall be inextricably linked to the software itself.</u>

- **<u>Unique identifier must be displayable/printable on command or during operation, etc. (marking req't in addition)</u>**

- **At a m inimum, a ve rsion/revision i ndication (1.02.09, rev 3. 0 a, e tc). C ould al so consist of / contain checksum, etc (crc32, for example)**

Discussion: Discussion on this item was brief, as it was the general consensus that those in attendance understood the goals of this item and were in agreement of those goals. However, the conceptual language was not far enough along to warrant detailed discussion specific to a draft proposal and more work offline should be done.

Conclusion: A work group will be designated by the Sector Co-Chairs prior to the NCWM Annual Meeting to further promote the state of this item, to be discussed at the next Sector meeting.

5. Software Protection/Security

Source: NTETC Software Sector

Background: The sector agreed that Handbook 44 already has audit trail and physical seal, but the question on the table is does the Handbook need to be enhanced to sufficiently discourage the facilitation of fraud, intentional or accidental, where software is concerned?

WELMEC and OIML again have addressed this issue specifically when dealing with software. From WELMEC:

Protection against accidental or unintentional changes:
Metrologically significant software and measurement data shall be protected against accidental or unintentional changes.

Specifying Notes:
Possible reasons for accidental changes and faults are: unpredictable physical influences, effects caused by user functions and residual defects of the software even though state of the art of development techniques have been applied.

This requirement includes:

a) Physical influences: Stored measurement data shall be protected against corruption or deletion when a fault occurs or, alternatively, the fault shall be detectable.

b) User functions: Confirmation shall be demanded before deleting or changing data.

c) Software defects: Appropriate measures shall be taken to protect data from unintentional changes that could occur through incorrect program design or programming errors(e.g., plausibility checks).

Required Documentation:
The documentation should show the measures that have been taken to protect the software and data against unintentional changes.

Example of an Acceptable Solution:

- The accidental modification of software and measurement data may be checked by calculating a checksum over the relevant parts, comparing it with the nominal value and stopping if anything has been modified.

- Measurement data are not deleted without prior authorization (e.g., a dialogue statement or window asking for confirmation of deletion).

- For fault detection, see also Extension I.

Recommendation: The Sector derived a suitable checklist for Pub 14 from the OIML checklist, and asked the current NTEP labs to begin using this checklist on a trial basis for new type approval applications.

Devices with embedded software TYPE P (aka built-for-purpose)			
	Declaration of the manufacturer that the software is used in a fixed hardware and software environment, and		**Yes** □ **No** □ **N/A** □
	cannot be modified or uploaded by any means after securing/verification		**Yes** □ **No** □ **N/A** □
	Note: *It is acceptable to break the "seal" and load new software, audit trail is also a sufficient seal.*		
	The software documentation contains:		
		description of the (all) metrologically significant functions OIML states that there shall be no undocumented functions	**Yes** □ **No** □ **N/A** □
		description of the securing means (evidence of an intervention)	**Yes** □ **No** □ **N/A** □
		software identification	**Yes** □ **No** □ **N/A** □
		description how to check the actual software identification	**Yes** □ **No** □ **N/A** □
	The software identification is:		
		clearly assigned to the metrologically significant software and functions	**Yes** □ **No** □ **N/A** □
		provided by the device as documented	**Yes** □ **No** □ **N/A** □
Personal computers, instruments with PC components, and other instruments, devices, modules, and elements with programmable or loadable metrologically significant software TYPE U (aka not built-for-purpose)			
	The *metrologically significant* software is:		
		documented with all relevant (see below for list of documents) information	**Yes** □ **No** □ **N/A** □
		protected against accidental or intentional changes	**Yes** □ **No** □ **N/A** □
	Evidence of intervention (such as changes, uploads, circumvention) is available until the next verification / inspection (e.g., physical seal, Checksum, CRC, audit trail, etc. means of security)		**Yes** □ **No** □ **N/A** □
Software with closed shell (no access to the operating system and/or programs possible for the user)			
	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** □
	Check whether the manufacturer has submitted a written declaration of the completeness of the set of commands		**Yes** □ **No** □ **N/A** □
Operating system and / or program(s) accessible for the user:			
	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~~ W&M jurisdiction and type-specific parameters)		**Yes** □ **No** □ **N/A** □
	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).		**Yes** □ **No** □ **N/A** □
Software interface(s)			
	Verify the manufacturer has documented:		
		the program modules of the metrologically significant software are defined and separated	**Yes** □ **No** □ **N/A** □

		the protective software interface itself is part of the metrologically significant software	**Yes** ☐ **No** ☐ **N/A** ☐
		the *functions* of the metrologically significant software that can be accessed via the protective software interface	**Yes** ☐ **No** ☐ **N/A** ☐
		the *parameters* that may be exchanged via the protective software interface are defined	**Yes** ☐ **No** ☐ **N/A** ☐
		the description of the functions and parameters are conclusive and complete	**Yes** ☐ **No** ☐ **N/A** ☐
		there are software interface instructions for the third party (external) application programmer.	**Yes** ☐ **No** ☐ **N/A** ☐

Discussion: The Chair requested feedback from the NTEP Labs as to whether they had the opportunity to utilize the checklist; each lab reported either they have not had any applications for devices where the checklist could be used, or were unaware of the request to try the checklist. The labs were again asked to try to use the checklist should the opportunity present itself.

Conclusion: The Sector will again wait for laboratory feedback on this item; discussion on this item will continue as part of the next agenda item since the two are closely related.

6. Software Maintenance and Reconfiguration

Source: NTETC Software Sector

Background: The following Items were reviewed by the Sector in previous meetings.

a. Verify that the update process is documented (OK)
b. 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 <u>or become inoperative.</u>
   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 <u>or become inoperative.</u>
   Examples are not limiting or exclusive.
c. Verify that the sealing requirements are met
   The Sector asked, what sealing requirements are we talking about?
   This item is <u>only</u> addressing the <u>software update</u>, 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
d. Verify that if the upgrade process fails, the device is inoperable or the original software is restored

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 U.S. weights and measures requirements.

Recommendation: 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.

The Sector also worked towards language proposed for defining the requirements for a Traced Update (currently considered as relevant for Publication 14):

> **For a Traced Update, an event logger is required. The logger shall be capable of storing a minimum of the 10 most recent updates. An entry shall be generated for each software update.**
>
> **Use of a Category 3 audit trail is acceptable for the software update logger. In this case, the existing requirement of 1 000 entries supersedes the 1 0 entry requirement. A software update log entry shall include the following:**
>
> - **An event counter;**
> - **the date and time of the change;**
> - **the event type/parameter ID, which indicates a software update event (if not using a dedicated update log); and**
> - **the new value of the parameter, which is the *software identification* of the newly installed version.**
>
> **A Category III device may include the software update events in the Category III audit log in lieu of a separate software update log; the existing requirement for 1000 entries supersedes the requirement for 10 entries.**
>
> **The traceability means and records are part of the metrologically significant software and should be protected as such. If software separation is employed, the software used for displaying the audit trail belongs to the fixed metrologically significant software. *(Note: This needs to be discussed further due to some manufacturer's concerns about where the software that displays the audit trail information is located and who has access if this feature is provided. Manufacturers did indicate that there are methods available to encrypt the audit trail information; however, it cannot be protected from being deleted.)* (include flowchart from OIML D 31)**

Discussion: The Sector discussed how to best move this item forward, and there was also some discussion as to whether new language for the General Code was required. The following new text was proposed:

> **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.**

Mr. Jim Truex indicated that the current requirements in G-S.8. already make the statement that any changes that affect metrological function are sealable, hence, software updates may be covered and the proposed G-S.9. unnecessary. Mr. Todd Lucas suggested to go ahead and submit the proposed G-S.9. to the Committee and request a clarification/interpretation of G-S.8.

Conclusion: The Sector feels that the explicit language proposed for G-S.9. is clearer than any implied requirement in G-S.8.. The Sector would like a clarification/interpretation of G-S.8. as it relates to software updates from the S&T Committee (with their response preferably to be included in Pub 16). The Sector will also continue to develop the proposed text (and flow chart) targeted for inclusion in Pub 14.

(Note to S&T Tthis item assumes additional requirements in individual codes will be eventually added to address this requirement; (e.g., L.M.D. code has philosophy of sealing section that could be enhanced to include processes described.)

7. Verification in the Field, by the W&M Inspector

Source: NTETC Software Sector

Background: What tools does the field inspector need as relates to software-based electronic devices? Some possible answers:

NTEP CC – hard marked, continuously displayed, via menu command or operator action
Clear and simple instructions on NTEP CC to get to the other Inspection Information
The metrologically significant software identifier needs to be easily accessible from operator console
Clear and simple instructions on NTEP CC to access audit trail(s)

Recommendation: The Sector needs to continue to develop this item.

Discussion: Some discussion about system information requirements for the inspector took place. Does the inspector really need to have access to OS, RAM information, etc? (General opinion seems to be if there is a dependency, then the NTEP Lab would specifically include that requirement in the CoC.)

Audit trail info – the question was asked, does there need to be a specific requirement for providing access to this information?

Regarding the concept of First Final – There was some concern expressed as to how the inspectors are able to discern where the indication of first final be found for the SYSTEM (as opposed to the DEVICES in the system). What devices in the system are of concern to the inspector? The NTEP Administrator indicated that field inspectors need to follow the system all the way to receipt/bill generation.

Data transmission is an issue when considering systems as opposed to devices. How far does the inspector's jurisdiction extend? (Should we model future requirements on the WELMEC section concerning DTD/DSD?) Data transmission/storage is not currently being addressed by the Sector at this time.

Since part of the Sector's mission is education, do we want to assist in developing training aids for labs/inspectors related to evaluating/inspecting software-based devices? This will be a topic to be added to the Sector's agenda for the next meeting.

Conclusion: The Sector will continue to develop this item, and initiate a new agenda item specific to inspector training in relation to evaluating/validating software-based devices.

8. NTEP Application for Software Requiring a Separate CC

Source: NTETC Software Sector

Background: This item had been on the agenda of previous meetings, but was not discussed due to time limitations.

Recommendation: Identify issues, requirements and processes for type approving type U device applications.

Discussion: 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/mechanisms for submission should be available?

Validation in the lab – all required subsystems shall be included to be able to simulate the system as installed.

It was noted this agenda item is irrelevant if the NTEP Committee does not approve the pending item up for vote.

Mr. John Roach, California NTEP Lab, 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 labs and scale manufacturers indicated that this is not usually done for scale evaluations.

Conclusion: The Sector will continue to develop this item, contingent on the status of the related NTEP Committee agenda item after the 2009 Annual meeting.

New Items:

9. Sealing Requirements for Electronic Devices

Source: Weighing Sector Tech Advisor

Background: Steve Cook of NIST has been involved in attempting to address some concerns with the current wording of G-S.8. as it relates to the sealing of electronic devices and configuration modes. Since this is related in some respects to other items within the purview of the Software Sector, it was suggested that it may be beneficial for the Sector to review and comment on the proposed language.

Discussion: The Sector discussed the relevance of this item, and though it is related somewhat to the discussions on software security and maintenance/reconfiguration, it is broader in scope and hence it was decided that the item was not wholly relevant to the Sector's mission.

Conclusion: The Software Sector takes no position on these proposed changes.

10. Next Meeting

Recommendation: The Sector was asked to develop a proposed date and location for the next meeting.

Discussion: The Sector discussed two options for the next meeting; continuing to meet in Ohio or alternating to a Western location to maintain equity in travel for the various participating labs. There appeared to be a preference (after an informal polling) to alternate the meeting location from year to year.

Conclusion: The Sector recommends that the next meeting be held in Sacramento in or around March 2010. Sector Co-Chair Norm Ingram will investigate suitable hotels and meeting facilities and report back to NCWM. Details need to be firmed up by December of this year.

Appendix A
2009 Software Sector Attendees

2009 Software Sector Meeting Attendee List
March 11-12, 2009 / Reynoldsburg, Ohio

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Appendix B

Slide Show (Draft) for Presentation at Regional Meetings

Software COC

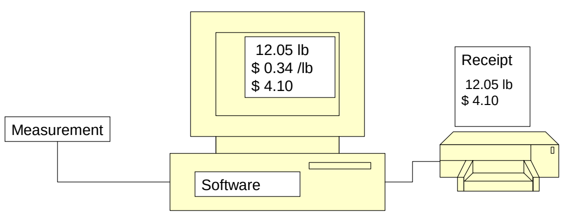
What is it and why do we need it?

Why? What's Broken?

- Software that runs on a PC may execute metrological functions
  - Display indication
  - Tare manipulation
  - Price computation
  - Receipt printing
- PC based software is often difficult to
  - Identify
  - Verify
  - Protect

First Final

- Refer to first final requirement here (Pub 14 admin policy)



PC-based Software Examples

- Point of Sale Cash Register
- Gas Station Pump Control
- Vehicle Scale In-Out

Point of Conflict?

- Current NTEP policy states that software shall not be separately evaluated and given a CoC
- It could be interpreted that Type Evaluation of the example systems is in conflict with the above rule.
  - No hardware was evaluated in these

What Software is NOT Affected?

- Software that executes confined within purpose-built hardware is generally not an issue
  - Hardware provides a ready place to mark for identification
  - Software is not easily modified (by design)
  - Physical seal is often an option

Appendix C
Draft Article for NCWM Newsletter
Software and Software-Based Measuring Equipment

Throughout most of the history of measurement, measuring equipment was purely mechanical in construction. The Industrial Revolution enabled the manufacture of mechanical devices that were identical to all other devices of its type, thus enabling the concept of metrological Type Evaluation. Critical adjustment points, being mechanical, could be readily identified and protected by a physical seal, which, when broken, provided visible evidence of tampering. Purely mechanical devices were (and remain) difficult to repurpose. A device, once installed, could be expected to continue throughout its working lifetime to do only the job for which it was designed. For all stakeholders, including the manufacturer, type evaluator, equipment owner and the field inspector, life was good.

The first electronics added to measuring equipment merely assisted the mechanical design, adding electrical "muscle" to the mechanical signals and perhaps provided a remote or a printed indication of the measurement value. The addition of electronics to measuring equipment created some new type evaluation checklist items, but remained easy to understand during both type evaluation and field inspection.

Next equipment designers cut the mechanical measurement signal and inserted a transducer to convert the mechanical energy into an electrical signal. The first true electronic-based measurement equipment was thus created. This transformation of measurement technology was strange and mysterious; no longer could one see the measurement along the entire measurement path. Nevertheless, the new transducer and associated electronic devices could each be evaluated as a "black box"; each component was built for a specific purpose, had well defined physical input and output characteristics, had a special adjustment point that could accept a physical seal and remained difficult to repurpose in the field. More checklist items and new device types were required and eventually created.

Purely electronic measuring components did not last very long; perhaps only one equipment generation. The invention of the microprocessor allowed equipment designers to condense much of the electronics into a single chip, providing cost savings and increased reliability, and permitting the addition of many new features and functions. Software performed much of the work previously accomplished using electronic hardware. This revolution, being internal, went almost unnoticed for a time. Software within the device was built for purpose and was difficult or impossible to modify in the field. More checklist items were added to cover the new software features.

Alongside the development of the microprocessor that is now embedded within most measuring equipment was a similar development in general purpose computing. Rapidly falling costs for general purpose computers moved the computer out of the high security computer room and onto the desktop. New operating systems not only allowed but encouraged users to control the operation of and data stored on their computer. It was a natural consequence of the flexibility and usefulness of general purpose computers that they would eventually be employed to perform measurement functions. Today, general purpose computers are routinely used in retail Point of Sale (POS) cash registers, fuel dispensing systems and vehicle scale weigh-in/weigh-out systems, to name a few examples.

Example: Retail Point of Sale

In a grocery store a general purpose computer is connected to a combination bar code scanner/weighing platform. No local display is provided at the scale; instead the computer provides a continuously updating weight display along with its running tally of the grocery bill items. The computer is also connected to a receipt printer, a cash drawer, and a central database computer. The bar coded item number and gross weight are sent to the cash register computer, which performs an item record look up to obtain the tare value and unit price (price per pound). The computer subtracts the tare weight from the gross weight to create a net weight, multiplies the unit price by the net weight and rounds to obtain total price. It then displays the net weight, unit price, and total price for the customer and clerk to see. In this case, the first indication of the final value for the transaction is displayed on the computer screen.

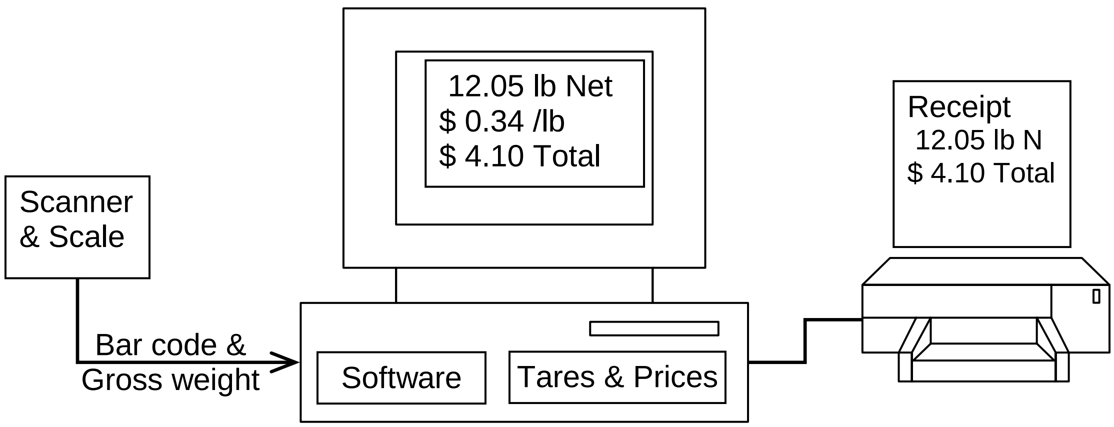
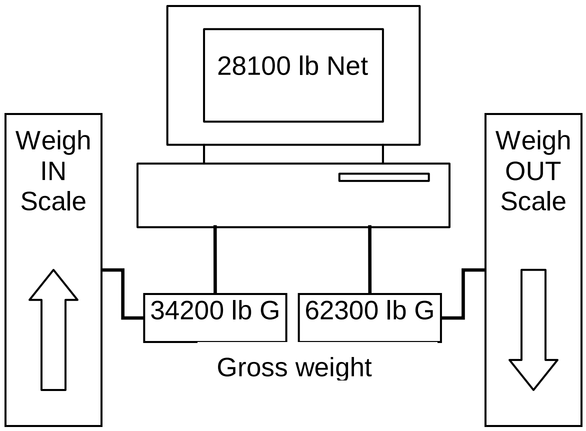


Figure 1 - Retail POS

Example: Vehicle Weigh-In / Weigh-Out

A user already owns one or two vehicle scale weighbridges and electronic weight indicating devices. The user then purchases a general purpose computer and a CDROM containing Vehicle Weigh-In/Weigh-Out software. The computer is loaded with the new software and is connected to the vehicle scales. In normal operation the gross weight is sent continuously from each scale to the computer, which provides an indication of the weight on its screen. Vehicles enter the facility by stopping on an inbound scale. A database record is created that includes the inbound weight and the vehicle ID. The vehicle either picks up or drops off a load and exits the facility by stopping on an outbound scale. The previously stored data record for this vehicle is retrieved and a net weight is calculated and displayed on the computer screen. A bill record or credit record is created and stored and the bill or credit amount is also displayed. The computer may provide net sign correction to prevent display of negative weights if the computer does not know whether the vehicle is empty or full when inbound. In some cases, the vehicle's empty weight is known and was previously stored in the computer. If the empty weight is available, the bill record or credit record may be created in a single transaction. In this case, the computer performs a gross/tare/net calculation, price computing, and net weight display. Note that the scale weighbridge, indicating device and computer software may each be provided by a different vendor. The computer is creating the "first final" indication of net weight and computing the transaction price/credit.



Also note that since times are hard, this computer will have other uses; during the 2nd shift an accounts payable software package is run and during 3rd shift the rather bored security guard plays *World of Warcraft* ®.

As we can see from history and examples, personal computer (PC) based software is a natural evolutionary step in the development of measuring devices. But how to handle PC based software during type evaluation and subsequent field inspection? This is exactly the same type of question that was asked each time the technology changed!

NCWM Publication 14, Administrative Policy, Section C (DEVICES TO BE SUBMITTED FOR TYPE EVALUATION) describes that the scope of NTEP evaluations is limited to equipment for which definitive criteria exist and to new technologies or applications where the development of criteria is deemed necessary. It further describes "…the minimum amount of equipment that must undergo type evaluation is all of the parts of a device or system that performs the measurement up to the first indicated or recorded value of the final quantity on which the transaction is based." Thus if a general purpose computer will execute software that is part of the chain up to that "first final" output, then that computer, or at the least, its software[1], must be evaluated for type approval.

But no one wants to evaluate a general purpose computer. They are not completely specified (a CoC only lists minimum requirements) and computer vendors and models change often. We are then left with evaluating the software, or rather the functions that the software performs. This in itself is not so bad; software can be treated like a "black box" with defined inputs and outputs. A major sticking point in the investigation is that a general purpose computer and its operating system are specifically designed to allow the user complete freedom to modify both the operating software and any data stored within!

Equipment Classification for Software Evaluation

Before any Type Evaluation can begin, it is necessary to know something about the design. When investigating software-based equipment this is especially true.

Software that executes confined within purpose-built hardware is generally not an issue.

- Hardware provides a ready place to mark for identification

[1] *Current NTEP policy states that software shall not be separately evaluated and given a Certificate of Conformance (CoC). It could be interpreted that Type Evaluation of some systems such as Vehicle Weigh-In/Weigh-Out is in conflict with the above rule since no hardware need be evaluated.*

- Software is not easily modified (by design)
- Physical seal is often an option for protection of software and parameters

A general purpose computer is by intent easy to modify; its value is derived from the ability to modify its data and its operation. A general purpose computer presents issues in the areas of:

- Identification and marking
- Verification of type
- Protection against intended and unintended changes to metrologically significant software and parameters

For the purposes of identifying and limiting the depth of investigation required, it is useful to create two classes; one of which is the well known Handbook 44 "built for purpose", also known as "Type P". The other class, based on a general purpose computer, is not presently defined by the NCWM but is known elsewhere as "Type U", which stands for Universal computer.

Software Identification Position Statement

- **The Software Sector recommends that all software-based devices be required to provide version identification for the metrologically significant portion of the software, regardless of whether such software runs on a built for purpose device (type "P") or a universal computer (type "U").**
- **Based on feedback from the Scale Manufacturers Association and other sources, there is a desire to eliminate the present device-type dependent differences in allowable marking/identification methods. The Software Sector agrees that all software-based devices should have identical marking options.**

The Software Sector is confident that both of these positions can be accommodated by simple text edits to Handbook 44 G-S.1. and G-S.1.1.

In addition, the Software Sector acknowledges that there are still reasons to differentiate between Type P and Type U software-based electronic devices (unrelated to the marking requirements) hence continues to support the proposed addition of these terms as definitions in Appendix D of Handbook 44, replacing the previously used term 'built-for-purpose'.

Appendix E
National Type Evaluation Technical Committee (NTETC)
Belt-Conveyor Scale Sector

Meeting Summary
February 26, 2009, St. Louis, Missouri

Contents

Carry-Over Items from 2008:

1. Proposed Update to NCWM Publication 14 Belt-Scale Checklist

Source: Mr. Bill Ripka, Sector Chairman

Background: At the February 2008 meeting of the Belt Sector, NIST Technical Advisor, Mr. Steven Cook reviewed recent changes to NIST Handbook 44 Section 2.21. (Belt-Conveyor Systems) and recommended that the NCWM Publication 14 (Pub 14) Belt-Conveyor Scale Checklist, which was based on the 2006 edition of NIST Handbook 44, be reviewed and updated. The Sector members reviewed suggested amendments and no further changes were recommended.

Prior to the 2009 Sector meeting, Sector Chairman, Mr. Bill Ripka, provided the draft Pub 14 Belt-Conveyor Scale Checklist technical policies on the substitutions of Master Weight Totalizers and other minor editorial suggestions for review. Among the suggested changes that were included in this draft were proposed changes for procedures involving testing semi-automatic and automatic zero-setting mechanisms.

Discussion/Conclusion: Comments were heard during the February 2009 Sector meeting regarding the draft proposed changes submitted by Mr. Ripka. Manufacturers generally agreed the proposal for evaluation of substitution MWTs is not intended to apply to devices produced by different manufacturers. The Sector also agreed to recommend that this criterion be used to amend existing certificates.

The Sector discussed whether or not a substitute totalizer needs to undergo a permanence test during type-evaluation. Mr. Ian Burrel, Control Systems Technology, stated that a totalizer submitted for evaluation should undergo a permanence test during the laboratory portion of the type-evaluation. Mr. Steven Cook, NIST, questioned whether or not totalizers from different manufacturers could be evaluated on a one-to-one comparison basis during a field test when different totalizers are used with identical associated equipment/systems.

NTEP Administrator, Mr. Jim Truex, polled the manufacturers present as to whether any among them have an instrument which is developed or being developed and will be submitted for NTEP evaluation. If so, would the manufacturers be willing to submit that device and have the above Pub 14 draft used during the evaluation? Mr. Ripka responded that Thermo-Ramsey may have a totalizer which might be available for evaluation by the end of 2009. Mr. Jim Truex stated that NTEP is ready to apply the draft on a trial basis, and that this step is necessary prior to amending Pub 14 by adopting the draft.

Language highlighted in shaded font indicates recommended changes to Pub 14 Belt-Conveyor Scale Checklist as shown below.

** A MWT submitted for approval as a stand-alone device can only be accepted as an addition to an existing Certificate of Conformance (CC) for a complete Belt Conveyor Scale System.

A. Models to be Submitted for Evaluation

A type is a model or models of the same design as defined in the NTEP Policy and Procedures. A complete list and description of all models of a type to be included in the CC shall be submitted with the request for type-evaluation. All options and features to be included on the CC must be submitted for evaluation. If the CC is to include more than one model of the same type, the submitter shall contact the evaluation agency to determine which model or models will be evaluated. A CC will be amended when new models of the same type meeting the specified criteria are applied for by the manufacturer.

The models to be submitted for evaluation shall be those having:

a. Laboratory Test – A master weight totalizer (MWT) or integrator, that as a minimum meets the requirements of the original evaluation, with defined enhancements and additional options indicated. The submitter shall also provide all necessary devices or instruments to represent the load receiving and speed sensing elements.

b. Field Test – The field test shall be performed with a previously "approved for commercial use" weighbridge model by the same manufacturer.

B. Certificate of Conformance (CC) Parameters

A CC will apply to all models that have:

1. Equivalent hardware and software, and

2. Subsets of standard options and features of the equipment evaluated.

Metrological features not recognized by Handbook 44, but capable of being used as the basis for commercial transactions, shall be capable of being disabled and sealed before the device can receive an NTEP CC.

C. Replacement Parts

The policy for addressing the conformance of replacement parts with the parts being replaced is:

1. If a MWT has received an NTEP evaluation and an NTEP, it must be repaired with parts that are consistent with the original design or metrologically equivalent parts.

D. Substitution of the Master Weight Totalizer

For a MWT to be considered an appropriate substitute for the MWT tested during the original type evaluation of a belt-conveyor scale system, the following criteria must be satisfied:

1. The MWT must be tested in the laboratory using appropriate load and speed signal simulators capable of being adjusted within the tolerances indicated in the checklists and tables in this document.

2. All MWT laboratory tests must be performed on the replacement MWT, including temperature testing.

3. During the test, the device must be within the acceptance tolerance.

4. A field test will be performed meeting new initial installation testing criteria.

5. A field permanence test will be performed.

6. A separate CC will not be issued for the new MWT. Instead, the original CC will be amended to include the new MWT as an option.

7. Application limits, such as capacity and speed ranges, established during the original type evaluation will not be amended.

E. Checklist and Test Procedures

1. Indicating and Recording Elements

The integrator of a belt-conveyor scale normally includes the master weight totalizer (MWT and a rate of flow indicator and rate of flow alarms. The MWT must have adequate resolution to be able to establish a valid zero reference value and must have sufficient capacity to totalize loads over a reasonable period of time. The integrator may also have a resettable partial totalizer for indicating the mass of loads conveyed over a limited period of time and may have a supplementary totalizer with a scale interval greater than that of the MWT that will indicate the mass of loads conveyed over a fairly long period of operation. The partial totalizer is normally used for indicating the values for the zero test, simulated load tests, materials tests, and individual measurements of interest to the scale owner.

The MWT shall be equipped with provisions for applying a security seal that must be broken or another approved security means before any change that affects the metrological integrity of the device can be made to the MWT.

1.1	The scale must have a master weight totalizer (MWT).	Yes ☐ No ☐ N/A ☐
1.2	The MWT shall not be resettable without breaking a security means.	Yes ☐ No ☐ N/A ☐
1.3	A power failure test must be conducted on digital electronic MWT's both in the laboratory and in the field permanence test.	Yes ☐ No ☐ N/A ☐

Test Procedure

1.3.1	Accumulate a measured quantity on the MWT and stop the flow of material. Note the reading.	Yes ☐ No ☐ N/A ☐
1.3.2	Disconnect power to the MWT.	Yes ☐ No ☐ N/A ☐
1.3.3	Connect power to the MWT.	Yes ☐ No ☐ N/A ☐
1.3.4	The quantity indication shall return to the previously displayed quantity within 1 division.	Yes ☐ No ☐ N/A ☐

Laboratory Test: The accumulated measured quantity for the MWT is retained in memory during a power failure of 24 hours and is displayed again when power is returned.

Field Test: The accumulated quantity for the MWT is retained in memory during a power failure of 10 seconds up to 24 hours and is displayed again when power is returned.

1.4	The capacity of the MWT shall be at least 10 hours times the maximum rated flow rate indicated on the original CC.	Yes ☐ No ☐ N/A ☐
1.5	The value of the scale division shall be capable of being established for a value less than or equal to 0.1 % of the minimum totalized load.	Yes ☐ No ☐ N/A ☐
1.6	The MWT shall indicate in one or more of the weight units indicated in table T.1 [check the applicable unit(s)]	Yes ☐ No ☐ N/A ☐
	The scale division shall be in increments of 1, 2, or 5 times 10k where k is an integer.	Yes ☐ No ☐ N/A ☐

Table T.1	
Unit	**Abbreviation**
_____ pounds	Lb or LB
_____ U.S. short ton	Ton or T
_____U.S. long ton	LT
_____ Metric ton	T
_____ kilograms	kg

1.7 The indicated weight value must be expressed without the use of a multiplier. Yes ☐ No ☐ N/A ☐

1.8 The MWT may have a no-flow lockout provided the lockout is limited to not more than 3 % of the rated belt loading in terms of weight per unit length. The no-flow lockout must be deactivated during the zero test. Yes ☐ No ☐ N/A ☐

1.8.1 During normal operation, the MWT shall advance only when the belt conveyor is in operation and under load. Yes ☐ No ☐ N/A ☐

1.8.2 If a no-flow lockout is provided, verify that it is limited to not more than 3 % of the rated belt loading. Yes ☐ No ☐ N/A ☐

1.8.3 It must be possible to deactivate the no-flow lockout during the zero test Yes ☐ No ☐ N/A ☐

2. Recording Element

2.1 The MWT shall incorporate or be capable of interfacing with a recording element. Yes ☐ No ☐ N/A ☐

2.1 The value of the scale division for the recording element shall be the same as for the MWT. Yes ☐ No ☐ N/A ☐

2.3 The recording element shall record the initial indication and the final indication of the MWT, the quantity delivered, the unit of measurement, (i.e., kilograms, tones, pounds, tons,), the date and time (see Table T.2). This information shall be recorded for each delivery. The indicated and recorded weight values must agree to the nearest scale division. Yes ☐ No ☐ N/A ☐

All weight values shall be recorded as digital values.

Information required on the ticket:

Table T.2	
Date	05 06 2008
Time	15:30
Master Start Total	44113.5 T
Master Stop Total	44300.5 T
Quantity	187.0 T

2.4 If a reset to zero mechanism is incorporated, there must be an interlock to prevent the zeroing of the device between the printing of the initial and final values of the totalized weight. Yes ☐ No ☐ N/A ☐

2.5 The printing of weight values shall be inhibited when the flow rate is greater than either: Yes ☐ No ☐ N/A ☐

~ 3 % of the maximum flow rate, or

~ The flow rate at which the MWT is engaged unless the weight value is identified as a subtotal, in process weight, or the equivalent.

2.6	The recorded weight value must be expressed without the use of a multiplier.	Yes ☐ No ☐ N/A ☐
2.7	The printer must automatically sequence through a print cycle so that each printed document includes two weight values to represent the initial and final values.	Yes ☐ No ☐ N/A ☐

3. Rate of Flow Indicator and Recorder

A rate of flow indicator and recorder are required. The MWT shall incorporate or be capable of interfacing with a rate of flow indicator and recorder. They may express the rate in weight units per hour or as a percent of capacity. The indicator and recorder may be either analog or digital.

3.1	The system must have both a rate of flow indicator and rate of flow recorder.	Yes ☐ No ☐ N/A ☐

The rate of flow recorder is:
_____ analog
_____ digital

3.2	If a digital flow rate recorder is provided, the readings must be taken at time intervals not exceeding 10 seconds.	Yes ☐ No ☐ N/A ☐
3.3	The rate of flow indicator must indicate from zero to at least 100 % of capacity.	Yes ☐ No ☐ N/A ☐
3.4	The rate of flow recorder shall record from zero to at least 100 % of capacity.	Yes ☐ No ☐ N/A ☐

4. Rate of Flow Alarms

The system shall be equipped with a permanent means to provide an audio or visual alarm (signal) when the rate of flow is equal to or less than 20 % and equal to or greater than 100 % of the rated capacity of the scale. The alarm shall be located such that it will be noticed by the operator during normal operation.

The rate of flow alarm is:

_____ both audio and visual _____ audio _____ visual

4.1	The alarm (signal) is located so it will be noticed during normal scale operation.	Yes ☐ No ☐ N/A ☐
4.2	Record the values at which the alarm is triggered:	Yes ☐ No ☐ N/A ☐

Low alarm:_______________

High alarm:_______________

4.2.1	The alarm triggered when the rate of flow is equal to or less than 20 % and equal to or greater than 100 % of the rated capacity of the scale.	Yes ☐ No ☐ N/A ☐
4.3	Access to the parameters for setting the alarm limits shall be through a	Yes ☐ No ☐ N/A ☐

security means.

5. Zero-Setting Mechanism

The zero-setting mechanism may be either a manual or automatic mechanism. If the zero-load reference is recorded at the beginning and end of a delivery, the range of the zero-setting mechanism shall not be greater than ± 5 % of the rated capacity of the scale. Where the zero-load reference is not recorded at the beginning and end of a delivery, the range of the zero-setting mechanism shall be limited to ± 2 % of the rated capacity of the scale. If a greater adjustment is needed, the access to the adjustment must be through some security means. An audio or visual signal shall be given when the automatic and semi-automatic zero-setting mechanisms reach the limit of adjustment. The zero-setting mechanism must be constructed such that the zero-setting operation is done only after a whole number of belt revolutions (a minimum of three minutes). The completion of the zero-setting operation must be indicated. The low-flow lockout must be deactivated for this test.

5.1 To verify the ± 5 % range of the zero setting mechanism and the zero load reference recording capability: Yes ☐ No ☐ N/A ☐

5.1.1 Verify that the zero-setting range is limited to ± 5 %. Yes ☐ No ☐ N/A ☐

5.1.2 Adjust the load simulating device to represent 8 % of the scale capacity. Yes ☐ No ☐ N/A ☐

5.1.3 Zero the scale. Yes ☐ No ☐ N/A ☐

5.1.4 Adjust the load simulating device representative of a 1 % of scale capacity decrease; the automatic-zero-setting mechanism shall reset the zero of the scale and the recording element shall indicate the change in zero.. Yes ☐ No ☐ N/A ☐

Adjust for another 1 % of scale capacity decrease.

Again, the MWT shall reset the zero and the recording element shall indicate the change.

Continue to decrease the load simulating device in 1 % increments until the automatic-zero-setting mechanism no longer resets the zero.

Record the total amount of adjustment.

Return the load simulating device to the initial zero value. Increase the load simulating device in 1 % increments, verifying zero corrections and recordings until the MWT will no longer automatically reset the zero.

Record the value where automatic zero correction is restricted.

The total range of the automatic-zero-setting mechanism shall not exceed 10 % of the scale capacity.

5.1.4 The zero should move a maximum of ± 5 % either in its automatic-zero setting mode or as manually adjusted. Yes ☐ No ☐ N/A ☐

5.2 To verify the ± 2 % range of the zero setting mechanism: Yes ☐ No ☐ N/A ☐

5.2.1 Verify that the zero-setting range is limited to ± 2 %. Yes ☐ No ☐ N/A ☐

5.2.2	Adjust the load simulating device to represent 5 % of the scale capacity.	Yes ☐ No ☐ N/A ☐
5.2.3	Zero the scale.	
5.2.4	Adjust the load simulating device representative of a 1 % of scale capacity decrease; the automatic-zero-setting mechanism shall reset the zero of the scale. Adjust for another 1 % of scale capacity decrease. Again, the MWT shall reset the zero. Continue to decrease the load simulating device in 1 % increments until the automatic-zero-setting mechanism no longer resets the zero. Record the total amount of adjustment. Return the load simulating device to the value initial zero value. Increase the load simulating device in 1 % increments, verifying zero corrections, until the MWT will no longer automatically reset the zero. Record the value where automatic zero correction is restricted. The total range of the automatic-zero-setting mechanism shall not exceed 4 % of the scale capacity.	Yes ☐ No ☐ N/A ☐
5.2.5	The zero should move a maximum of ± 2 % either in its automatic-zero setting mode or as manually adjusted.	Yes ☐ No ☐ N/A ☐
5.3	The zero-setting operation shall be performed only after a whole number of belt revolutions and at least 3 minutes of operation.	Yes ☐ No ☐ N/A ☐
5.4	The completion of the automatic zero-setting operation must be indicated.	Yes ☐ No ☐ N/A ☐
5.5	The range of the zero-setting mechanism must be limited to ± 2 % or ± 5 % of the capacity of the scale without breaking a security means.	Yes ☐ No ☐ N/A ☐
5.6	An audio or visual signal shall be given when the automatic and semi-automatic Zero-setting mechanisms reach the limit of adjustment.	Yes ☐ No ☐ N/A ☐

6. Sensitivity at Zero Load

The purpose of this requirement is to assure that the MWT has sufficient resolution and sensitivity to establish a good zero reference value. The manufacturer may specify an alternate test procedure to demonstrate the required sensitivity. The no-flow lockout must be deactivated for this test.

6.1	Adjust the load simulating device to represent the weight required to determine compliance based on the equation:	Yes ☐ No ☐ N/A ☐

$$\frac{2 * W_c}{C_m} \underline{\hspace{6cm}}$$

For example: $$\frac{2*500}{1000} = 1 \text{ lb}$$

Where: C_m = counts in dynamic weighing scale divisions required for the minimum totalized load

W_c = weight required to reach the static scale capacity of the weighbridge.

Static scale capacity = (maximum weight/foot)(length of weighbridge)

6.2 Operate the scale for a time equal to the time required to deliver the minimum totalized load.

6.2.1 Record the time period: ___________ minutes.

6.3 The totalizer shall advance at least one but not more than three divisions. Yes ☐ No ☐ N/A ☐

6.3.1 Record the quantity registered: _________ divisions.

6.4 The MWT has the sensitivity specified at zero. Yes ☐ No ☐ N/A ☐

7. Marking Requirements

7.1 The marking of the MWT shall meet the requirements established during the initial CC evaluation. Yes ☐ No ☐ N/A ☐

8. Provisions for Metrological Sealing of Adjustable Components or Audit Trail

Due to the ease of adjusting the accuracy of electronic MWTs, all MWT's must provide for a security seal that must be broken or provide an audit trail, before any adjustment that detrimentally affects the performance of the electronic device can be made. Only metrological parameters that can affect the measurement features that have a significant potential for fraud and features or parameters whose range extends beyond that appropriate for the device compliance with HB 44 or the suitability of equipment, shall be sealed.

For additional information on the proper design and operation of the different forms of audit trail, see the Appendix for Audit Trail

8.1 The device has the capability for a physical seal. Yes ☐ No ☐ N/A ☐

8.2 The device meets the requirements for Audit Trail. Yes ☐ No ☐ N/A ☐

9. RFI/EMI Environment

The equipment shall be suitable for the environment in which it is intended to be used, including resistance to electromagnetic and radio-frequency interference generated by electromechanical equipment, portable hand-held radio transmitters and citizen's band transmitting equipment (if normally used at the site of installation).

9.1 The instrument meets standard NTEP RFI/EMI influence requirements. Yes ☐ No ☐ N/A ☐

10. Laboratory Test Procedures

A. Technical Policy

The MWT is to be placed in the environmental chamber to determine performance with respect to influence factors. It is not necessary to re-rest a previously type approved weighbridges, speed sensors or ancillary devices. It is not necessary, nor recommended, that signal simulators for load and speed be located in the chamber. The simulated test loads to be used for the MWT evaluation shall be equal to the signal levels from the actual tests loads used during the initial type evaluation.

B. Initial Tests

1. Determine and record the load simulating device setting for zero and full scale ranges.
2. Calibrate the MWT at 20 ºC.
3. Conduct the sensitivity test at zero load.
4. Verify that the range of the automatic zero setting mechanism(s) do not exceed ± 2 % and ±5 % of capacity.
5. Test the alarms for flow rates below 20 % and above 100 % of rated capacity.

Once the laboratory test is started, after completion of the voltage tests, neither the zero nor the span are to be adjusted. The data should be normalized for the many tests.

The laboratory tests consist of a combination of simulated dynamic tests. These tests require adjusting a load simulating device and a speed simulating device to pre-calculated values and conducting a simulation of belt travel distances, integrating the weight on the MWT.

C. Soak Requirements

The laboratory test is to be run at 20 ºC, the upper temperature limit and the lower temperature limit. The surface temperature of the MWT is to be measured. In consultation with the manufacturer, place the temperature sensor on the portion of the MWT that is expected to be the last part to reach thermal equilibrium. After the surface temperature has reached the test temperature, allow the equipment to soak for at least an additional two hours, but not more than six hours, before starting the test. For convenience of the test, however, an overnight period may be used for the soak period before running the next temperature test.

1. Stabilize the temperature at 20 ºC.
2. Enable the speed simulating device for a constant signal level.
3. Deactivate the automatic zero setting mechanism and no-flow lock-out.
4. Zero the MWT.

The MWT shall have sufficient resolution (that is a sufficiently small dynamic scale division) to permit this test to be completed in the greater of 20 minutes, or for a time equivalent to the test time required for the test run at 35 % of the minimum static capacity.

The beginning and ending MWT indications shall not change more than ± 1 scale division.

D. Voltage Tests

Verify the line power source, AC or DC, is set to the manufacturers recommended nominal value (i.e., 120 VAC or 24 VDC)

1. Run an accuracy test at 98 % of scale capacity for the time to deliver 800d.
2. Reduce the line power supply to 85 % of nominal (i.e., 100 VAC or 20.4 VDC).
3. Run a zero test.
4. Run an accuracy test at 98 % of scale capacity for the time to deliver 800d.
5. Increase the line power supply to 110 % of nominal (i.e., 130 VAC or 26.4 VDC).
6. Run a zero test.
7. Run an accuracy test at 98 % of scale capacity for the time to deliver 800d.

8. Return the line power supply to the nominal value.

E. Temperature Tests

1. Run a zero test.
2. Do not reset zero or adjust the span at any time after the start of this test.
3. Adjust the load simulating device to achieve the desired load representations.
4. Test the MWT simulating dynamic operation of the belt conveyor scale system at the following "flow rates" (all percent values represent percent loads of static scale capacity (SSC)):

0 (zero test), 35 % (SSC_{min}), 35 %, 70 %, 98 %,

Leave the MWT under simulated load for 1 hour, then:

98 %, 70 %, 35 %, 35 % (SSC_{min}), and 0 (zero test)

Table T.3		
Percent of Static Scale Capacity	**Nominal Time (Minutes)**	**Equivalent Belt Travel**
0	20 minutes, or MTL_{min}/[(0.35)(BL_{min})(belt speed for test)], whichever is greater	__________
35 % of SSC_{min}	20 minutes, or MTL_{min}/[(0.35)(BL_{min})(belt speed for test)], whichever is greater	__________
35 % of SSC_{max}	Time to deliver 800d	
70 % of SSC_{max}	Time to deliver 800d	
98 % of SSC_{max}	Time to deliver 800d	
Leave MWT under simulated load for 1 hour		
98 % of SSC_{max}	Time to deliver 800d	
70 % of SSC_{max}	Time to deliver 800d	
35 % of SSC_{max}	Time to deliver 800d	
35 % of SSC_{min}	20 minutes, or MTL_{min}/[(0.35)(BL_{min})(belt speed for test)], whichever is greater	__________
0	20 minutes, or MTL_{min}/[(0.35)(BL_{min})(belt speed for test)], whichever is greater	__________

The tolerance to be applied for the laboratory test is set at 0.45 times the tolerance for the complete installation times 0.3 (30 %). The formula is shown in Table T.4 to illustrate the process. The reference value for a particular accuracy test is the simulated load times the simulated belt travel distance. The values to be used for the laboratory test are shown in the following example:

F. 98 % load – Zero load test = difference

Proportion the effect of the zero-load test to the time of the tests for each simulated load. The values for the differences represent the simulated material measured by the MWT and are compared to the reference value for accuracy.

1. Change the temperature to -10 ºC (14 ºF) at a rate no faster than 1 ºC/min following the "soak requirements."
2. Repeat the simulated dynamic tests.

3. Change the temperature to 40 ºC (104 ºF) at a rate no faster than 1 ºC/min following the "soak requirements."
4. Repeat the simulated dynamic tests.
5. Change the temperature to 20 ºC (68 ºF) at a rate no faster than 1 ºC/min following the "soak requirements."
6. Repeat the simulated dynamic tests.

G. Data Analysis

1. The data are evaluated on the Simulated Dynamic MWT Test Work Sheet, Item 14 and 15, for pass or fail.

11. Field Test

A field test is required prior to final type approval. The field test can be performed as a retrofit on a previously approved for commercial use belt-conveyor scale system or in a new application. The Field Test Procedures as defined in paragraph 13 of the initial belt-conveyor scale Type Evaluation section of Publication 14 and as defined in HB 44 are to be followed. The results of all tests must be within acceptance tolerances.

12. Permanence Test

A permanence test is conducted to determine the accuracy of the device in use over a period of time. The permanence test shall be conducted after a minimum of 20 days after successful completion of the initial performance test, and after a minimum volume of material has been transported across the belt-conveyor scale. This minimum volume of material shall be no less than the maximum scale capacity times 8 hours times 20 days. (i.e. A system with a maximum scale capacity of 1000 TPH requires a minimum volume of 160000 tons [1000 * 8 * 20] to have been transported prior to the permanence test.). The results of all tests must be within acceptance tolerances.

The permanence test shall include:

1. initial stable zero tests
2. at least two test loads at normal use capacity
3. simulated load tests
4. verification of audit trail recorded events

13. Data Sheet and Laboratory Test Procedure

Temperature Testing: Belt-Conveyor Scale Systems Code paragraphs T.3.1., T.3.1.1., T.3.1.2. The accuracy of the MWT is to be adjusted at 70 % of the static scale capacity (SSC). A weight display of 0.01 % (1 part in 10,000) is required for the laboratory tests. The allowable error is adjusted to 30 % of the allowable error for the entire system type approval. If tests are run for a time greater than that needed for the minimum test load (MTL), substitute the totalized load (TL) for the MTL in the tolerance calculation in Test Conditions, step 3 (Table T.4).

Table T.4

Device Parameters	Abbrev.	Maximum	Minimum	Dim
1. Load per unit length from existing CC; corresponds to the largest capacity and the lowest capacity rating	BL			lb/ft
2. Length of the weighbridge (inches) from existing CC				In
3. Belt Speed from existing CC	SP			ft/min
4. Determine scale capacity in units per hour SC=SP*BL*60/2000 (must correspond to existing CC)	SC			ton/hr
5. Record the static scale capacity in units of weight SSC=(maximum weight per foot)(length of weighbridge)	SSC			lb
6. Allowable zero error for temperature change of 10 ºC (18 ºF) AZE=(.003)(0.0007)(SC_{min})(time)/60 where "time" is the time of the zero test in minutes	AZE			ton
7. Size of scale division required for zero	SD			ton
8. Determine the minimum and maximum totalized loads	MTL			ton
Test Conditions	**Abbrev.**			
1. Determine the time in minutes to acquire MTL with the test load to be simulated in the laboratory.	Test load, pound/foot			lb/ft
	Test load, total			lb
	Time (minutes) to deliver MTL (at least 10 minutes)	Time		min
2. Determine number of belt travel sensor revolutions required for the above time. Manufacturer to provide revolutions per foot or pulses per foot as appropriate to determine 3 belt revolutions and a delivery of 800d.		BTR		revolutions
3. Allowable weighing error (units of weight) for simulated dynamic tests which will be divisions on master weight totalizer. AWE = (0.003)(0.45)(0.005)(TL)	AWE			ton

Table T.5
Initial Tests
1. Set up the unit at 20 ºC (68 ºF), zero the MWT, and adjust the span following the manufacturer's procedure.
2. Conduct the sensitivity test at zero load.
3. Verify that the range of the automatic zero setting mechanism(s) do not exceed ±2 % and ±5 % of capacity.
4. Test the alarms for flow rates below 20 % and over 100 % of scale capacity.

Table T.6
Laboratory Tests
1. Stabilize the temperature at 20 ºC.
2. Enable the speed simulator to represent 100 % speed.
3. Deactivate the automatic zero setting mechanism and zero the MWT.
4. Run a zero test.
Voltage tests
5. Run an accuracy test at 98 % of scale capacity for the time to deliver 800d.
6. Reduce the live voltage to 85 % of nominal.
7. Run a zero test.
8. Run an accuracy test at 98 % of scale capacity for the time to deliver 800d.
9. Increase the line voltage to 110 % of nominal.
10. Run a zero test.
11. Run an accuracy test at 98 % of scale capacity for the time to deliver 800d.
12. Return the live supply to nominal.
Temperature Tests
13. Run a zero test. Do not reset zero or adjust the span at any time after the start of this test.
14. Adjust the load simulating device to represent normal loading of the scale (70 % of scale capacity).
15. At 20 ºC, test the MWT dynamically with simulation of the load and speed. Test the MWT at the following "flow rates" (all percent values represent percent loads of static scale capacity): 0 (zero test); 35 %(SSC_{min}); 35 %; 70 %; 98 %. Then, leave the MWT at full load for 1 hour and test at the following flowrates: 98 %; 70 %; 35 %; 35 %(SSC_{min}); and 0 (zero test).

Table T.7

Percent of Static Scale Capacity	Time (Minutes)	Totalaized Load TL (ton)	Tolerance AWE= (0.003)(0.45)(0.005)(TL)
0	20 minutes, or MTL_{min}/[(0.35)(BL_{min})(belt speed for test)], whichever is greater		
35 % of SSC_{min}	20 minutes, or MTL_{min}/[(0.35)(BL_{min})(belt speed for test)], whichever is greater		

35 % of SSC_{max}	Time to deliver 800d		
70 % of SSC_{max}	Time to deliver 800d		
98 % of SSC_{max}	Time to deliver 800d		
Leave MWT under simulated load for 1 hour			
98 % of SSC_{max}	Time to deliver 800d		
70 % of SSC_{max}	Time to deliver 800d		
35 % of SSC_{max}	Time to deliver 800d		
35 % of SSC_{min}	20 minutes, or MTL_{min}/[(0.35)(BL_{min})(belt speed for test)], whichever is greater		
0	20 minutes, or MTL_{min}/[(0.35)(BL_{min})(belt speed for test)], whichever is greater		

Table T.8
Laboratory Tests *continued*
16. Change the temperature to -10 ºC (14 ºF) at a rate no faster than 1 ºC/min. Follow soak requirements.
17. Repeat the simulated dynamic tests performed in step 15 (Table T.6)
18. Change the temperature to 40 ºC (104 ºF) at a rate no faster than 1 ºC/min. Follow soak requirements.
19. Repeat the simulated dynamic tests performed in step 15 (Table T.6)
20. Change the temperature to 20 ºC (68 ºF) at a rate no faster than 1 ºC/min. Follow soak requirements
21. Repeat the simulated dynamic tests performed in step 15 (Table T.6)
Data Analysis
1. The data are evaluated on the following Simulated Dynamic MWT Test Work Sheets for pass or fail
2. Approval is for addition of MWT to existing Certificate of Conformance without changes to minimum and maximum ranges.

14. Dynamic MWT Test Work Sheet and Laboratory Test Procedure No. 1

The calibration point is the 70 % load for the initial room temperature (20 ºC) test. Because the weight indication when in the test mode may not be at zero and may not be adjusted to indicate n weight values (e.g., the quantity indication may be voltage output or "counts." the table provides for calculations to convert indications into weight units). The scale indication shall not be zeroed during the test process. Corrections for the change in zero tests are to be done by calculation.

Places to record information needed for the test and the formulae needed to compute table entries are given below.

Static Scale Capacity, SSC = (maximum weight per foot)(length of weighbridge) = ________ lb.

Test load for 70 % SSC = _______________ lb.

Weight/foot = (static scale load)/(length of weighbridge) = Static scale capacity)/(length of weighbridge)

Start and end readings are in divisions and must be converted to weight values.

Conversion factor for divisions to weight = (change in static weight indication from zero to 70 % SSC load) / (70 % SSC load in pounds)

Change in zero = (Total change of zero during zero test) {(time of test for applied load)/(time of zero test)}

Indication corrected for change of zero = (Indicated change) – (Change of zero)

Scale indication in lb = (Indication corrected for change of zero) / (Conversion factor)

Actual weight = {(Applied load)/(length of weighbridge)}(speed)(time)

Note: Speed and time must use the same units of time (e.g., feet per minute and minutes)

Error = Scale indication – actual weight

Tolerance is from the Belt-Conveyor Scale Data Sheet and Laboratory Test Procedure, step 3.

15. Dynamic MWT Test Work Sheet and Laboratory Test Procedure No. 2

Scale indication at zero load (static scale indication) = _______________ divisions

(Not required if MWT can display static weight)

Scale indication at 70 % SSC (static scale indication) = _______________ divisions (Not required if MWT can display static weight)

Conversion factor = (change in static weight indication from zero to 70 % SSC load) / (70 % AAC load in pounds) = divisions/lb

Temperature__________ ºC

Type of Tests_______________ Signature____________________

Table T.9

Test Load (lb)	Applied load (lb)	Time of test in minutes	Reading in counts		Indicated Change = End – Start	Change in Zero	Indication corrected for change in zero	Scale Indication (lb)	Actual Weight	Error (lb)	Toleran ce (lb)
			End	Start							
Zero test	0										
35 % SSC_{min}											
35 % SSC_{max}											
70 % SSC_{max}											
98 % SSC_{max}											
Leave scale under simulated load for 1 hour											
98 % SSC_{max}											
70 % SSC_{max}											
35 % SSC_{max}											
35 % SSC_{min}											
Zero test	0										

16. Zero Change with Respect to Temperature

<table>
<tr><th colspan="8">Table T.10</th></tr>
<tr><td></td><td colspan="2">Low Temperature</td><td colspan="2">High Temperature</td><td colspan="2">20 ºC</td><td rowspan="7">Performance limit for temperature effect on zero test, AZE, per 10 ºC</td></tr>
<tr><td>Previous Temperature T_P</td><td colspan="2">20 ºC</td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>Current Temperature T_C</td><td colspan="2"></td><td colspan="2"></td><td colspan="2">20 ºC</td></tr>
<tr><td>Change in Temperature (T_C – T_P)</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td></td><td>Divisions</td><td>lb</td><td>Divisions</td><td>lb</td><td>Divisions</td><td>lb</td></tr>
<tr><td>Zero load indication at T_P</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Zero load indication at T_C</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Change in zero</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Change in zero per 5 ºC (9 ºF)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Date: ___________________

Indicator Model Number:_______________ Indicator Serial Number:_______________

___________________________________ ______________________________
Signature **Title**

2. Develop a List of Sealable Parameters for BCS Systems

Background: During the Sector's February 2008 meeting, members were asked to develop a list of programmable parameters within belt-conveyor scale systems which should have access restricted by means of some form of security seal. In developing this list, members were asked to consider all instruments which would have any metrological effect to the system. Mr. Paul Chase agreed to poll those manufacturers which currently hold NTEP certificates in order to develop a list of parameters that would be inclusive of the different design types. The resulting list was intended to be incorporated in NCWM Publication 14 and used in the type evaluation process.

A copy of the "Requirements for Metrological Audit Trails" from NCWM Publication 14 was provided to Sector members prior to the meeting for a review and discussion and recommendations.

Discussion: During the February 2009 Sector meeting, Mr. Chase indicated that he did not receive replies from all the manufacturers polled. Some members stated during the 2009 meeting that not all manufacturers give similar parameters within their particular devices, the same name, or terminology as do other manufactures do. Also, pointed out during discussion were situations where several (if not all) programmable parameters could have access limited through the use of one security seal, and what consequence this type of situation has on the development of a list that is useful to an NTEP evaluator. Mr. Ian Burrell stated that an adjustable parameter (such as span adjustment) may, in some systems, involve more than one component or module, and thereby, require the use of more than just one seal to limit access to a single parameter.

Mr. Jim Truex, NTEP Administrator, stated that NTEP evaluators require some foundation to base the test procedures on when various devices go through the type approval process. There was discussion among the members about various specific features (e.g., coarse zero adjustment; high/low flow alarm settings; etc.) that may be found on a device and whether or not to require a security seal to limit access.

Conclusion: The following table was initially developed showing what parameters should be protected by limiting access to them through a security seal or other security means. The Sector agreed that this table is simply a generic basis for the evaluator to use as a starting point, and the need to seal additional features would be assessed on a case-by-case basis for each manufacturer during the application for type evaluation.

Mr. Truex stated that NTEP evaluators will employ this table on a trial basis and note and comment on any changes that are deemed necessary.

Belt-Conveyor Scale Features and Parameters	
Typical Features to be Sealed	**Typical Features and Parameters Not Required to be Sealed**
• Official verification zero reference • Official verification span/calibration reference • Linearity correction values • Allowable range of zero (if adjustable) • Selection of measurement units • Division value, d • Range of over capacity indications (if it can be set to extend beyond regulatory limits) • Alarm limits for flow rate (high/low) • Automatic zero-setting mechanism (on/off) • Automatic zero-setting mechanism (range of a single step) • Configuration (speed, capacity, calibrated test weight value if applicable, pulses per belt revolution, load cell configuration,)	• Display update rate • Baud rate for electronic data transfer • Communications (Configuration of input, output signal to peripheral devices)
NOTE: *The above examples of adjustments, parameters, and features to be sealed are to be considered "typical" or "normal." This list may not be all inclusive, and there may be parameters other than those listed which affect the metrological performance of the device and must, therefore, be sealed. If listed parameters or other parameters which may affect the metrological function of the device are not sealed, the manufacturer must demonstrate that the parameter will not affect the metrological performance of the device (i.e., all settings comply with the most stringent requirements of Handbook 44 for the applications for which the device is to be used).*	

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